# PHILIPPINE COCONUT INDUSTRY ROADMAP 2021-2040

DEPARTMENT OF AGRICULTURE
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# PHILIPPINE COCONUT INDUSTRY ROADMAP 2021-2040

Department of Agriculture
**PHILIPPINE COCONUT AUTHORITY**
Elliptical Road, Diliman, Quezon City

**The Philippine Coconut Industry Roadmap (2021-2040)**

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Tel Nos: 8928-4501 to 09
Email address: ofad@pca.gov.ph

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Alphabet Communications Graphics & Print
Quezon City, Philippines
alphabetprinting@gmail.com

# PHILIPPINE COCONUT INDUSTRY ROADMAP DEVELOPMENT TEAM


**Lead Authors**

Edna A. Aguilar, Ph.D, Farming Systems Specialist, Program Leader

Ernesto P. Lozada, Ph.D., Post-harvest and Processing Engineering Specialist

Corazon T. Aragon, Ph.D., Agricultural Policy Specialist

**Contributors**

Leonardo A. Gonzales, Ph.D., Agricultural Policy Specialist

Julieane Camile Lacsina, MBS Global Agriculture

Enrico P. Supangco, Ph.D., Integrated Crop-Livestocks Farming Systems

Celia Medina, Ph.D., Entomologist / Insect and Pest Management Specialist

Concepcion L. Khan, Ms.C., Information systems, Databases, Mobile Computing and Artificial intelligence

**Project Support Staff**

Glaisa R. Garcia

Ebraim R. Ramos

Jhoana V. Alcade

Mar Jovette B. Laureta

Dara Maria A. Fabro

Felen A. Divina II

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# ACRONYMS

| | |
|---|---|
| **ACA** | Additional Compensation Allowance |
| **ACBI** | Association of Coconut Brokers Incorporation |
| **ACPC** | Agricultural Credit and Policy Council |
| **AFMIS** | Agriculture and Fisheries Market Information System |
| **AMAD** | Agribusiness and Marketing Assistance Service Division |
| **AMS** | Agricultural Marketing Service |
| **BAI** | Bureau of Animal Industry |
| **BARMM** | Bangsamoro Autonomous Region of Muslim Mindanao |
| **BETP** | Bureau of Export Trade Promotion |
| **BSMED** | Bureau of Small and Medium Enterprise |
| **CAGR** | Compound Annual Growth Rate |
| **CALABARZON** | Cavite, Laguna, Batangas, Rizal, Quezon |
| **CDOs** | Coconut Development Officers |
| **CIP** | Coconut Intercropping Project |
| **CIPMoD** | National Coconut Industry Program Monitoring Database |
| **CITEM** | Center for International Trade Expositions and Missions |
| **COD** | Coconut Development Officers |
| **COO** | Certificate of Origin |
| **CRA** | Cost and Return Analysis |
| **CREATE** | Corporate Recovery and Tax Incentives for Enterprises Act |
| **DBM** | Department of Budget and Management |
| **DOE** | Department of Energy |
| **DOF** | Department of Finance |
| **DOH** | Department of Health |
| **DRRCCA** | Disaster Risk Reduction Climate Change Adaptation |

| | |
|---|---|
| **EFTA** | European Free Trade Agreement |
| **EFTA** | European Free Trade |
| **EU** | European union |
| **FDA** | Food and Drug Authority |
| **FOB** | Freight On Board |
| **FSG** | Farm Service Groups |
| **FTA** | Free Trade Agreement |
| **FTSA** | Fair Trade Sustainability Alliance |
| **GAA** | General Appropriation Act |
| **GC** | Governing Council |
| **GMO** | Genetically Modified Organism |
| **GMP** | Good Management Practices |
| **GSP** | Generalized System of Preferences |
| **HACCP** | Hazard Analysis Critical Control Point |
| **IPM** | Integrated Pest Management |
| **IPOP** | Indigenous People Outreach Program |
| **IRR** | Internal Rate of Return |
| **ITDI** | Industrial Technology Development Institute |
| **ITEMA** | Information Technology-Enabled Maturity Assessment |
| **KAANIB** | Kasaganaan sa Niyugan ay Kaunlaran ng Bayan |
| **KEDP** | Kaanib Enterprise Development Project |
| **KEDP** | KAANIB Enterprise Development Project |
| **LBP** | LandBank of the Philippines |
| **LSFC** | Local Small Farmers Councils |
| **LSU** | Leyte State University |
| **MAP** | Management Association of the Philippines |
| **MC** | Moisture Content |
| **MGB** | Mines and Geoscience Bureau |
| **MIMAROPA** | Mindoro, Marinduque, Romblon, Palawan |
| **MIS** | Market Information System |

| | |
|---|---|
| **MSME** | Micro, Small, and Medium Enterprises |
| **MSME** | Micro, Small, Medium Enterprise |
| **MT** | Metric Ton |
| **NBB** | National Biodiesel Board |
| **NBP** | National Biofuels Program |
| **NCFRS** | National Coconut Farmers Registry System |
| **NCPC** | National Crop Protection Center |
| **NCRC** | National Coconut Research Center |
| **NDA** | National Dairy Authority |
| **NEDA** | National Economic and Development Authority |
| **NGA** | National Government Agencies |
| **NIA** | National Irrigation Administration |
| **NSIC** | National Seed Industry Council |
| **NTCP** | National Tobacco Control Programme |
| **OFR** | On-Farm Projects |
| **OPAFSAM** | Office of the Presidential Assistant for Food Security and Agricultural Modernization |
| **OPV** | Open Pollinated Variety |
| **OTAP** | One Town One Product program |
| **PACMA** | Philippine Activated Carbon Manufacturers Association |
| **PACMA** | Philippine Activated Carbon Manufacturers Association, Inc. |
| **PAH** | Polycyclic Aromatic Hydrocarbons |
| **PAH** | Polycyclic Aromatic Hydrocarbons |
| **PCA** | Philippine Coconut Authority |
| **PCA-RDB** | Philippine Coconut Authority – Research and Development Branch |
| **PCC** | Philippine Carabao Center |
| **PCHRD** | Philippine Council for Health Research and Development |
| **PCIC** | Philippine Crop Insurance Corporation |
| **PCOPA** | Philippine Coconut Oil Producers Association |
| **PCOPA** | Philippine Coconut Oil Producers Association, Inc. |

| | |
|---|---|
| **PCPP** | Participatory Coconut Planting Project |
| **PCRDF** | Philippine Coconut R and D Foundation, Inc. |
| **PDP** | Philippine Development Plan |
| **PEZA** | Philippine Economic Zone Authority |
| **PhilCoir** | Philippine Coconut Coir Exporters Association |
| **PhilHealth** | Philippine Health Insurance Corporation |
| **PhilMech** | Philippine Center for Postharvest Development and Mechanization |
| **PKO** | Palm Kernel Oil |
| **PM** | Particulate Matter |
| **PNS** | Philippine National Standard |
| **PNS/BAFS** | Philippine National Standards – Bureau of Agriculture and Fisheries Standards |
| **POMA** | Philippine Oleochemical Manufacturers Association |
| **POMA** | Philippine Oleochemical Manufacturers Association |
| **PPA** | Philippine Ports Authority |
| **PSA** | Philippine Statistics Authority |
| **PSA** | Philippine Statistics Authority |
| **PTR** | PCA Transformation Roadmap |
| **R&D** | Research and Development |
| **RBD** | Refined, Bleached and Deodorized |
| **RBD** | Refined, Bleached, and Deodorized |
| **RBO** | Refined bleached oil |
| **RCR** | Resource Cost Ratio |
| **RIARCS** | Regional Integrated Agricultural Research Center |
| **ROO** | Region of Origin |
| **SCFO** | Small Coconut Farmers Organization |
| **SFDP** | Seed Farm Development Project |
| **SFDP** | Small Farmer Development Program |
| **SME** | Small and Mid-size Enterprise |
| **SMPDP** | Smallholder Oil Palm Development Project |

| | |
|---|---|
| **SOCSKSARGEN** | South Cotabato, Sultan Kudarat, Sarangani, General Santos |
| **SPS** | Sanitary and Phytosanitary |
| **SSF** | Shared Service Facilities |
| **SSS** | Social Security System |
| **SUCs** | State University and Colleges |
| **SWOT** | Strength, Weakness, Opportunities and Threats |
| **TESDA** | Technical Education and Skills Development Authority |
| **TPD** | Tons of copra per day |
| **TSA** | Trade Sustainability Alliance |
| **UCAP** | United Coconut Associations of the Philippines Inc. |
| **UCAP** | United Coconut Association of the Philippines |
| **UCPB-CIIF** | United Coconut Planters Bank-Coconut IndustryInvestment Fund |
| **UNICOM** | United Coconut Oil Mills |
| **UPLB** | University of the Philippines Los Baños |
| **USM** | University of Southern Mindanao |
| **VC** | Value Chain |
| **VCO** | Virgin Coconut Oil |
| **VCO** | Virgin Coconut Oil |
| **VCOP** | Virgin Coconut Oil Processors and Traders Association of the Philippines Inc. |
| **VCOP** | Virgin Coconut Oil Producers and Traders Association of the Philippines |
| **VCOPTAP** | Virgin Coconut Oil Producers and Traders Association of the Philippines |
| **VSU** | Visayas State University |
| **WCC** | White Copra Central |

# MESSAGE


Through the years, the coconut industry has proven to be a sturdy pillar of the national economy, as coconut oil, desiccated coconut and copra oil cake remain three of the Philippines' top agricultural export commodities. In 2019 alone, exports of these three coconut products reached $1.25 billion, providing income and livelihood opportunities for industry stakeholders.

However, the industry confronts a number of challenges, including low productivity due to underutilized and senile trees, and unorganized supply chain that affects the economies of scale in input supply, primary processing and marketing. Poverty incidence among coconut farmers is also one of the highest in the agriculture sector.

Given its enormous economic potential that we have yet to fully realize, the Philippine coconut industry is indeed one sleeping giant whose time to be awakened has come.

We at the Department of Agriculture therefore commend the Philippine Coconut Authority— led by its Administrator Benjamin Madrigal and Deputy Administrator for Research and Development, Erlene C. Manohar—for coming up with this Coconut Farmers and Industry Road Map (COCOFIRM) to guide the industry towards a more productive and sustainable future.

Likewise, we pay tribute to the technical experts from the University of the Philippines-Los Baños—namely Dr. Edna Aguilar, Dr. Corazon T. Aragon, Dr. Ernesto P. Lozada and Dr. Leo Gonzales—for their respective contributions in preparing this roadmap.

The interventions under this roadmap, coupled with the support and investments for the industry as part of the newly-minted Coco Levy Trust Fund Law (RA 11524), are our best hopes to sustain this industry.

We therefore call on all stakeholders — oil millers, refiners, copra traders, coconut processors, farmers, and local government officials — for us to unite and truly develop our coconut industry for the benefit of all, most especially our small farmers and their families.

*Mabuhay ang industriya ng niyugan sa bansa!*

**WILLIAM D. DAR, Ph.D.**
**Secretary**
**Department of Agriculture**

# FOREWORD

The Philippine Coconut Industry has to transform to achieve its vision of a globally competitive and inclusive industry with ensured equitable gains to all industry stakeholders, the coconut farmers in particular. With the complex nature of the industry and the multi-faceted value chain, the need to set the direction and come up with holistic strategies to reinvigorate and awaken this "sleeping giant" industry is not just apt but is a compelling need of the time. Thus, it is imperative to have a guided pathway to navigate industry stakeholders on the road towards the VISION of the industry. This is what the Coconut Farmers and Industry Road Map or COCOFIRM is all about.

The crafting of the COCOFIRM is inevitable to have a unified and strategic missionary plan for the industry. This industry has been historically tagged as the 'milking cow of the Philippine economy' and has generated an average of US $ 2 billion from 2016 to 2018. Definitely, there are a lot of challenges, but there are more opportunities that need to be seized. Critical thinking and strategic planning are the key to attain the prospects of the industry for the benefit of the marginalized 2.5M coconut farmers (NCFRS, 2018).

It is my ardent desire when I assumed the leadership of the Philippine Coconut Authority to transform the agency to be responsive and proactive in developing the industry. The PCA as mandated by law has to implement and promote the rapid integrated development and growth of the industry in all its aspects and ensure that the coconut farmers are direct participants and beneficiaries of such development and growth. Hence, all outlooks and prospects have to be explored through appropriate formulation of programs and projects based on our capability and available resources.

Proper planning and programming of the desired targets and the course of actions have to be analyzed and ensured to be inclusively beneficial to all stakeholders.

The COCOFIRM has addressed the quest for aligning the industry direction to the Philippine Development Plan and incorporating the pillars of the One-DA Strategies in the New Thinking in Agriculture. The PCA as the prime mover of the industry has to set its base camps in transforming into a premier agency that will lead the industry to its desired goals.

Thus, this COCOFIRM will serve as the guidebook on where to go, what to do, and how to get there. With such guidance, the coconut industry will be able to be firmed and harnessed in setting directions and policies for the development of a forward-looking industry to attain sustainability and global competitiveness. Through COCOFIRM, we have provided the industry the pathway of change and guide the industry towards better and well-planned industry development.

To the technical experts who relentlessly gathered information, analyzed, and assessed every aspect of the industry, PCA salutes all of you for your significant contribution to the industry. Likewise, to all stakeholders of the industry who served as direct key informants and for the valuable support of the academe and other government agencies, PCA is certainly grateful for all your contributions.

This COCOFIRM belongs to all coconut stakeholders, just as we belong into one unified and solid force with a common goal of providing prosperous livelihood to the coconut farmers that will eventually trigger global competitiveness. The COCOFIRM is the pathway to prosperity, and herein are the ideas that emanated from all of you and intended for all of you.

**BENJAMIN R. MADRIGAL, JR.**
**Administrator**
**Philippine Coconut Authority**

# ACKNOWLEDGEMENT

On behalf of the PCA Management, RDB wishes to thank UPLB Chancellor Dr. Jose DV Camacho, Jr. for accepting the project entitled "Crafting the Coconut Farmers' and Industry Roadmap (COCOFIRM)". This document serves as the epitome of a unified and inclusive strategic plan that will set the industry direction. The first documentary in the long history of the coconut industry, the path to progress, and how to get there.

Sincerest gratitude goes to the Program Leader of this project entitled: and the lead author, Dr. Edna A. Aguilar, who despite the complexity of the coconut industry and short duration of the project, took the lead and conscientiously organized her team.
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Acknowledgement is likewise extended to the farmers who actively participated in various Farmers' Consultations conducted by PCA, in Luzon, Visayas, and Mindanao. The documentation and highlights of which were perused and consolidated by the COCOFIRM. The participants of the series of farmers' consultations held in 2017, specifically for coconut levy concerns are acknowledged. Farmers and farmers' representatives from Aurora, Batangas, Laguna, Quezon, Camarines Norte, Camarines Sur, Marinduque, Sorsogon, and Oriental Mindoro in Luzon. In the Visayas region, the 72 attendees which include 54 coconut farmers and representative that are part of small farmers' organizations from Tacloban, Leyte, Cebu, Samar, Northern Samar Eastern Samar, Negros Oriental, Negros Occidental, Bohol, Antique, Capiz, Iloilo, and Aklan are greatly acknowledged. The participants in the Farmers' Consultations from the provinces of Davao del Sur, Davao Oriental, Davao del Norte, Dinagat Islands, North Cotabato, Cotabato, Surigao del Sur and Agusan del Sur in Davao, the organizations like KAMMPIL, PAKISAMA, KATARUNGAN, AMMMA-KATIPUNAN, LAKAMBINI, PKMP, IRDF, KADAMO, Kilusang Pagbabago, and others, as well as various SCFOs, the farmers and farmers' representatives from the provinces of Davao Oriental, Sulu, Zamboanga, Zamboanga del Norte, Zamboanga del Sur, Basilan, Maguindanao, Lanao del Norte, and Misamis Occidental in Zamboanga Islands are all recognized.

Also, acknowledgement to the participants in the Technical Consultation with the Academe, The representatives from three universities: UPLB led by COCOFIRM team with Dr. Emil Q. Javier (AGAP/CAMP), the University of Southern Mindanao (USM) Coconut Experts, and lastly, Visayas State University (VSU) Experts, for the one-on-one discussion, thank you for your time and valuable inputs.

To the partner stakeholders, the representatives and members of the United Coconut Association of the Philippines (UCAP), and the coconut farmers who made themselves available for interviews and contributing insightful situations and ideas, providing figures for metrics and analysis of the coconut industry, we are truly grateful. Particularly, we would like to acknowledge Mr. Dean A. Lao, Jr. of Chemrez Technologies, Inc. as representative of Philippine Oleochemical Manufacturers Association (POMA), Engr. Bonifacio Fernandez Jr. of BF Industries Inc., a representative of Philippine Activated Carbon Manufacturers Association, Inc. (PACMA), Mr. Jesse

F. Cheng of Davao Bay Coconut Oil Mills, Inc., representing the Philippine Coconut Oil Producers Association, Inc. (PCOPA), Ms. Maureen Pasciolco of Pasciolco Agri Ventures representing the Virgin Coconut Oil Producers and Traders Association of the Philippines, Inc. (VCOP), Mr. Reynaldo Go of Rg Industries Inc. and the representative of Philippine Coco Coir Exporters Association, Mayor Fernando Mesa of Alabat, Quezon for sharing the convergence concept of the first PCA community-based coco sugar hub project, Ms. Maribeth Algodon of Mapecon Green Charcoal Philippines Inc., Mr. Jervis Jao and Ms. Juliet Maralit of JNJ Oil Industries, Inc., Ms. Evelina Patiño of United Coconut Chemicals, Inc. (COCOCHEM), Mr. Martial Beck of Eau de Coco, Ms. Noreen Joy F. Ehilla of Oriental Golden Coco Inc., Pauline Arjay of New Quezon Coconut Enterprises, and Mr. Rowee Daquis of Peter Paul.

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To everyone who has imparted their views, comments, recommendations, and inputs directly or indirectly to this project, our deepest and sincere appreciation, and gratitude. To the Almighty God for the realization of our aspiration, He made it possible.

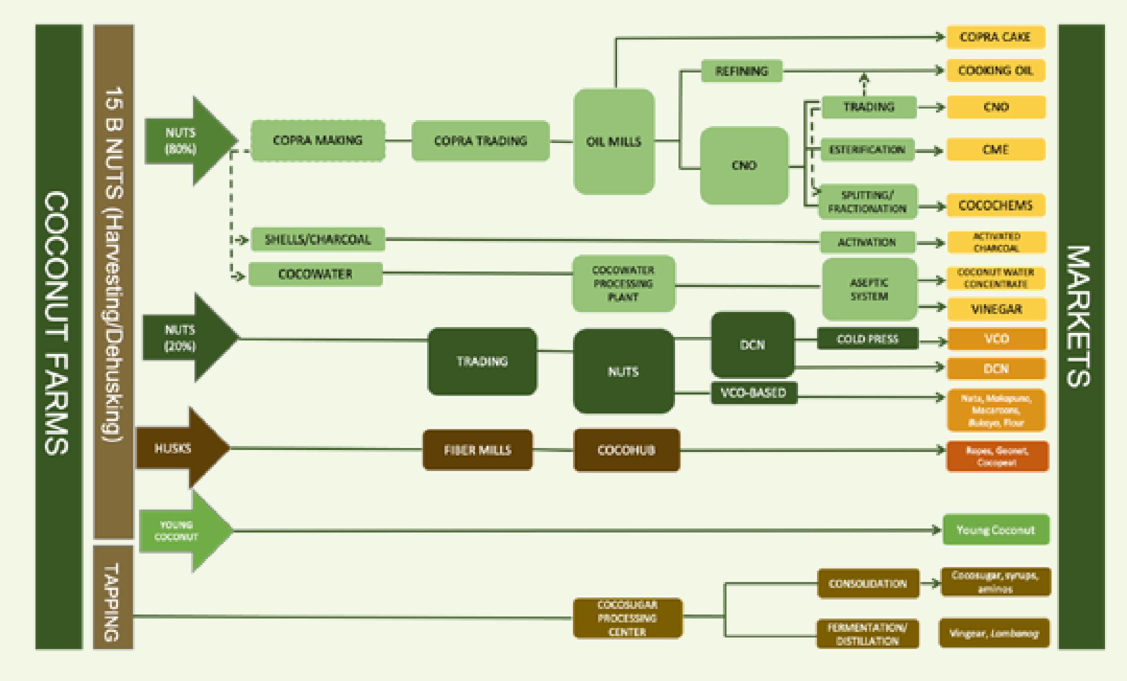
**ERLENE C. MANOHAR**
**Deputy Administrator and COCOFIRM Proponent & Coordinator Research and Development Branch**

# EXECUTIVE SUMMARY

The Coconut Farmers and Industry Roadmap (COCOFIRM) aims to provide direction and recommendations towards sustainable development of the coconut industry, focusing on: 1) inclusive growth to lift the coconut farmers out of poverty and 2) improving the competitiveness and expanding the market potential of traditional and non-traditional coconut products.

Mapping, baseline and benchmark analyses of the various coconut value chain clusters and product streams (Figure 1) were used as bases for recommending improvements for a more efficient supply and value chains. Stakeholders' participation and inputs in previous PCA consultations, summits and workshops were reviewed. Feedback meetings and consultations through PCA were solicited to validate the baseline analytics and recommendations.

**FIGURE 1. THE UNIFIED VALUE CHAIN FOR SEGMENTATION PURPOSES MAY BE DIVIDED INTO THE FOLLOWING VALUE CHAINS: 1) COPRA-CNO-OLEOCHEMICALS VALUE CHAIN; 2) DCN VALUE CHAIN; 3) VCO VALUE CHAIN; 4) COCO COIR VALUE CHAIN; 5) YOUNG COCONUT VALUE CHAIN; 6) COCONUT SAP VALUE CHAIN; AND 7) ACTIVATED CARBON VALUE CHAIN**



The continuing restrictions on travel and face to face meetings due to the COVID-19 pandemic posed a great constraint and challenge to the team in primary and secondary data sourcing, hence the heavy reliance on PCA support for secondary data gathering and in coordinating online interviews, consultations, meetings for collecting primary data, feedback and validation.

Analytics and recommendations were guided by the following operational framework (Figure 2), grounded on the principles of empowerment, convergence , sustainability, inclusive growth espoused by the Philippine Development Plan (PDP 2017-2022), the first medium-term plan anchored on the national long- term vision of AmBisyon Natin 2040, which represents the vision and aspirations of the Filipino people for a Matatag, Maginhawa at Panatag na Buhay (strongly-rooted, comfortable, and secure life) in the next 25 years.

Inputs to support the COCOFIRM's strategies and recommendations were enabling laws and policies, investments including infrastructure, capable and sufficient manpower, continuing research driven by industry needs and innovations, and efficient transfer of technologies. COCOFIRM adopted the Department of Agriculture's 12 paradigms towards a ONE Department of Agriculture: A Holistic Approach to Agriculture & Fisheries Transformation focusing on "Masaganang Ani at Mataas na Kita" for the small- scale coconut farmers. Existing practices of small- and medium-sized enterprises (MSMEs) and large-scale processing companies were benchmarked with best practices and new technologies.

A transformed PCA (PTR) will be the major driver moving the supply chains to the right, producing goods and services for inclusive growth and prosperity of all stakeholders, harnessing convergence, and partnerships with NGAs, academe, industry, public private partnerships to apply the 12 paradigms to lift the coconut farmers out of poverty and improve the competitiveness, expand markets of traditional and non- traditional products, and explore new products and markets.

**FIGURE 2. OPERATIONAL FRAMEWORK OF COCOFIRM TOWARDS A SECURE AND RESILIENT COCONUT INDUSTRY WITH EMPOWERED AND PROSPEROUS FARMERS**


The approval of RA 11524 creating the COCONUT FARMERS AND INDUSTRY TRUST FUND (CFITF) will jumpstart and sustain the transformation of the coconut industry, providing social protection, empowerment and prosperity to farmers and thus, strengthening and enhancing the global competitiveness of the coconut industry.

# The Philippine Coconut Industry: Situationer

## Production sector

Coconuts dominate the agricultural landscape of 69 out of the 82 provinces of the Philippines covering 3.65 M hectares – a quarter of the country's total arable land. Coconut contributes an average of PhP 91.4B yearly export earnings from 2014-2018 (PSA, 2018), comprising 25% of the country's agricultural exports. There are over 2.5 M coconut farmers, 51%

representing landless tenants and workers and the other 49% are owners. Income from coconut farming is low and over 90% of coconut farmers live below poverty threshold of PhP 125,775/ year (PSA, ref no. 2019-053). Majority of the coconut farmers in the 2018 National Coconut Farmers Registry (NCFRS) are food insecure and without any social protection. Coconuts farms are small, 75% are 2.0 ha and below, fragmented and farms in uplands have accessibility constraints.

The production sector, the lifeblood of the industry supplying the feedstock for the various coconut value chains (Figure 1), is challenged by low and declining coconut productivity, inspite of continuous expansion in land area. Thus, while some 15 B nuts are

harvested annually from 345 M bearing palms, coconut productivity in 2019 was only at 44 nuts per tree per year. This only represents 50% of the potential yield of the native tall variety and 30% of the potential yield of local hybrids. While the Philippines has the largest area planted to coconuts in the world, and is the 2nd top producer, the country's productivity per hectare remains the lowest among the top ten coconut producers of the world at only 4.0 MT /ha nuts compared with the world's best at 12.5 MT/ha.

Coconut population is dominated by 98% native talls with an average of 10% senility. Around 1.78 M hectares or 50% of coconut areas are nutrient deficient. The typical coconut farm is poorly managed, rainfed, unfertilized, and with no regular pest and disease monitoring and control. There is much room for improvement of coconut yield using already available production technologies and improved tall and hybrid varieties. The low productivity, particularly in suitable with large coconut areas should be addressed, according to their particular needs or constraints to increased yield.

The impact of climate change, which has caused great devastation to many regions, including major production grids, is expected to remain a concern, given geographic location of the country. The Philippines is ranked 4th in the long-term climate risk index in 2021, having the highest number of events (2009-2019) among those in the top ten countries. An analysis of the production trends revealed that the series of strong and super typhoons, severe drought caused by intense and prolonged El Niño, and the exotic pest cocolisap, have devastated coconut regions, reducing bearing trees and decreasing tree productivity for several years. Major production grids including Davao, Eastern

Visayas and CALABARZON have been severely affected and have not fully recovered. Buffering the farmers and the industry from the severe impacts of climate related risks and hazards needs to be considered in the design of programs and interventions. Recalibration of targets and prioritization for rehabilitation, planting and replanting of coconuts particularly of hybrids and the choice of intercrops and other enterprises should consider this recurring extreme weather risks. Adopting climate resilient coconut-based farming systems should be integrated in planning for agribusiness corridors both for coconuts and intercrops. Continuing innovative and strong research and science-based recommendations and strategies have to back-up national programs.

Sustainable growth and global competitiveness of the various coconut value chains are dependent on the productivity of coconut farms, which provide the raw materials and feedstocks for these industries. Additionally, the demands of the export market for price competitiveness, reliability of supply, traceability of sustainable farm practices and stricter quality standards, are dependent on the farmers adopting good agricultural practices (GAP) or organic production systems that meet the standards of the market. Thus, incentivizing the farmers to participate in improving the productivity, efficiency and sustainability of coconut farms is at the core of this coconut industry roadmap.

The Philippine Coconut Authority (PCA) has been implementing continuing fertilization and planting and replanting programs. Supported by the seed production and hybridization program, it is predicted that production is on the upswing, breaching 16 B nuts by 2025, the country's highest projected production. With the further support from science-based technologies and strategies towards good management practices and expansion of its participatory on-farm hybridization using assisted pollination technique, a farmer-inclusive program that can be replicated and upscaled to increase utilization of good varieties and hybrids and further expand the country's nut production towards a target of 20 B nuts by 2030 and 30 B by 2040 should be attainable, despite the challenges. Convergence of government agencies led by PCA and private sector support are a key strategy to achieve this.

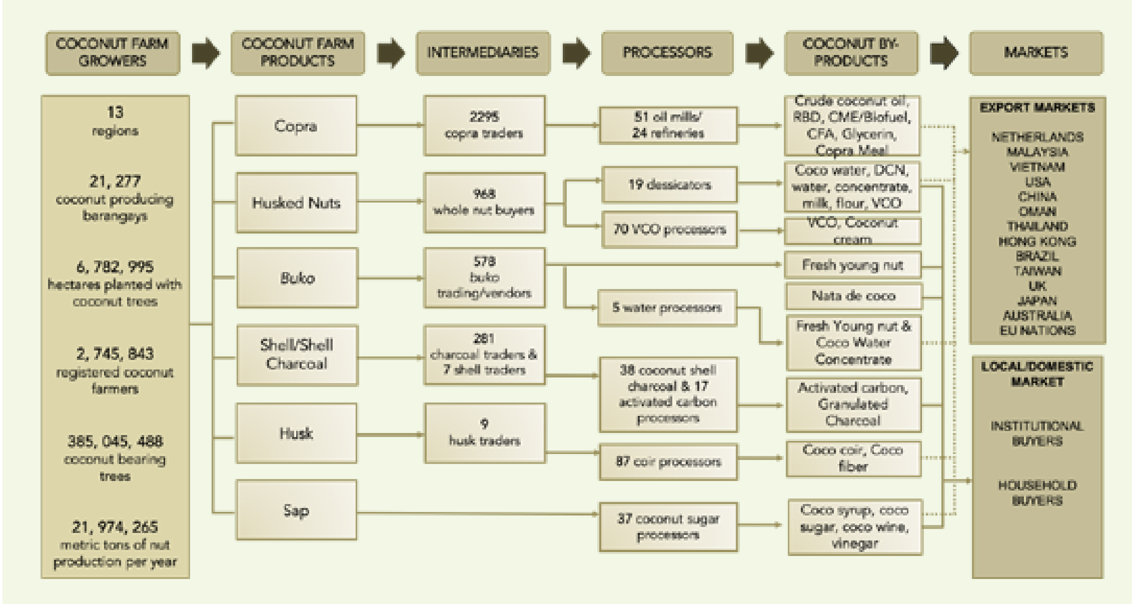
The farmers cannot depend on coconuts alone for their livelihood to attain food security and reduce poverty. They need to diversify their income sources. The wide spaces in between coconuts and its unique canopy architecture make it suitable for intercropping, yet over 80% of the coconut farms are monocropped. Coconut areas can increase the country's agricultural output without opening new lands. Intercropping and livestock integration under coconuts have been proven to increase farm productivity and income many- folds and are a good strategy to significantly increase farmers' income and welfare. However, small hold coconut farmers lack capital and infrastructure, and have no sustained access to formal credit sources. It is imperative that farmers' organizations should undertake collective action and policy advocacy activities to voice out their socio-economic and other concerns. The lack of entrepreneurial and leadership skills of farmers' organizations/cooperatives that will enable the association to successfully engage in business enterprises needs to be addressed.

The KAANIB enterprise development program of PCA (KEDP) has supported numerous intercropping, livestock integration and coconut processing projects. There are existing best practices for agro-industrial hubs, for major intercrops such as coffee, cacao, banana, and high value vegetables that can be replicated and upscaled. The livestock industry has viable commercial models of vertical integration and specialized production, which can be adopted to community-based models. There are partnership models for CFOs and private investors to create a backward

integration system for coconut and intercrops processing hubs. Successful and promising KAANIB projects are low lying fruits that maybe prioritized for support towards clustering under a centralized management and linkage to a reliable market. Support should be provided to enable them to do cooperative management from production to processing and marketing, ensuring adherence to market standards of reliability and quality. This will mainstream farmers' participation in agro- industrial corridors of development.

Despite the backdrop of a struggling coconut industry, there are many very encouraging developments. Infrastructure such as road networks and ports to support logistics for distribution has improved, communication facilities and other support systems have been modernized, and PEZA zones where a number of coconut processors are located already exist. The private sector-led processing sector, a number of which are highly efficient and among the world's benchmark, are primed to increasing their processing capacities given the reliable and quality supply of raw materials and feedstock and those interviewed by COCOFIRM, whether in direct or indirect relationship with farmer growers are one in expressing their willingness to support the farming sector towards planning and replanting using improved varieties and hybrids, sustainable management practices, diversification and getting certification, among others. On the market side, there is a growing worldwide recognition of the medical, therapeutic, and nutritional values of coconut products. Owing to the growing need of consumers for healthier products and the global direction towards green products, the Philippine coconut industry must take advantage of this growing market.

**FIGURE 3. SUPPLY CHAIN MAP OF THE COCONUT INDUSTRY IN THE PHILIPPINES**




The following figure presents the supply chain map of the coconut industry in the Philippines indicating the flow of supply, the stakeholders, and their numbers at each node. Regional supply chain maps are also presented in the report. Inputs from the farms are linked to the processors through the intermediaries who are composed of traders for different farm products. The manufacturers then transform the feedstock into a set of products that reach the local or international market. Strategies and recommendations generally apply to all regions addressing common problems on the production sector and for each industry cluster or product stream. The regional road maps' proposed regional interventions can have specific recommendations and strategies based on their resources and specialized products. There are 21,277 barangays that grow coconuts, representing about 50% of the total number of barangays in the country. A total of 2.745 M farmers registered in the (National Coconut Farmers Registry System, 2018) are directly involved in the production sector. Around 4,138 intermediaries are part of the multi-layered marketing system of the coconut industry, majority of whom are copra traders. Some of these traders also serve as consolidators that ease the delivery of the coco farm produce to manufacturers who need the supply in bulk. There are a total of 331 processors in various coconut product lines who are operating in the country in small to large scale. Coco coir producers are present in largest number followed by VCO manufacturers.

Oil mills, refineries, and factories operate at a large capacity. Products are channeled to the consumers in domestic and international markets.

## Processing sector

About 80% of the coconuts produced in the country are processed into copra - the feedstock for coco oil mills. There are 60 oil mills, with combined crushing capacity of 3.4M MT/year operating at only 38-69% of their capacities due to unreliability of coconut supply. Majority of the oil mills are located in CALABARZON and Davao Region. Thirteen of the oil mills are vertically forward integrated into refining and value- added processing (i.e., oleochemical and CME processing). There are 39 oil refineries operating in 10 regions with a total annual refining capacity of almost 2.0 M MT. Most of these oil refineries are in Northern Mindanao, Davao Region, CALABARZON, and NCR. There are eight oleochemical companies (making intermediate coconut-based chemicals like fatty alcohol, fatty acids, methyl ester, and glycerin) operating in four regions - CALABARZON, the National Capital Region, Zamboanga Peninsula, and Northern Mindanao. Moreover, there are 12 operational coco-biodiesel manufacturers with a total production capacity of about 0.61 M MT of CME per year, clustered in the National Capital Region and CALABARZON, and Mindanao regions.

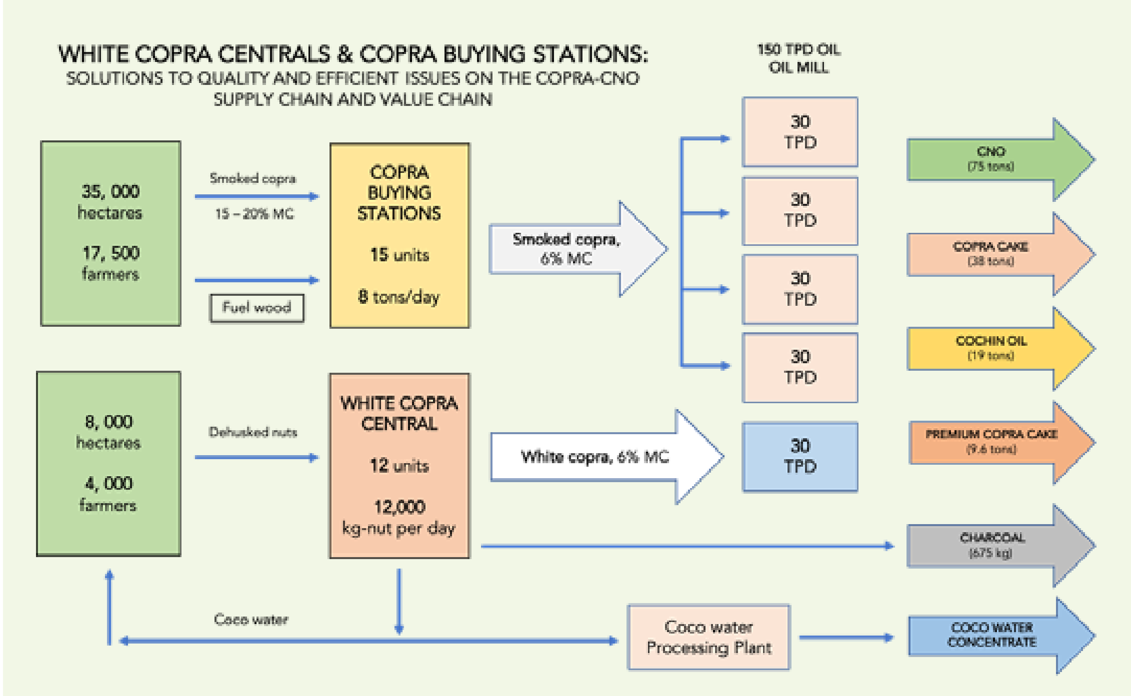
While the technology for oil mill processing is highly efficient and world class, the low quality of copra supplied to oil mills increases the processing costs, significantly affecting milling efficiency, refining recovery, and refining costs. Low quality of copra leads to a high level of polycyclic aromatic hydrocarbons (PAH) and aflatoxin in the production of crude coconut oil that could make these products unmarketable in the export market.

Poor copra produced by smoke kilns at the farms and the multi-layered marketing that could take small upland farmers to millers between 1-3 months, results to further physical and quality losses. The Philippines stands to lose the export markets if the country cannot comply with the stricter standards on allowable limits of aflatoxin and PAH in coconut oil and copra cake. Radical transformation in the copra processing sector is an investment that the industry cannot do without. COCOFIRM proposes the establishment of agro-industrial corridors for a white copra central (WCC) owned and operated by coconut farmers that will market directly to coco oils. The WCC will be supported by strategically located coconut buying stations (CBSs) which will consolidate whole nuts for the WCC or for the farmers still selling copra to oil mills. The buying stations will provide re-drying facility to reduce copra moisture content to 6% thereby arresting the growth of aflatoxin. The farmers organization-owned WCCs and farmers organization-owned CBS will be established along a

supply chain that will efficiently supply the participating mills with high quality raw materials. A generic prototype model is presented below (Figure 4). The farmers organization-owned WCCs and farmers organization-owned CBSs will supply the mill with white copra and high-quality smoked copra. The mill will produce cochin oil, premium grade copra and high quality CNO. The mill will pay premiums on high quality.

Twenty percent (20%) of the 15 B nut production are used for the manufacture of desiccated coconut (DCN), virgin coconut oil (VCO), coconut milk and other uses, including for home consumption. The Philippines is the top producer and exporter of DCN and VCO in the world. In 2018, there were 21 medium- scale DCN processing plants operated by 19 companies with an aggregate annual production capacity of about 0.45 M MT. Three companies operate two desiccated coconut processing plants each in different locations. Desiccated coconut processing companies in the Philippines have become integrated producing multi-products from a whole nut such as low-fat desiccated coconut, coconut flour, coconut cream/milk, coconut water, paring cakes, paring oil, and virgin coconut oil. The DCN factories are models for large-scale integrated coconut processing by recovering and processing coconut water into exportable concentrates. By crushing DCN, virgin coconut oil (VCO) is produced at volumes attractive to global players. The by-product is coconut flour. The market for coconut water has grown to the

**FIGURE 4. PROPOSED TRANSFORMATION OF COPRA PROCESSING AND TRADING THROUGH COCONUT BUYING STATIONS WITH RE- DRYING FACILITIES AND WHITE COPRA CENTRALS**




point where coconut water from DCN factories is not sufficient anymore. The proposed WCC offers an opportunity to use the mature nuts brought into the white copra central for processing into coco water concentrate.

There are 42 VCO processing plants operating in nine regions in the country and 14 coconut water processing plants spread out in six regions. Coco shell-based, coir and coco sugar industries are dominantly operating in Mindanao with 15 small- to large- sized coco shell charcoal with an aggregate annual production capacity of 0.32 M MT and 14 activated carbon processing plants with total annual production capacity of 85,585 MT. There are also 161 coir and 33 coco sugar processing plants operating in Mindanao, respectively.

Critical to supplying the volume and quality of raw materials in a timely manner rests on the availability of tappers for sap harvest, nut harvesters, dehuskers, splitters, and operators of the various machines and equipment in coconut processing plants. Additionally, service crew who can manage, monitor crop health, and raise early warning for pest and disease as well as render farm services such as farm harvesting and dehusking are a critical support system in a modernized coconut industry. Professionalizing this sector through certificate trainings and continuing education will mainstream them into the formal workforce as wage earners and would qualify them for SSS membership. For example, each farmer-organization-owned WCC would require 270 farm service crews so that harvesting can be scheduled in synchronized with the drying schedules.

## Coconut Utilization and Consumption

The coconut industry is export oriented. The share of export of the total utilization increased markedly from 61% in 2009 to 74% in 2019. Conversely, the proportion retained for domestic consumption/utilization decreased from 39% in 2009 to 26% in 2019.

Local consumption of manufactured coconut oil (597,000 MT per year) during the period 2009- 2019 accounted for the largest share (approximately 76%) of the total domestic consumption of coconut, followed by food nuts (113,671 MT or 14.5%). The biggest consumers of mature husked nuts are desiccated coconut manufacturers, followed by coconut milk/cream producers, virgin coconut oil producers, and households. Young coconuts are mainly utilized for salads and for its water as non-carbonated, healthy beverage or sports drink. Home-made oil is mainly intended for home consumption and its share was the lowest at approximately 10% in the same period.

PSA reported that the annual per capita consumption of coconut decreased from 6.96 kilograms (kg) per capita in 2018 to 6.88 kg per capita in 2019. However, FAO's estimate of Filipinos' annual per capita consumption of coconut in 2018 was much lower compared to PSA's reported per capita coconut intake figure. Filipinos' annual per capita intake of coconut was only 5.04 kg, much lower than the world's largest coconut consumer, Sri Lanka, at 74.67 kg and the world's largest coconut producer, Indonesia, at 14.24 kg. Multimedia information and market promotion campaign on the health and nutritional benefits of coconut food products, its nutraceutical, beauty and wellness use as well as the multifunctionality and ecosystem services of coconut palm can significantly increase local consumption and teach Filipinos to value coconut more as a national heritage. Research on new uses of coconuts, new processes, and technologies to improve efficiencies of farm operations and processing to reduce costs are continuously needed.

## Trade Performance and Prospects Per Product Stream

The total export revenue from traditional and the non-traditional coconut products grew by an average rate of 3.9% per year from 2015 to 2019. Revenues from exports of traditional coconut products increased by an average of 5.1%, but export earnings from non-traditional coconut products declined by an average of 1% per year.

The largest contribution to the country's coconut export earnings came from traditional coconut products. Coconut oil (70%), desiccated coconut (15%) and copra meal (4%) generated an aggregate value of US$ 1.83 B per year and accounted for 2.86% of the country's merchandise export earnings from 2015-2019. Exports of non-traditional coconut products only accounted for an average of 0.46% (US$ 292 M) of the country's total foreign exchange earnings. A total of 43 non-traditional coconut products were exported from 2009- 2019 with the following as top promising products: virgin coconut oil, coco water, coconut concentrate, liquid coco milk, coco cream, hydrogenated coconut oil, coco husk cubes, coco peat, baled coir, and glycerin.

Coconut oil, as a lauric acid oil, constitutes a measly 2.2% of the world's oil and fats market in 2019. The Philippines supplies to 57 countries, approximately 45% of the total world export volume of coconut oil from 2009 to 2019 with an average annual growth rate of 6.9%/year and 9.7%/year in export volume and export value, respectively. The Philippines has the highest competitive advantage in the production and export of crude coconut oil compared to its close competitors, Indonesia and India. The Philippines has a favorable market prospect in exporting coconut oil owing to the negative advisory against the use of palm oil in recent years. Palm oil imports for food consumption are dropping in Europe and have stalled in the United States. In view of these recent developments, it is expected that coconut oil's position in the oil and fats trade in these countries will improve. In the domestic market, local consumption of RBD coconut oil as cooking oil is projected to be slow due to the proliferation of lower-priced imported palm oil, canola oil, corn oil, and other vegetable oils in retail stores and supermarkets throughout the country.

The Philippines is the world's top exporter of desiccated coconut followed by Indonesia and Sri Lanka. The country's volume of exports increased by 5.2% per year, while export earnings grew faster at 11.1% per year from 2009-2019. Among the coconut exports, DCN has the most diverse market penetrating about 109 countries all over the world and it also commands the highest price. The country has a higher comparative advantage in producing and exporting desiccated coconut than Indonesia and Sri Lanka. The Philippines has the greatest ability to compete in the global desiccated coconut market particularly in the European Union, which is the world's largest importer of desiccated coconut. Presently, the Philippine desiccated coconut fetches a higher price compared to desiccated coconut imported from Indonesia and Sri Lanka because of our premium quality. The Philippines will stand to benefit from the considerable growth in market

demand for desiccated coconut by the food processing and confectionery industries in the European market.

The Philippines is the world's second major exporter of coco shell charcoal, next to Indonesia. On the average, the country's export of coconut shell charcoal in terms of volume and value increased by 20.3% and 24.1% per year, respectively from 2009-2019. Coco shell charcoal was dominantly shipped to China and Japan for further processing to activated carbon. Rising volume of exports of raw coco shell charcoal has been depleting the supply of this raw material for Filipino activated carbon manufacturers. The country would benefit more if more activated carbon were produced and exported because it is a high value-added product.

The Philippines used to be the top exporter of coco shell charcoal-based activated carbon in the international market but was overtaken by India starting in 2016. Nonetheless, from 2009-2019, the volume and earnings of coco shell-based activated carbon exported in the international market Increased at an average of 17.6% and 20,8% per year, respectively. The export market for coco shell-based activated carbon is more diverse compared to coco shell charcoal, reaching 100 destinations in the international market. India has the highest comparative advantage in producing and exporting coco shell charcoal- based activated carbon, followed by the Philippines. The global demand for coco shell charcoal-based activated carbon is growing because government regulatory agencies in different countries have recommended coconut activated carbon as the best available material for use in air purification, mercury absorption, and water treatment applications owing to growing environmental concerns. The increasing applications of activated carbon in the food and beverage industry and the pharmaceutical sectors have also contributed to demand growth of activated carbon globally and are expected to increase further the demand for coco shell-based activated carbon from the Philippines.

Coconut oil is used as feedstock in producing oleochemicals. The country's export earnings from traditional oleochemicals (coco fatty alcohol, coco fatty acid, and coco methyl ester) increased by an average growth rate of 22.3% per year from approximately US$ 12.68 M in 2009 to US$ 37.04 M in 2019. Coco methyl ester had the highest growth rate at 102.6% in terms of export volume and 141.6% in terms of export revenue from

2009 to 2019. Exports of coco fatty acid and coco fatty alcohol decreased from 2009 to 2019. The decrease in the volume of exports of coco fatty alcohol could be attributed to the shutting down of three out of four oleochemical companies manufacturing coco fatty alcohol because of the discontinuation of the implementation of EO 259. The Philippine Coconut Authority has submitted a proposal to Congress for approval to increase the CME blend from 2% (B2) to 5% (B5) based on Republic Act (RA) 9367 or the Philippine Biofuels Act of 2006 for the purpose of increasing local biodiesel utilization and stabilizing copra prices. The Philippine Oleochemical Manufacturers Association is also clamoring for the revival of Executive Order 259 which required all detergent manufacturers to use fatty alcohol in their detergent formulation. The environmental, health and economic benefits to coconut farmers of using coco-based surfactant in the detergent industry justifies the revival of the implementation of EO 259 and will provide the needed boost for the local oleochemical industry. If these policy proposals will be approved, it is projected that the domestic demand for crude coconut oil as feedstock for CME production will increase. On the export side, the import ban on palm oil exports of three large Malaysian palm oil companies by the United States will likely increase its imports of Philippine coco methyl ester. Market Research reports that the global oleochemicals market size is anticipated to reach US $ 31.4 B by 2027 registering a compounded annual growth rate (CAGR) of 5.8%.

The total volume of exports of VCO increased by an average annual growth rate of 45% with a corresponding 55% increase in average export earnings per year from 2009-2019. The American Heart Association (AHA) advisory against saturated fats continue to

negatively affect the prospect of coconut oil - based food products in the export market. The Philippines has a high comparative advantage in producing and exporting VCO. The virgin coconut oil with its anti-microbial property, its appeal as a natural and green product, and the wider application to beauty, cosmetics, and personal care products is expected to stimulate further growth of VCO in the export market. The local consumption of virgin coconut oil will remain high especially with the promising results of DOST's experiment on the health benefits of VCO intake on Covid-19 patients. More people would be encouraged to purchase virgin coconut oil as an immune-health supplement for faster recovery, the possibility of combating African Swine Flu, and other beneficial uses of virgin coconut oil.

Coconut water ranked 2nd to VCO in terms of volume of exports of non-traditional coconut products, increasing markedly from 593 MT worth approximately US$ 0.37 M in 2009 to 51,839 MT valued at US$ 57 M in 2019. The country shipped out an average of 39,065 MT of coconut water worth US$ 41 M annually during the 11-year period under review. The Philippines has a comparative advantage in producing and exporting coconut water. Coco water as a natural, organic, and healthy functional drink has been recognized globally. Owners of Vita Coco, O.N.E., and Kirkland (Costco), the popular brands of coconut water drink in the United States and/or Europe, source their coconut water from the Philippines, among other countries. However, local consumption of coconut water may remain low, since local consumers prefer to drink water from young nuts rather than the packaged one.

The annual export performance of coconut sugar showed an irregular trend. Coconut sugar exports during from 2017-2019 averaged 344 MT and export earnings generated amounted to US$ 1.1 M per year. The Philippines has very low comparative advantage in producing and exporting coconut sap sugar. Philippine coconut sap sugar is not price and cost competitive compared to Indonesia's coconut sap sugar which is being sold at a lower price due to higher labor cost incurred in tapping coconut sap in the country. Technology to mechanize/automate tapping or planting of dwarf and hybrids for sap production is recommended. Adulteration (i.e., mixing of sugarcane with coco sugar and mixing Philippine coco sugar with low quality and lower-priced coco sugar imported from Indonesia) is also a current threat to the coco sugar industry. The country should capitalize on promoting coco sugar's low glycemic index, given the rising cases of diseases such as diabetes, cardiovascular diseases (CVD), obesity rates as well as the change in dietary patterns to increase global demand. For culinary purposes, coco sugar could have unlimited application in food and drinks. As a non-food product, coco sugar is used as body scrubs, shaving gels, facial and body creams, and for haircare products. The growth in the local demand for coco sugar may be slow due to the continued reliance on sugarcane-based sweeteners which are relatively cheaper.

Export performance of coir products was erratic. The major coconut coir products exported by the Philippines were coconut peat/dust, husk cubes, baled coir, and coconut pads. Export earnings from coco peat/dust increased from US$ 661,000 in 2009 to US$ 3.9 M in 2019. The total value of husk cube exports from the Philippines reached as high as US$ 5.6 M in 2019. Exports of baled coir decreased from 2,079 MT in 2009 to 544 MT in 2019 but the total export earnings rose by 210% per year, on the average. China is the major market for coco husk /coir/peat products. The Philippines has a lower comparative advantage in producing and exporting coco coir products compared to India and Sri Lanka. In 2019, India and Sri Lanka captured 94% of the global coco coir market. India has larger mechanized coir processing plants with economies of scale and has lower coir processing cost. For coir and coir products, the Philippines should ride on the global trend of going green promoting products which are sustainable and environmentally friendly. Application to horticulture, soil conditioning, gardening, and hydroponics specifically the use of geotextiles to civil engineering, agriculture, and soil erosion are some of the key drivers for growth for coir products. There are very large market demand and opportunities for coir products. The Philippines can venture into coco chips and coconut fiber, but the coco coir industry would require market development, market intelligence, and intensive promotional efforts to realize the potential demand.

# Industry SWOT Analysis Recommendations

SWOT analysis of the industry led to the development of recommendations to achieve improvement in global competitiveness and increase domestic consumption, towards an inclusive, market driven, innovative and sustainably growing coconut industry. Figure 5 presents the thematic of recommendations:

## FIGURE 5. COCOFIRM OVERALL FRAMEWORK

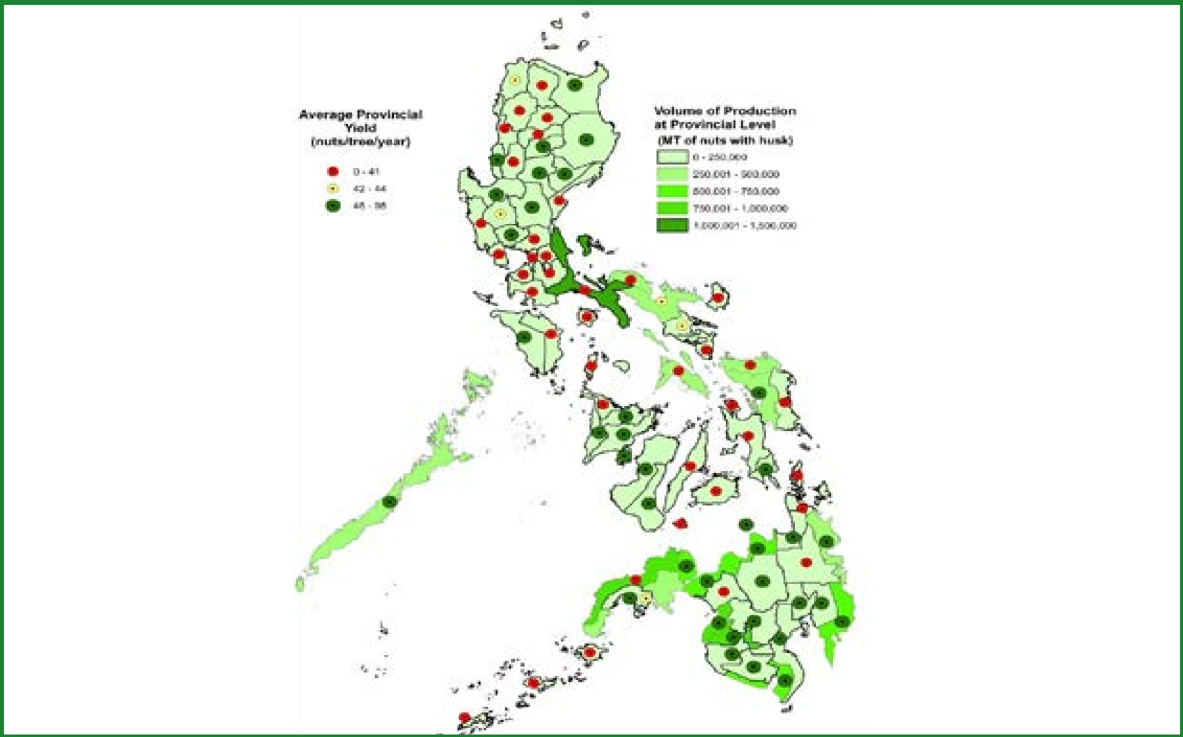

The approval of RA 11524 creating the COCONUT FARMERS AND INDUSTRY TRUST FUND will jumpstart substantial components of these recommendations supportive of the following: Social protection and improved farmers welfare, agribusiness management and skills enhancement of coconut farmers organizations, farm improvements including hybridization, intercropping, livestock integration and integrated coconut processing agro-enterprises, and provision of support systems including credit, shared facilities, infrastructure and road networks. These COCOFIRM recommendations address major concerns of the industry towards improving the competitiveness of traditional and non-traditional coconut products for global and domestic markets.

The coconut is a Filipino legacy. It is a heritage crop that should be valued by all Filipinos and provided full support for its sustainable and inclusive growth. The time to radically reform and transform the sector towards a secure and resilient coconut industry with empowered and prosperous farmers is HERE and NOW!

# INTRODUCTION

## The Philippine Coconut Industry

Coconut palms dominate the agricultural landscape of 69 out of the 82 provinces of the Philippines covering 3.6 million ha—around a quarter of the country's total arable land. Coconut contributes 25% to the country's agricultural exports, with an average of PHP 91.4 B yearly export earnings from 2014–2018 (PSA, 2018). There are over 2.5 million coconut farmers, 51% represents the landless tenants and workers, the other 49% are owners. Income from coconut farming is low and over 90% of coconut farmers live below poverty threshold of PHP 125,775/year (PSA, Ref No.: 2019-053). Majority of coconut farmers in the 2018 National Coconut Farmers' Registry System (NCFRS) are food insecure and without any social protection. Coconut farms are fragmented and small, 75% are 2.0 ha and below; farms in uplands are accessibility constrained to roads and markets.



The production sector, the lifeblood of the industry and the supplier of feedstock for the various coconut value chains (Figure 1.1), is beset with problems arising from decades of neglect and abuse. These problems include low priority and budget allocation for the industry as well as low and unstable income of farmers who are marginalized and unable to participate in/benefit from traditional and nontraditional coconut value chains. Coconut population represents 98% native talls with an average of 10% senility. Around 1.78 million ha, or 50% of coconut areas, are nutrient deficient. The typical coconut farm is poorly managed, rainfed, unfertilized, with no regular pest and disease monitoring and control, even while improved tall and hybrid varieties and production technologies for increased productivity are available. Thus, while some 14.7 B nuts are harvested annually from 347 M bearing palms, tree productivity in 2019 was only 44 nuts per tree per year, which is much lower compared with the potential of 80–150 nuts per tree per year. The Philippines has the largest coconut area and is the 2nd top producer in the world, but the country's productivity per hectare remains the lowest among the top ten coconut producers of the world.

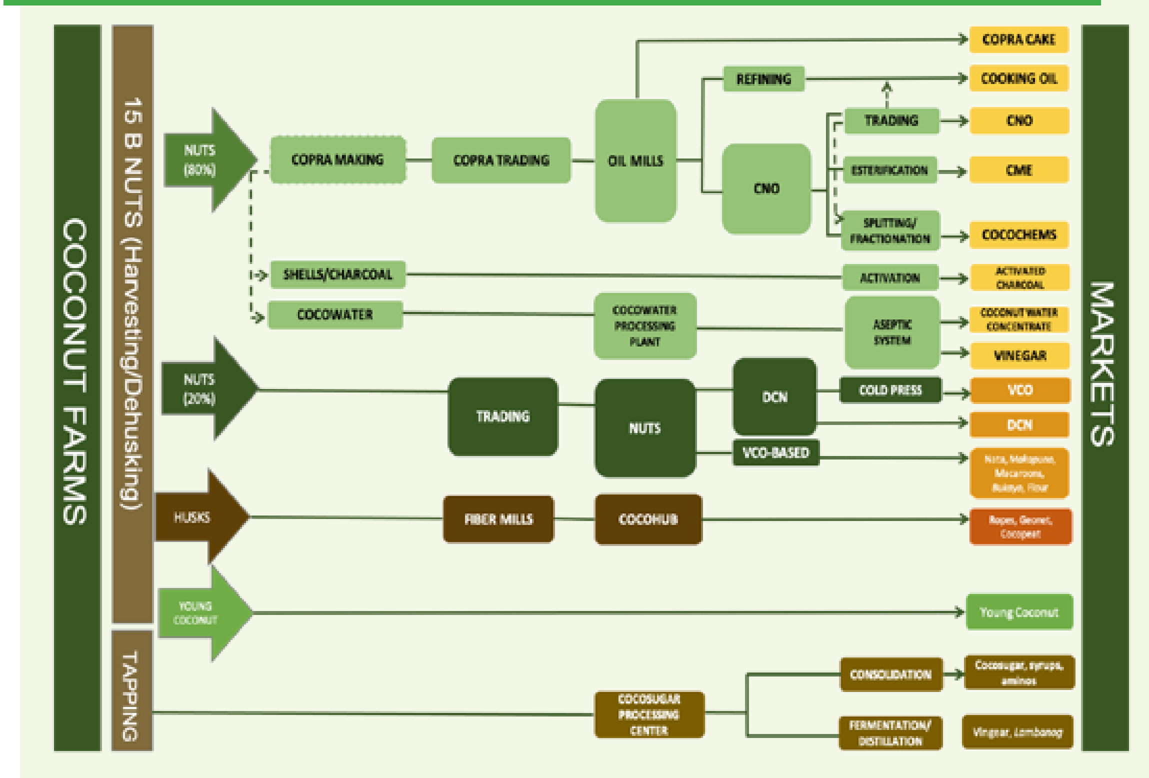
The wide spaces in between coconuts and their unique canopy architecture make them suitable for intercropping, yet over 80% of the coconut farms are monocropped. Coconut areas can increase the country's agricultural output without opening up new lands. Intercropping and livestock integration under coconut have been proven to increase farm productivity and income manyfold and are good strategies to significantly increase farmers income and welfare. However, smallholder coconut farmers lack capital and infrastructure and have no sustained access to formal credit sources. Coconut farmers' organizations that should undertake collective action and policy advocacy activities, to voice out their socio-economic and other concern are the exception rather than the norm. The lack of entrepreneurial and leadership skills of farmers' organizations/cooperatives that will enable these associations to successfully engage in business enterprises needs to be addressed. There are agribusiness models that coconut cooperatives can adopt (clustering and cooperative management, processing and marketing that adheres to market standards on reliability and quality) can mainstream farmers' participation in agro-industrial corridors of development. These models include clustering, cooperative management, processing and marketing that will enable products to adhere to market standards of supply reliability and product quality.

Assurance of steady supply of good quality coconuts, the lifeblood of the various coconut-based value chains industry clusters, is key to sustainable growth of the industry. Supply reliability limits the utilization of full crushing capacities of oil mills. About 80% of the coconuts produced in the country are processed into copra - the feedstock for coconut oil mills. From 2009-2019, the estimated yearly utilization of the oil mills ranged only from 38-69% of the total crushing capacity of 3.4 M MT/year of 60 oil mills. In addition, there is an increasing demand for other coconut products coming from whole nuts and sap, and the magnitude of supply deficit increases further.

Addressing the strict quality requirement for aflatoxin and PAH levels by the coconut oil and copra cake export markets is critical for the sustained growth of the industry. The traditional copra processing practiced by farmers, using smoke kilns, produces undercooked copra at 15–20% moisture content, that is contaminated with aflatoxin with high Polycyclic Aromatic Hydrocarbons (PAH). Multi-layered marketing that could take one to three months from small upland farmers to millers, results in further physical and quality losses. The Philippines stands to lose the export markets if the country cannot comply with the stricter standards on allowable limits of aflatoxin and PAH in coconut oil and copra cake. Radical transformation in the copra processing sector value chains is an investment that the industry cannot do without.

Twenty percent (20%) of the 14.7 B nut production is used for the manufacture of desiccated coconut (DCN), virgin coconut oil (VCO), coconut milk and other uses including for home consumption. In 2018, there were 22 DCN processing plants with a combined capacity of 841 MT. The DCN factories are models for large- scale integrated coconut processing by recovering and processing coconut water into exportable concentrates. By crushing DCN, virgin coconut oil (VCO) is produced at volumes attractive to global players. The by-product of this process is coconut flour. The market for coconut water has grown to the point where the coconut water from DCN factories is no longer sufficient to meet the present demands.

## FIGURE 1.1. THE UNIFIED VALUE CHAIN FOR SEGMENTATION PURPOSES MAY BE DIVIDED INTO THE FOLLOWING VALUE CHAINS: 1) COPRA-CNO-OLEOCHEMICALS VALUE CHAIN; 2) DCN VALUE CHAIN; 3) VCO VALUE CHAIN; 4) COCO COIR VALUE CHAIN; 5) YOUNG COCONUT VALUE CHAIN; 6) COCONUT SAP VALUE CHAIN; AND 7) ACTIVATED CARBON VALUE CHAIN




The impact of climate change has caused great devastation to many regions including major production grids. It is expected to remain a concern given the country's geographic location. The Philippines is ranked 4th in the long-term climate risk index in 2021, having the highest number of extreme weather events (2009–2019) among those in the top ten countries. Buffering the farmers and the industry from the severe impacts of climate-related risks and hazards should be considered in the design of programs and interventions.

Despite the backdrop of a struggling coconut industry, subjected to decades of neglect and abuse, characterized by low farm productivity, ageing trees, ageing and food insecure farmers with no social protection, stiff competition from palm oil, inefficient value chains—there are still many very encouraging developments including but not limited to: growing recognition of the medical, therapeutic, and nutritional values of coconut products particularly coconut water, VCO and coconut flour, and coconut cooking oil; expanding markets for coco coir and coco dusts products; increasing demand for activated carbon from coconut shell charcoal; maturing of technology packages for producing white copra and VCO; and international recognition for lambanog. Important factors that stimulate the worldwide demand for nontraditional coconut products (NTCPs) are the growing need for healthier products, and coir products, and greener production processes and products. The global demand for these NTCPs is expected to grow at a compound annual growth rate (CAGR) of 5.86% to 10.04% in the future. There is still low domestic consumption of coconut RBD oil as cooking oil due to the influx of imported low-priced palm oil, canola oil, soybean oil, and corn oil, and low utilization of coconut oil as raw material in oleochemical production. Policy to increase the biodiesel blend from 2% to 5% and reimplementation of EO 259 to allow local production of coco fatty alcohol for the local detergent industry are expected to increase domestic utilization of coconut oil. The domestic demand for VCO will remain high especially with the disclosure of the DOST on the potential benefits of VCO on COVID-19 patients and the high possibility of combating African Swine Flu. The same trend is expected for coir due to its wide range of uses. However, the growth in the local demand for coco sugar may be slow-moving due to the continued reliance on sugarcane-based sweeteners which are relatively cheaper. The same is true for coconut water since local consumers prefer to drink the water from fresh young nut rather than the packaged ones.

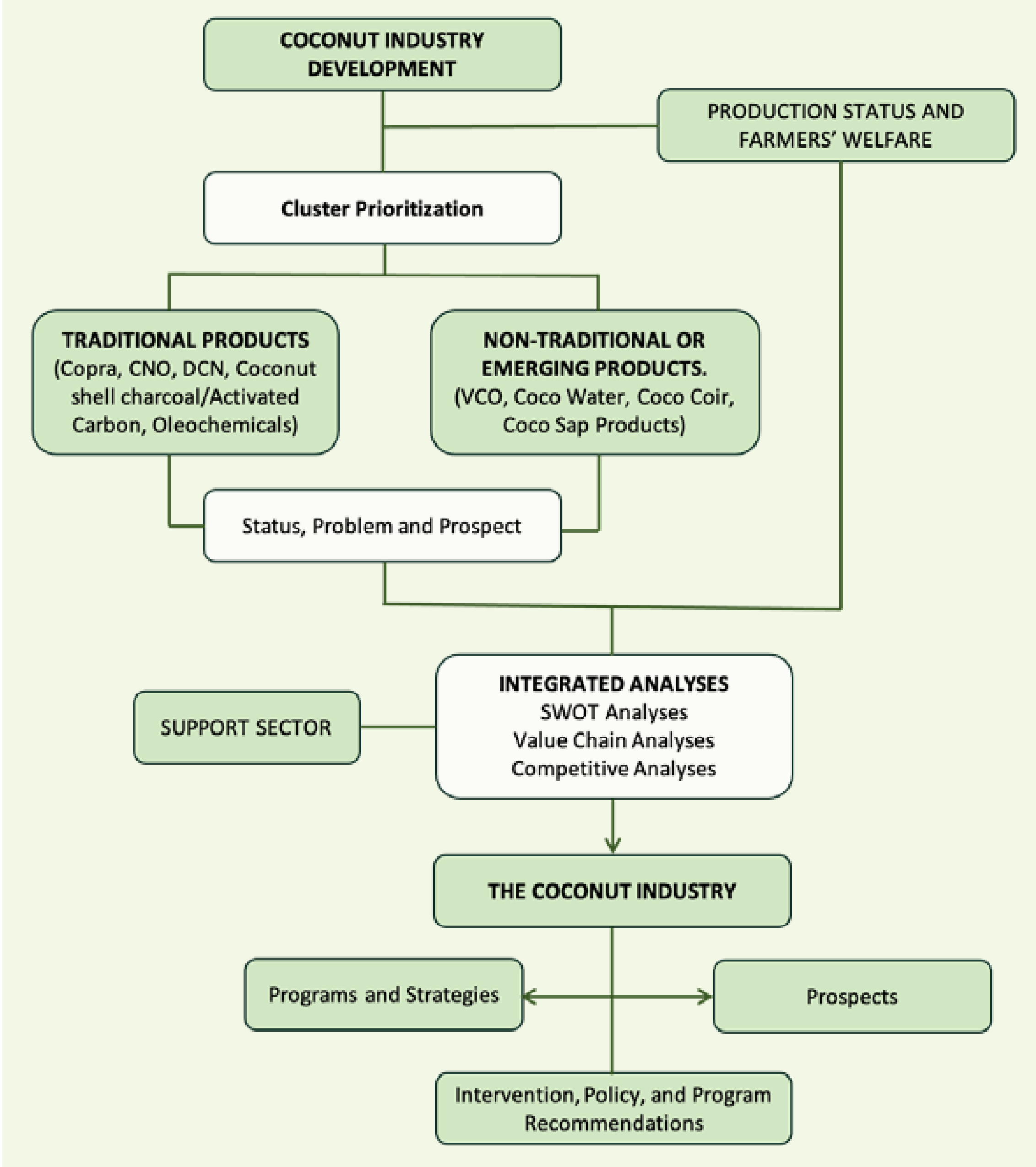
The continuing planting and replanting program, supported by the seed production and hybridization program of the PCA is predicted to increase coconut production, breaching 16 B nuts by 2025, the country's highest production. Participatory on-farm hybridization using assisted pollination technique is a farmer- inclusive program that can be replicated and upscaled to further increase our utilization of good varieties and hybrids, thus further increasing the country's nut production potential.

The approval of RA 11524 creating the COCONUT FARMERS AND INDUSTRY TRUST FUND will jumpstart and sustain the process of transforming the industry (i.e., providing social protection and enhancing skills, streamlining farmers cooperatives and organizations' participation in the higher levels of the value chains, transforming copra processing into a white copra agro-industry corridor owned and managed by farmers' cooperatives, using hybrids and Open Pollinated Variety (OPVs) with selected qualities, improving coconut farms through intercropping, livestock integration, and integrated coconut processing agro-enterprises) that will eventually elevate the welfare and income of Filipino coconut farmers while strengthening and enhancing the global competitiveness of the coconut industry.

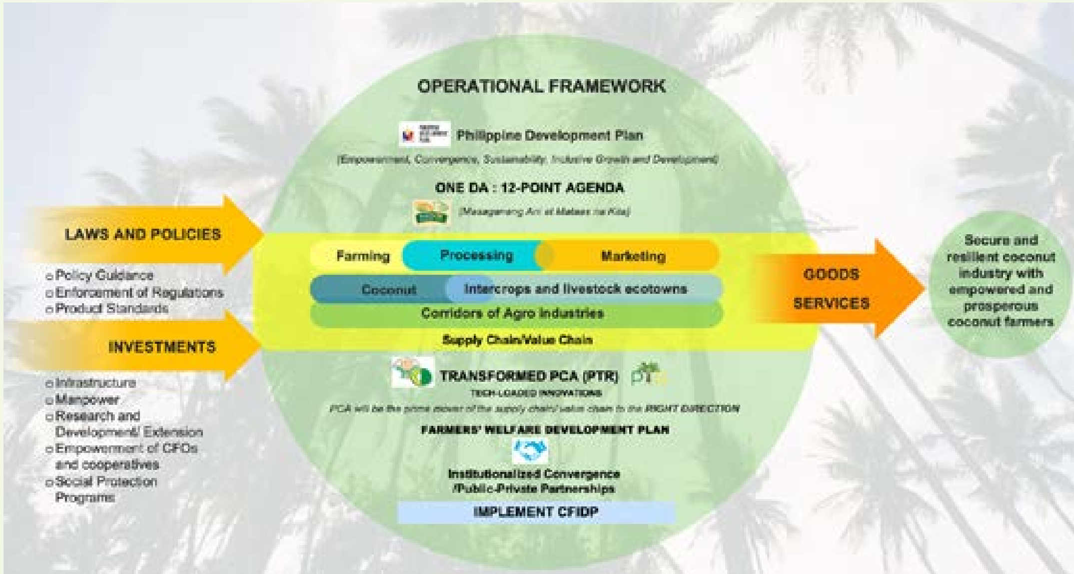
# METHODOLOGY

The Coconut Farmers and Industry Roadmap focuses on two interlinked components - the farmers in the production sector and the various coconut-based value chain industries in the processing and marketing sectors. The roadmap is composed of situational analyses, traditional and selected non-traditional products' value chain mapping, benchmarking, market trends analyses, SWOT analysis, and market analysis that explore opportunities and constraints in penetrating new markets or expanding value chains of selected products. The roadmap identifies corridors of development where farmers have an opportunity to participate in a higher level of the value chain either by partnering with other actors or participating as cocopreneur. It also identifies coconut technologies, intensified farming systems, and diversified livelihood options of increasing whole farm productivity. The roadmap's analytical framework is schematically shown in Figure 2.1.

## FIGURE 2.1. COCONUT INDUSTRY ROADMAP ANALYTICAL FRAMEWORK



## FIGURE 2.2. OPERATIONAL FRAMEWORK AT THE MACRO LEVEL




Inputs to support the COCOFIRM's implementation are enabling laws and policies, investments including infrastructure, capable and sufficient manpower, continuing research driven by industry needs and innovations, and efficient transfer of technologies to find new uses of coconuts. Improved products, packaging technologies, and efficient locally manufactured farm and processing equipment, among others, are also needed.

The COCOFIRM framework has considered the Philippine Development Plan (PDP) and the One DA: 12-Point Agenda. The roadmap is guided by the Philippine Development Plan which enables Filipinos to attain a *Matatag, Maginhawa, at Panatag na buhay*. The Department of Agriculture's 12 paradigms toward ONE Department of Agriculture: A Holistic Approach to Agriculture & Fisheries Transformation focusing on "Masaganang Ani at Mataas na Kita" for the small- scale farmers, the Coconut Farmers and Industry Roadmap has undergone mapping, baseline, and benchmark analyses which served as the bases for designing more efficient and modern supply/value chain of traditional and nontraditional industry clusters. Existing practices of SMEs and large-scale processing companies were benchmarked with best practices and new technologies.

A transformed PCA (PTR) will be the major driver moving the supply chains to the right, producing goods and services for inclusive growth and prosperity of all stakeholders, harnessing convergence, and partnerships with non-government agencies (NGAs), academe, industry, and public-private partnerships (PPPs). The goal is to apply the 12 paradigms to lift the coconut farmers out of poverty and improve their competitiveness, expand markets for traditional and nontraditional products, and explore new products and markets.

**FIGURE 2.3. OPERATING FRAMEWORK AT THE SECTORAL LEVEL**


The Department of Agriculture's 12 paradigms toward ONE Department of Agriculture: A Holistic Approach to Agriculture & Fisheries Transformation focusing on "Masaganang Ani at Mataas na Kita" for the small- scale farmers, the Coconut Farmers and Industry Roadmap has undergone mapping, baseline, and benchmark analyses which served as the bases for designing more efficient and modern supply/value chain of traditional and nontraditional industry clusters. Existing practices of SMEs and large-scale processing companies were benchmarked with best practices and new technologies.

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# Situational Analysis

There are many studies on various coconut value chains and coconut industry situationer. Consolidated baseline studies and information on production, utilization and markets, and trends in supply- demand dynamics and trade were used for initial diagnostics from which the core roadmap document was developed. This core document was used to target outcomes for coconut farmers and coconut communities, to solicit inputs from stakeholders in various value chain industry clusters, and to develop strategies for increased and sustainable production and competitiveness of the various industry value chains.

Secondary data from the United Coconut Association of the Philippines (UCAP), the Philippine Statistics Authority (PSA) and the Philippine Coconut Authority (PCA) were used to determine the national coconut production trend from 2009 – 2019. The data and production trends were used to establish the current state of coconut farming in the Philippines, and to evaluate the immediate outcome of several government projects aimed at increasing coconut productivity. These projects include hybridization and rehabilitation (planting and replanting) programs. Secondary data from past stakeholder consultations were also reviewed and considered as solicited issues and concerns of coconut farmers throughout the years.

Primary and secondary data were also collected from 2014 to 2019 Gawad Saka Awardees. These data sets were used as benchmark for good agricultural practices (GAP) in coconut farming.

# Stakeholders’ Consultations

PCA conducted farmers’ consultations in Luzon, Visayas, Davao Islands, and Zamboanga Islands. For Luzon Island-wide consultation, the participants were composed of farmers and farmers' representatives from Aurora, Batangas, Laguna, Quezon, Camarines Norte, Camarines Sur, Marinduque, Sorsogon, and Oriental Mindoro. In the Visayas region, the consultation was attended by 72 attendees including 54 coconut farmers and representatives. Present also were members of small farmers' organizations from Tacloban, Leyte, Cebu, Samar, Northern Samar Eastern Samar, Negros Oriental, Negros Occidental, Bohol, Antique,

Capiz, Iloilo, and Aklan. From the southern part of the country, in Davao Islands, the participants in the farmers' consultations were composed of farmers and farmers' representatives from the provinces of Davao del Sur, Davao Oriental, Davao del Norte, Dinagat Islands, North Cotabato, Cotabato, Surigao del Sur, and Agusan del Sur; from organizations KAMMPIL, PAKISAMA, KATARUNGAN, AMMMA-KATIPUNAN, LAKAMBINI, PKMP, IRDF, KADAMO, Kilusang Pagbabago, and others, as well as various small coconut farmers organizations (SCFOs). On the other hand, farmers and farmers' representatives from the provinces of Davao Oriental, Sulu, Zamboanga, Zamboanga del Norte, Zamboanga del Sur, Basilan, Maguindanao, Lanao del Norte, and Misamis Occidental participated in the Zamboanga Islands consultation. Trends and relationship between the solicited farmers' issues and yearly production data were determined. Primary data from interviews were used for data validation and cross-referencing. The study employed the tracing method to identify the survey respondents. The sample processors identified their coconut trader respondents. The farmers interviewed were identified by coconut traders as their suppliers.

Technical consultation with the academe was conducted last May 18, 2021. Seven officials from PCA attended, together with representatives from three universities in the Philippines: University of the Philippines Los Baños (UPLB), University of Southern Mindanao (USM), and Visayas State University (VSU). Five experts comprised the UPLB team, one from USM, and two from VSU. The result of the consultation was beneficial to the COCOFIRM Program.

## Recommendation and Stakeholder Validation

The insights from all the gathered primary and secondary data were used to come up with the recommendations and strategies for increasing the productivity, income, sustainability, and for 'agribusinessizing' of the coconut farming sector. The recommendations and strategies were validated through stakeholders' consultations. The validated recommendations and strategies were then included in the Coconut Farmers and Industry Roadmap.

# Strategies for Increasing Productivity, Income and Sustainability of the Coconut Farming Sector

For the coconut-based industries to move forward, maintain viability and gain a competitive advantage in the global market, there must be assurance of a steady supply of high-quality raw materials from the production sector. No amount of improvement in the efficiency of the other sectors would matter without an adequate volume of quality nuts from the supply line. All efforts aimed at inclusive growth and sustained profitability of the various value chains of the coconut industry should anchor on: (1) improving the productivity, efficiency, profitability, and sustainability of coconut farms despite climatic extremes and uncertainties and a highly volatile world vegetable oil market, and (2) uplifting the welfare and alleviating poverty of the coconut farm households and communities. Increasing coconut and total farm productivity can be achieved in three ways: (1) expansion to new areas, (2) increasing yield through agronomic interventions, and (3) increasing land-use efficiency through intensification and diversification. Good agricultural practices should adhere to the ethical source and sustainable practices aligned with the Philippines' major export markets' standards. Data on the KAANIB enterprise development program (KEDP) of PCA were processed, disaggregated by enterprise (processing, crops, livestock) and their combinations, then by crop for intercropping, by animal species for livestock, and by-product for coconut processing to identify the best performing region/province and community farmers organizations (CFOs).

# Strategies for Agribusinessizing the Coconut Industry

The following strategies should be promoted and sufficiently supported technically and financially, and managed professionally:

- identifying corridors for particular coconut agro-enterprises for rural development;
- capacitating farmers to be cocopreneurs; and
- networking farms into development clusters that will produce suitable and marketable intercrops or value adding processes and services at a commercially viable scale

Successful and new coconut-based farming systems models from PCA's KAANIB projects were identified and recommended for replication and scaling up into agribusiness corridors and demo learning sites for other farmers and CFOs. The recommendations considered compatibility with the Philippine Development Plan and the 12 DA paradigms to level up agriculture.

# Mapping and Analysis of Coconut Value Chain Clusters for Expo rt Markets

This section covers supply/value chain analyses, benchmarking, analysis of the competitiveness, and market analyses (current global and domestic demand situation) of the identified coconut products.

Separate value chain maps were prepared for copra/coconut oil, desiccated coconut, activated carbon/coconut shell, virgin coconut oil, coco coir, coconut water, and coconut sugar sub-sectors/clusters. The value chain maps of various industry clusters of coconut cover five major components/segments: input supply, coconut production, processing, and marketing for domestic consumption. Key participants involved the input suppliers, farmers, local buyers, assemblers/consolidators, processors, brokers, exporters, and consumers. Support service institutions or business service providers were also identified.

The existing supply chains and value chains for different coconut products were assessed through baseline and sectoral consultations. Survey questionnaires were prepared and distributed for sectoral consultation with coconut processors, traders and consolidators, farmers, coconut federations, and various industry associations. Endorsement from the PCA administration was requested to solicit cooperation from key informants in responding to the questionnaires/interview schedules. The total count of respondents from Luzon, Visayas, and Mindanao consisted of 48 farmers, ten traders, two CNO processors, two DCN processors, two activated carbon processors, one VCO processor, two coir processors, 11 coco sugar processors, and one coconut water processor.

The COCOFIRM Program mapped out the different actors performing the various processes along the value chain. The Program also estimated the value addition and profit margin at each stage and stakeholders'

share in the total value of each coconut product. Cost and returns analyses for each key player in the value chain for each coconut sub-sector/cluster were conducted. Using the cost-build-up method, the build-up of total costs (or accumulated total costs) at each stage of the value chain was determined. The unit added cost and the unit added cost share (in %) of each player in the value chain were estimated. In addition, the unit added profit and the unit added profit share (in %) of each key player in the value chain were computed. The financial position of the different players in the value chain of each coconut industry cluster was determined to ascertain who among the key players benefitted the most. The constraints in specific segments of the value chain for each coconut product were identified and analyzed for value chain development and opportunities as entry points for introducing interventions or upgrading strategies to key players. Strategies were recommended to address key constraints limiting the efficiencies at each node of the value chain, and to upscale and modernize the processing sector.

The regional product supply chain maps were obtained from PCA's regional offices. Recognizing the potential and the magnitude of coconut resources endowed for each region, the flow of coconut farm products at the regional level was tracked together with the number of intermediaries present in the area. The processors for each coconut product established in the region were tallied and the products' market destinations were identified. The product supply chain maps, specifically the inventory of resources and the number of operating processors, were linked with the proposed strategies and interventions.

Local benchmarking of coconut farms was also conducted. At the farm level, the benchmark/most efficient farms were compared with the typical/model farms using performance indicators such as:

- Quantitative indicators – coconut productivity, material input usage, and labor use; cost and returns and;
- Qualitative indicators – use of improved coconut varieties, improved farm practices.

For global benchmarking of coconut farms, comparison of coconut farm productivity, farm practices, and government support between the Philippines and other major coconut producing countries (e.g., Indonesia) was done. Moreover, global benchmarking with competing countries was employed for selected traditional and non-traditional coconut products. For coconut processed products, comparison in terms of best processing practices/good manufacturing practices, market network, etc. was conducted.

Depending on the availability of data, the competitiveness of a given exportable coconut product covered in this report was assessed and measured using a simple price comparison approach, domestic resource cost analysis (DRC using financial prices), and the revealed comparative advantage (RCA) analysis. In the simple price comparison approach, a ratio greater than one between the export parity price (Px) and the domestic wholesale price (Pd) implies that the traditional/nontraditional coconut product under review is price competitive in the export market. Competitive advantage indicates whether a country, like the Philippines, can successfully compete in the trading of a commodity in the international markets. It shows the relative position of the Philippines for a given coconut product against other countries. Previous studies which utilized the DRC methodology in determining the comparative advantage of Philippine coconut oil were adopted in this report. In the DRC approach, the estimated DRC was divided by the official exchange rate (OER) to arrive at the Resource Cost Ratio (RCR), which is an efficiency measure of competitive advantage. An RCR less than one implies that the country has a competitive advantage in producing and exporting the coconut product under review (i.e., coconut oil). An estimated RCA index greater than one indicates that the country has a comparative advantage in exporting the coconut product under review.

The trends in production, prices, domestic utilization, and trade of traditional and selected nontraditional coconut products were analyzed. Market analyses of the market potential/ prospects of coconut oil, desiccated coconut, activated carbon/coconut shell, oleochemicals, virgin coconut oil, coco coir, coco water, and coconut sugar in the domestic and export markets were also conducted. Market demand drivers and the factors that have a negative effect on the growth in demand for the coconut product under review were also identified. Market opportunities penetrating the coconut green export market were explored.

## Enablers and Constraints to Achieving the Vision of the Coconut Industry

Different stakeholders in the Philippine coconut industry, consisting of coconut farmers' groups, officers, and members of different coconut industry associations for traditional and nontraditional coconut products included in the study, and other stakeholders in the industry were consulted. The stakeholders identified the internal factors – strengths (S) and weaknesses (W), and the external factors – opportunities (O), and threats (T) affecting the performance of the industry as a whole and each specific sub-sector/cluster. These sub-sectors consist of copra/coconut oil, desiccated coconut, coco coir, coco shell charcoal/ activated carbon, oleochemicals, virgin coconut oil, coco water, and coconut sap sugar. SWOT analysis was useful in helping the coconut industry face and address its challenges.

The COCOFIRM Program identified the technical, socio-economic, cultural, environmental, and institutional factors, as well as government policies, that constrain farmers/farmers' groups from adopting new production and processing technologies that would limit their transformation into cocopreneurs. These constraining factors were assessed to develop strategies to overcome them.

Existing coconut programs of PCA were reviewed to determine their alignment with the Department of Agriculture's thrust to provide Filipino farmers "Ani at Kita". The accomplishments and the problems encountered in the implementation of these development programs were examined. Mechanism to provide continuity of support to demand-driven and pro-active research, developing science-based technologies, processes and systems were recommended.

Institutional analysis of the PCA structure was conducted to determine the agency's capability to carry out the new vision and mission of the industry. As the instrumentality of the state in the coconut sector, the PCA must bridge the farming, manufacturing, and trading sectors.

Relevant government legislations and policies that have either facilitated or hindered the development of the Philippine coconut industry in general and its specific sub-sectors were assessed. The hindering policies were recommended for reformulation or revision.

# INDUSTRY SITUATION & OUTLOOK

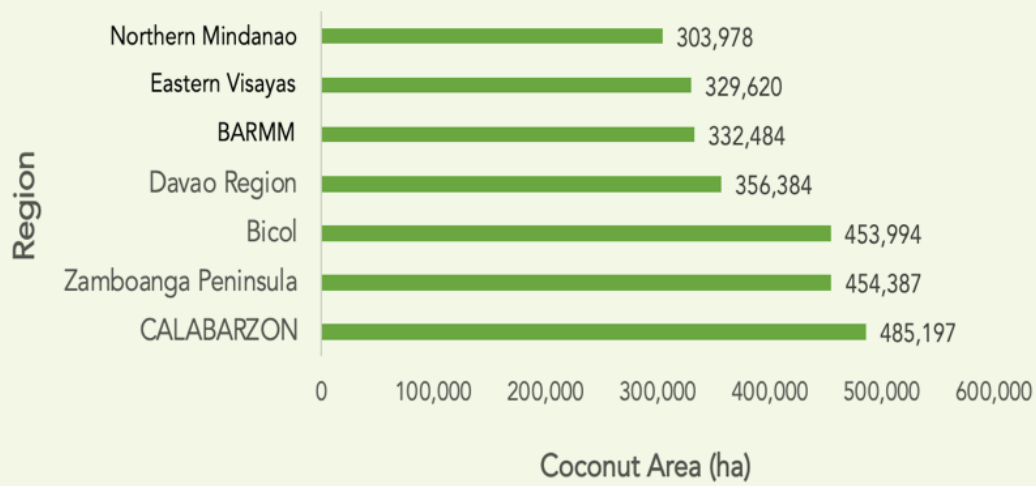
## Coconut Farm Sector

The Philippines, Indonesia, and India accounted for 74.6% of the world's coconut production of 62.46 M metric tons (MT) in nut terms in 2019 (Table 3.1). The Philippines is the second largest producer of coconut in the world after Indonesia. Indonesia's volume of coconut production was 17.13 MMT in the same year, which was higher than the Philippines' coconut production volume of 14.77 MMT and India's 14.68 MMT. The world's area planted to coconut in the same year was placed at 11.8 M hectares (ha), with the Philippines having the largest coconut area (3.65 M ha), followed by Indonesia at 3.5 M ha, and India at 2.15 M ha.

**TABLE 3.1. WORLD COCONUT PRODUCTION AND AREA BY MAJOR PRODUCING COUNTRIES, 2019 (FAOSTAT, 2019)**

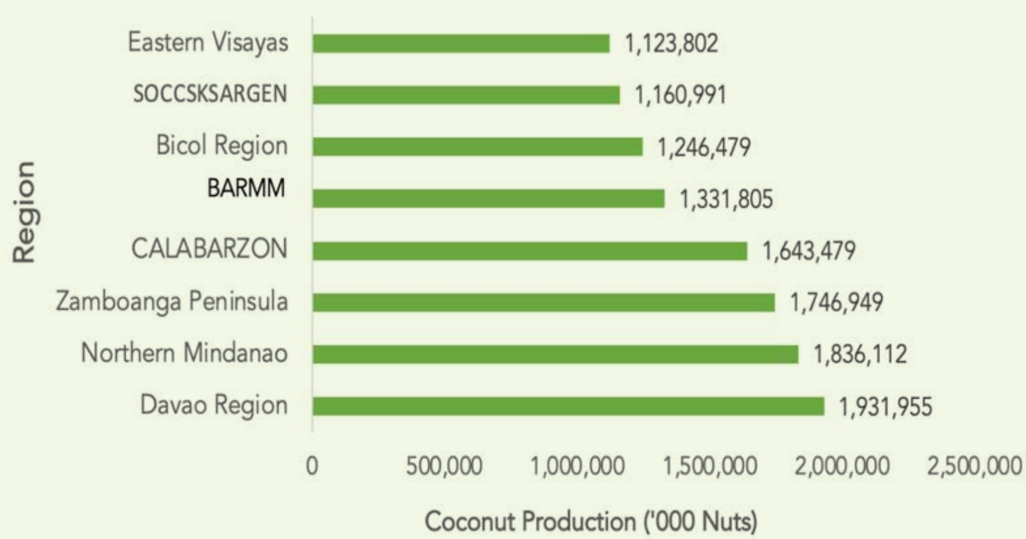
| Coconut Production | | | Coconut Area | |
|---|---|---|---|---|
| Country | Volume MMT | % Share | M ha | % Share |
| Indonesia | 17.13 | 27.4 | 3.50 | 29.7 |
| Philippines | 14.77 | 23.6 | 3.65 | 30.9 |
| India | 14.68 | 23.5 | 2.15 | 18.2 |
| World | 62.46 | | 11.80 | |

FIGURE 3.1. TOP SEVEN COCONUT-PRODUCING REGIONS IN TERMS OF HECTARAGE PLANTED TO COCONUT IN THE PHILIPPINES




Source: PSA, 2019

FIGURE 3.2. VOLUME OF COCONUT PRODUCTION IN TOP EIGHT COCONUT PRODUCING REGIONS IN THE PHILIPPINES




Source: PSA, 2019

Coconut occupies about 27% of the country's arable land and dominates the landscape of 69 out of 82 provinces with a total of 347 M bearing palms in 2019 (PSA, 2020). Among the country's 16 administrative regions, CALABARZON had the largest coconut hectarage (485,197 ha with 13.3% share), followed by Zamboanga Peninsula, Bicol Region, Davao Region, Eastern Visayas, BARMM, and Northern Mindanao (Figure 3.1). About 80% of coconut lands are monocropped and 1.78 M ha or 50% of coconut areas are nutrient deficient (Rosales, 2020).

Coconut production varies among regions. Davao Region posted the highest coconut production of 1.93 M MT (13.08% share) in 2019 (Figure 3.2). Northern Mindanao ranked second to Davao Region, followed by Zamboanga Peninsula, CALABARZON, BARMM, Bicol Region, SOCCSKSARGEN, and Eastern Visayas (Figure 3.2).

The national average coconut yield was only 44 nuts/tree per year in 2019 (PSA, 2021). This is considerably much lower than the coconut yield of 200-400 nuts per tree in India and Brazil (Dar, 2019) and the potential yield of 150 nuts/tree obtainable from hybrid coconut varieties. Low coconut productivity in the country could be attributed to the slow adoption of recommended cultural management practices, persistent use of unselected and genetically poor planting materials, and an increasing number of senile and unproductive trees that need to be replaced. Based on data reported in the National Coconut Farmers Registry System (NCFRS), about 10% of the total number of coconut trees in the country are senile.

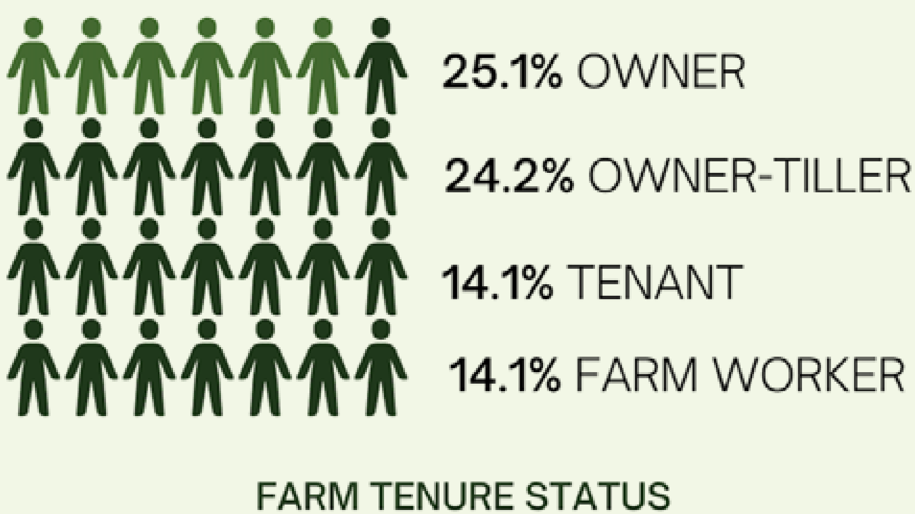
Coconut productivity also varies significantly among islands and coconut- producing regions. The island of Mindanao registered the highest average coconut yield of 50 nuts per tree in 2019 compared with Luzon and Visayas with 34 and 36 nuts per tree, respectively.

The high coconut yield in Mindanao could be explained by its highly sustainable rainfall and their younger tree population and more optimal tree spacing than those in Luzon and Visayas. A comparison of coconut productivity among regions showed that nine out of the 16 administrative regions posted coconut yield levels above the national average coconut yield. SOCCSKSARGEN registered the highest average coconut productivity at 66 nuts per tree, followed by Davao Region and Northern Mindanao at 57 nuts per tree

**FIGURE 3.3. COCONUT YIELDS IN NINE REGIONS WITH HIGH COCONUT PRODUCTIVITY LEVELS IN THE PHILIPPINES**


Source: PSA, 2019

**FIGURE 3.4. PERCENT DISTRIBUTION OF 2.54 M COCONUT FARMERS BY FARM TENURE IN THE PHILIPPINES, 2018**



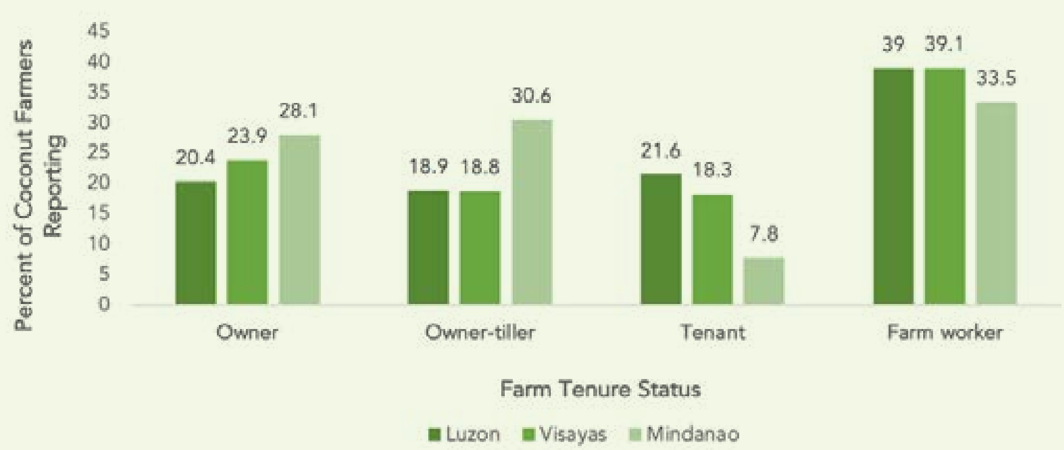

Source: NCFRS

(Figure 3.3). Other regions which recorded coconut yield levels higher than the national average coconut yield were Western Visayas, Cagayan Valley, Ilocos Region, MIMAROPA, Zamboanga Peninsula, and Caraga Region. The two regions with the lowest coconut yield levels were CALABARZON (29 nuts/tree) and CAR (28 nuts/tree). Low coconut productivity in CALABARZON could be explained by a large number of senile trees of the Local Tall variety.

Based on the NCFRS, the coconut industry provides employment to 2.54 M farmers. Of this total, the majority (36.5%) are farm workers (Figure 3.4). About 25.1% are absentee owners, 24.2% are owner-operators, and only 14.1% are tenants.

The coconut farmer population varies among the three islands (NCFRS, 2018). There are more coconut farmers in Mindanao (1,158,984) than in Visayas (875,745) and Luzon (503,098). Farm workers account for the highest proportion (more than 33%) of the total number of coconut farmers in the three islands (Figure 3.5). However, the proportion of coconut farm workers in Luzon and Visayas (39%) is higher than in Mindanao (33.5%). Luzon also has the highest proportion of tenants (21.6%), followed by Visayas (18.3%). Mindanao has the lowest proportion of tenants (7.8%) but has higher proportions of coconut farmers who are owner-tillers (30.6%) and absentee owners (28.1%) compared to Luzon and Visayas.

**FIGURE 3.5. PERCENT DISTRIBUTION OF COCONUT FARMERS BY TENURE STATUS IN LUZON, VISAYAS, AND MINDANAO IN THE PHILIPPINES, 2018**




Source: NCFRS

regions (Table 3.2 and Figure 3.6). Region IV-B has the highest percentage of coconut farm workers (48.6%), followed by Region VI (43%), Region IX (47.5%), and Region VIII (41%). Moreover, Region IV-B again registers the highest percentage of tenants (24.6%), followed by Region VIII (22.5%), Region VI (22.3%), and Region V (20.6%). On the other hand, BARMM has the highest percentage of owner-tillers (53.6%), followed by Region XII (35.6%), Region XI (31.9%), Region XIII (29.6%), and Region VII (29.4%). Region X exhibits the highest percentage of owners (32.3%), followed by BARMM and Region XII (both 30.7% each), Region XI (27.8%), and Region VII (26.8%).

### TABLE 3.2. PERCENT DISTRIBUTION OF COCONUT FARMERS BY TENURE STATUS AND BY REGION IN THE PHILIPPINES, 2018

| Region | Owner (%) | Owner-Tiller (%) | Tenant (%) | Farm Worker (%) | Total Numer of Coconut Farmers |
|---|---|---|---|---|---|
| Region IV-A (CALABARZON) | 24.9 | 29.6 | 17.0 | 28.5 | 134,380 |
| Region IV-B (MIMAROPA) | 17.0 | 9.7 | 24.6 | 48.6 | 248,269 |
| Region V (Bicol Region) | 22.4 | 26.1 | 20.6 | 30.9 | 120,449 |
| Region VI (Western Visayas) | 24.2 | 10.5 | 22.3 | 43.0 | 231,786 |
| Region VII (Central Visayas) | 26.8 | 29.4 | 10.1 | 33.7 | 294,486 |
| Region VIII (Eastern Visayas) | 21.1 | 15.4 | 22.5 | 41.0 | 349,473 |
| Region IX (Zamboanga Peninsula) | 23.5 | 15.4 | 13.6 | 47.5 | 239,736 |
| Region X (Northern Mindanao) | 32.3 | 21.5 | 11.7 | 34.4 | 153,050 |
| Region XI (Davao Region) | 27.8 | 31.9 | 2.3 | 38.0 | 267,781 |
| Region XII (SOCCSKSARGEN) | 30.7 | 35.6 | 8.0 | 25.8 | 138,721 |
| Region XIII (Caraga) | 25.6 | 25.9 | 10.6 | 37.9 | 153,303 |
| BARMM | 30.7 | 53.6 | 3.0 | 12.8 | 206,393 |

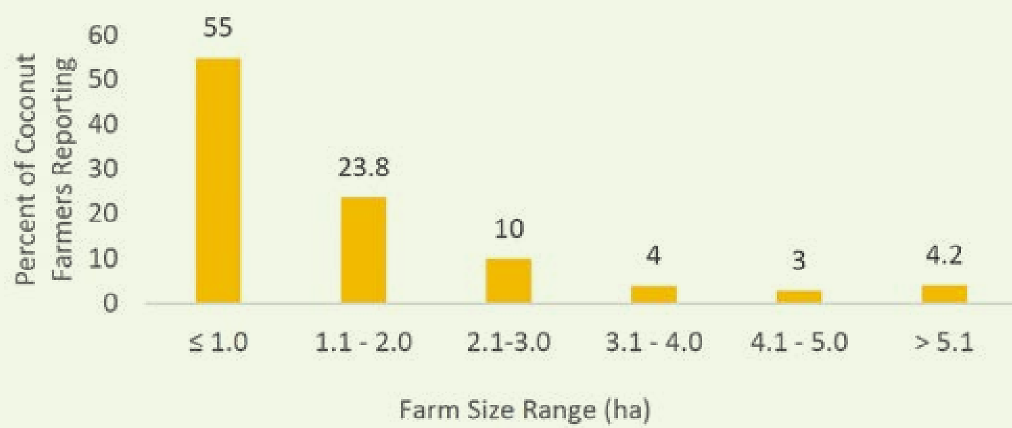
Source: NCFR

**FIGURE 3.6. PERCENT DISTRIBUTION OF COCONUT FARMERS BY TENURIAL STATUS AND BY REGION IN THE PHILIPPINES, 2018**


Source: NCFRS

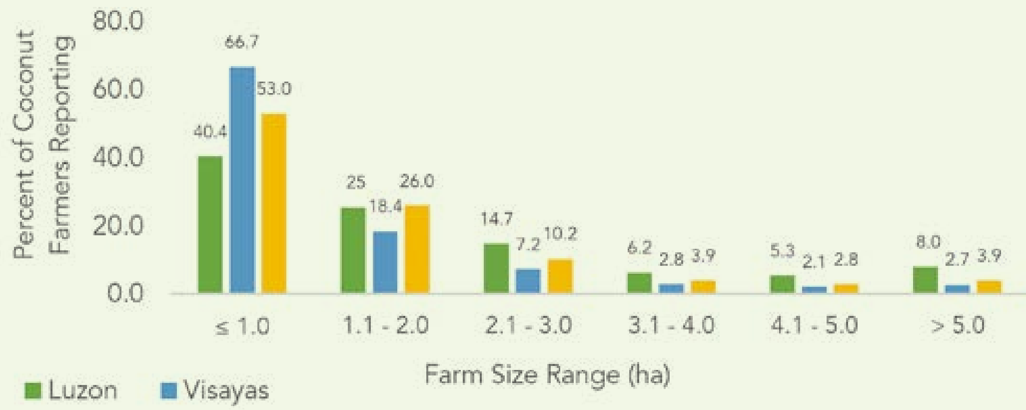
Based on the 2002 Census of Agriculture, the average coconut farm size in 2001 was 2.4 ha. Since the approval of the Comprehensive Agrarian Reform Program Extension with Reforms (CARPER) in 2009, coconut farms appear to have further shrunk in size. As shown in Figure 3.7, the majority (55%) of the coconut farmers in the Philippines operate very small farms (≤1.0 ha). Only 7.2% of the coconut farmers in the country operate more than 4.0 ha.

**FIGURE 3.7. DISTRIBUTION OF COCONUT FARMS BY FARM SIZE RANGE, PHILIPPINES, 2018**




Source: NCFRS

FIGURE 3.8. PERCENT DISTRIBUTION OF COCONUT FARMERS ACCORDING TO FARM SIZE RANGE BY MAJOR ISLAND GROUP IN THE PHILIPPINES, 2018




Source: NCFRS

Comparing the farm size distribution among islands, the predominant farm size in the three islands is ≤1.0 ha, indicating that the majority of the coconut farmers in these islands operate very small coconut farms (Figure 3.8). Among the three islands, Visayas has the highest proportion (66.7%) of coconut farmers operating ≤1.0 ha, followed by Mindanao (53%). Luzon has the lowest proportion (40.4%) of coconut farmers who operate ≤1.0 ha. Regarding large coconut plantations, the highest proportion of coconut

farmers operating more than 4.0 ha are in Luzon (13.3%), followed by Mindanao (6.7%) and lastly, Visayas (4.8%).

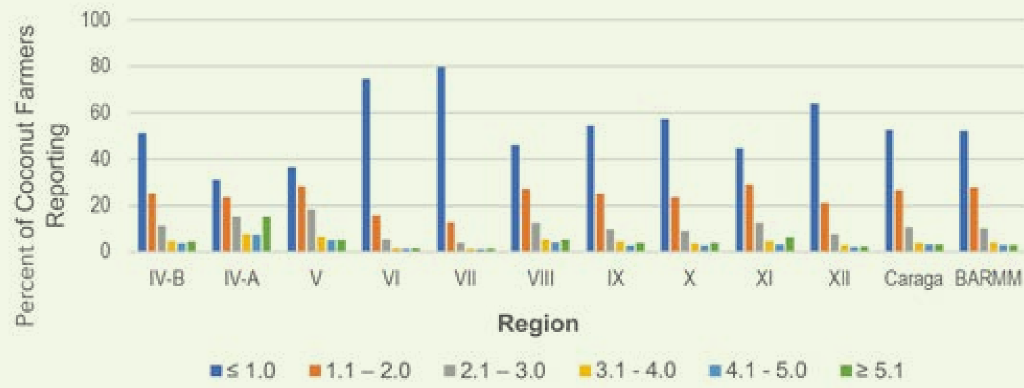
There are also variations in the farm size distribution among administrative regions. Table 3.3 and Figure 3.9 show that Region VII has the highest proportion of coconut farmers who operate ≤ 1.0 hectare (79.7%), followed by Region VI (74.6%), Region XII (64.1%), Region X (57.4%), Region IX (54.7%), Caraga (52.6%) and BARMM (52.2%). Meanwhile, Region IV-A exhibits the highest proportion of coconut farmers who operate more than 4.0 hectares (22.7%), followed by Region V (10%), Region XI (9.5%), and Region VIII (9.2%). It can be noted in Table 3.3 that except for Region IV-A, more than 90% of the coconut farmers in all the regions have farm sizes less than 5.1 ha.

### TABLE 3.3. PERCENT DISTRIBUTION OF COCONUT FARMERS BY FARM SIZE AND BY REGION IN THE PHILIPPINES, 2018

| Region | ≤1.0 ha | 1.1-2.0 ha | 2.1-3.0 ha | 3.1-4.0 ha | 4.1-5.0 Ha | ≥ 5.1 ha | Total Number Coconut Farmers |
|---|---|---|---|---|---|---|---|
| Region IV-A (CALABARZON) | 30.9 | 23.5 | 15.2 | 7.8 | 7.5 | 15.2 | 248,269 |
| Region IV-B (MIMAROPA) | 51.3 | 24.9 | 11.4 | 4.5 | 3.6 | 4.2 | 134,380 |
| Region V (Bicol Region) | 36.7 | 28.2 | 18.5 | 6.6 | 5.0 | 5.0 | 120,449 |
| Region VI (Western Visayas) | 74.6 | 15.8 | 5.1 | 1.6 | 1.4 | 1.5 | 231,786 |
| Region VII (Central Visayas) | 79.7 | 12.8 | 3.8 | 1.4 | 1.0 | 1.3 | 294,486 |
| Region VIII (Eastern Visayas) | 46.2 | 27.0 | 12.4 | 5.2 | 4.0 | 5.2 | 349,473 |
| Region IX (Zamboanga Peninsula) | 54.7 | 24.8 | 9.8 | 4.2 | 2.7 | 3.8 | 239,736 |
| Region X (Northern Mindanao) | 57.4 | 23.5 | 9.0 | 3.7 | 2.7 | 3.8 | 153,050 |
| Region XI (Davao Region) | 44.8 | 28.8 | 12.5 | 4.5 | 3.2 | 6.3 | 267,781 |
| Region XII (SOCCSKSARGEN) | 64.1 | 21.1 | 7.6 | 2.9 | 2.0 | 2.3 | 138,721 |
| Region XIII (Caraga) | 52.6 | 26.6 | 10.7 | 3.9 | 3.1 | 3.2 | 153,303 |
| BARMM | 52.2 | 27.8 | 10.1 | 4 | 2.9 | 2.9 | 206,393 |

Source: NCFRS

## FIGURE 3.9. DISTRIBUTION OF COCONUT FARMS BY FARM SIZE RANGE AND REGION IN THE PHILIPPINES, 2018




Source: NCFRS

## FIGURE 3.10. PERCENT DISTRIBUTION OF COCONUT FARMERS ACCORDING TO INCOME RANGE IN THE PHILIPPINES, 2018


Source: NCFRS

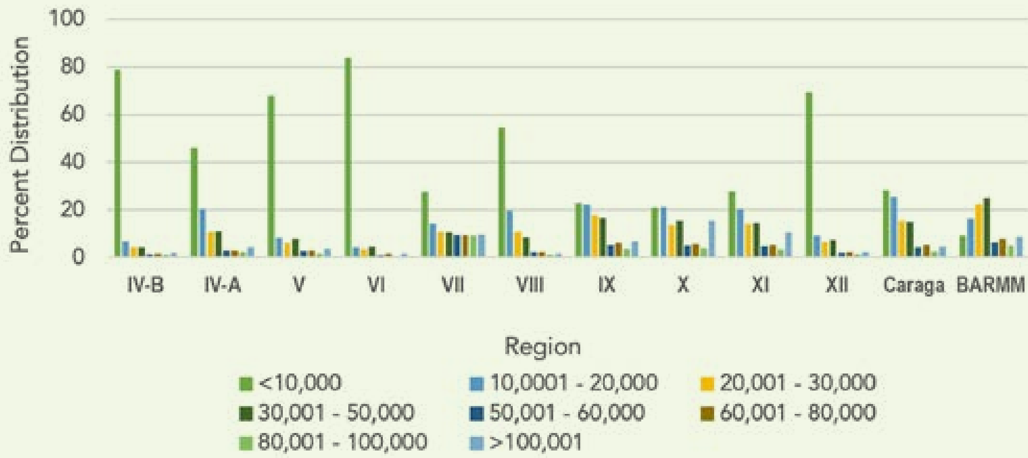
Coconut farmers are considered among the poorest in the country. They accounted for about 60% of the rural poor and have an average annual income of PHP 20,000 per hectare (DAR, 2019). The income distribution in the coconut farm sector would show a better picture of the extent of poverty among the coconut farmer population than the average annual farm income figure. As shown in Figure 3.10, most of the 2.54 M coconut farmers in the country earn less than PHP 10,000 per year. Those who fall in this income range are largely farm workers and tenants. In 2019, the prevailing wage rate in the coconut farm sector was only PHP 338.72 per day (PSA, 2020). Approximately 26% of the coconut farmers in the country have low annual incomes ranging from PHP 10,001 to PHP 30,000. Only 5.6% of the coconut farmers earn more than PHP 100,000 per year.

This great inequality in the annual incomes among small coconut farmers has profound policy implications on food security and the alleviation of poverty. As defined by NEDA, the food threshold expenditure for a family of five is PHP 90,630 per annum (PSA, 2018). This food expenditure is estimated to cover the minimum 2,200 kcal per capita per year of household members to be able to perform their basic human functions (FNRI, 2000).

Using the economic carrying capacity ratio decision criteria developed by Gonzales et al. (2000), the annual income range among small coconut farmers implies that 92% of the coconut farmers in the NCFRS are food insecure with a carrying capacity ratio of less than one, ranging from 0.11 to 0.88. The carrying capacity ratio refers to the annual income divided by the food threshold. The farmers, therefore, need to enhance their current household income from a range of 12% to 100% of their current annual income to be at least neutrally food secure.

The baseline findings further showed that only 5.6% of the coconut farmers have annual income levels that can cover their food subsistence requirement and may be close to covering their poverty threshold expenditures of PHP 129,065 per year for a family of five (Figure 3.10). The regional data discussed below show different levels of annual income variability, but they support the national situation on coconut farmers’ annual income variability.

FIGURE 3.11. PERCENT DISTRIBUTION OF COCONUT FARMERS ACCORDING TO INCOME RANGE BY MAJOR ISLAND GROUP IN THE PHILIPPINES, 2018




Source: NCFRS

A comparison of the income distribution among the three major island groups shows that Luzon exhibited the highest proportion (73%) of coconut farmers who earn less than PHP 10,000 per year, followed by Visayas (51.3%). Mindanao posted the least proportion (31.4%) of the coconut farmer population in that island who earn less than PHP 10,000 per year (Figure 3.11). This trend could be explained by the higher proportions of coconut farm workers and tenants in Luzon and Visayas than in Mindanao. Conversely, a higher proportion (7.5%) of the coconut farmer population in Mindanao reported an annual income of more than PHP 100,000 compared with Visayas (4.3%) and Luzon (2.7%). This could be attributed to the higher proportion of the coconut farmer population in Mindanao who are owners. Farm owners can freely make decisions pertaining to their practice of intercropping, livestock integration, and coconut processing and can easily access credit support from formal institutions compared with farm workers and tenants. The foregoing analysis reveals that coconut farmers in Luzon are the poorest in the country's coconut farm sector while the coconut farmers in Mindanao are the most better off financially.

As shown in Table 3.4 and Figure 3.12, the distribution of income of coconut farmers also varies among administrative regions. Region 6 has the highest percentage (83.8%) of coconut farmers with less than PHP 10,000/year of coconut farm income, followed by Region IV-B (78.9%), Region XII (69.4%), Region V (67.8%), Region VIII (54.6%), and Region IV-A (46%). In contrast, Region X has the highest percentage (15.2%) of coconut farmers with more than PHP 100,000/ year of coconut farm income followed by Region XI (10.6%), Region VII (9.5%), and BARMM (8.6%).

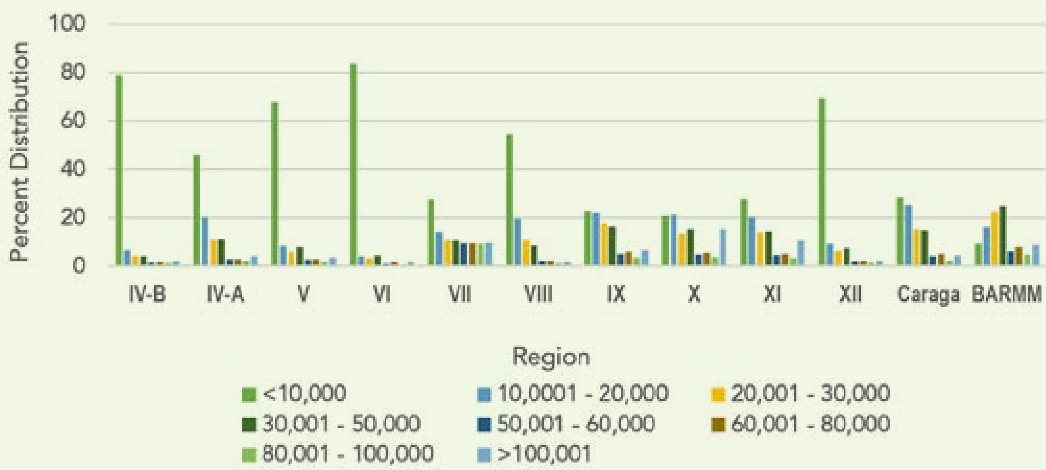
### TABLE 3.4. PERCENT DISTRIBUTION OF COCONUT FARMERS BY FARM INCOME RANGE AND BY REGION IN THE PHILIPPINES, 2018

| Percent of Coconut Farmers Reporting | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Region | <10,000 | 10,0001 - 20,000 | 20,001 - 30,000 | 30,001 - 50,000 | 50,001 - 60,000 | 60,0001 - 80,000 | 80, 001 - 100,000 | >1000,001 |
| Region IV-A (CALABAR-ZON) | 46.0 | 30.2 | 10.8 | 10.9 | 2.9 | 2.8 | 2.1 | 4.3 |
| Region IV-B (MIMAROPA) | 48.9 | 6.7 | 4.2 | 4.3 | 1.3 | 1.6 | 1.0 | 1.9 |
| Region V (Bicol Region) | 67.8 | 8.2 | 5.9 | 7.8 | 2.6 | 2.8 | 1.6 | 3.5 |
| Region VI (Western Visayas) | 83.8 | 4.3 | 3.3 | 4.4 | 0.9 | 1.5 | 0.4 | 1.5 |
| Region VII (Central Visayas) | 27.5 | 14.1 | 10.8 | 10.4 | 9.3 | 9.3 | 9.2 | 9.5 |
| Region VIII (Eastern Visayas) | 54.6 | 19.4 | 10.8 | 8.5 | 2.1 | 2.1 | 1.0 | 1.5 |
| Region IX (Zamboanga Peninsula) | 22.8 | 22.1 | 17.7 | 16.3 | 5.0 | 5.9 | 3.6 | 6.6 |
| Region X (Northern Mindanao) | 20.8 | 21.1 | 13.7 | 15.2 | 4.8 | 5.6 | 3.8 | 15.2 |
| Region XI (Davao Region) | 27.9 | 20.2 | 13.9 | 14.4 | 4.6 | 5.1 | 3.4 | 10.6 |
| Region XII (SOCCSKSAR-GEN) | 69.4 | 9.2 | 6.4 | 7.4 | 2.0 | 2.2 | 1.2 | 2.1 |

| Region | <10,000 | 10,0001 - 20,000 | 20,001 - 30,000 | 30,001 - 50,000 | 50,001 - 60,000 | 60,0001 - 80,000 | 80, 001 - 100,000 | >1000,001 |
|---|---|---|---|---|---|---|---|---|
| | Percent of Coconut Farmers Reporting | | | | | | | |
| Region XIII (Caraga) | 28.3 | 25.4 | 15.3 | 14.8 | 4.1 | 5.2 | 2.5 | 4.5 c |
| BARMM | 9.2 | 16.1 | 22.4 | 24.9 | 6.2 | 7.8 | 4.8 | 8.6 |

Source: NCFRS

**FIGURE 3.12. PERCENT DISTRIBUTION OF COCONUT FARMERS ACCORDING TO INCOME RANGE BY ADMINISTRATIVE REGION IN THE PHILIPPINES, 2018.**




Source: NCFRS

Coconut farmers' associations and cooperatives would play a major role in "agribusinessizing" the coconut farm sector. It is deemed important to have adequate information on the total number of small coconut farmers' organizations (SCFOs), cooperatives, and farmers' federations in each region. Currently, there are about 10,505 SCFOs, 1,306 coconut farmers' cooperatives, and 70 coconut farmers' federations covering 11,405 municipalities in the country (Table 3.5). Among the 16 administrative regions, Central Visayas has the highest number of coconut farmers' cooperatives followed by Northern Mindanao and Eastern Visayas. Meanwhile, Eastern Visayas has the highest number of SCFOs. There are also several SCFOs in Central Visayas, Zamboanga Peninsula, Western Visayas, and Caraga. Moreover, Caraga has the highest number of coconut farmers' federations, followed by Northern Mindanao and CALABARZON. Landowners dominate the membership in these associations (Appendix Tables 1-3). Other association members include tenants and farm workers.

### TABLE 3.5. NUMBER OF COCONUT FARMERS' COOPERATIVES, SMALL COCONUT FARMERS' ORGANIZATIONS AND FEDERATION OF COCONUT FARMERS' ORGANIZATIONS BY REGION IN THE PHILIPPINES, 2019

| Region | No. of Coconut Farmers Cooperatives | No. of Small Coconut Farmers Organizations | No. of Federations of Coconut Farmers Organizations |
|---|---|---|---|
| CAR | 1 | - | - |
| Region I (Ilocos Region) | 48 | 120 | - |
| Region II (Cagayan Valley) | 23 | 97 | - |
| Region III (Central Luzon) | 7 | 132 | - |
| Region IV-A (CALABARZON) | 39 | 336 | 8 |
| Region IV-B (MIMAROPA) | 63 | 183 | - |
| Region V (Bicol Region) | 57 | 758 | 4 |
| Region VI (Western Visayas) | 66 | 1,000 | 5 |
| Region VII (Central Visayas) | 486 | 1,747 | 3 |
| Region VIII (Eastern Visayas) | 128 | 1,902 | 2 |
| Region IX (Zamboanga Peninsula) | 40 | 1,023 | - |
| Region X (Northern Mindanao) | 141 | 559 | 13 |
| Region XI (Davao Region) | 42 | 778 | 3 |
| Region XII (SOCCSKSARGEN) | 51 | 713 | 1 |
| Region XIII (Caraga) | 57 | 952 | 30 |
| BARMM | 57 | 206 | - |
| PHILIPPINES | 1,306 | 10,506 | 69 |

Source: PCA

# Coconut Processing Sector

Copra processing is commonly practiced at the farm level. About 80% of the total coconut production of the Philippines during the period 2009–2019 passed through the copra stage. Village-level processing of other coconut products such as nata de coco, coconut vinegar, coconut oil, coco coir, coco sugar, virgin coconut oil, nata de coco, and coco-charcoal, among other processed coconut products is undertaken by SCFOs or cooperatives and coconut farming households to a limited extent.

Small- to large-scale coconut processing is generally done by companies comprised of the following:

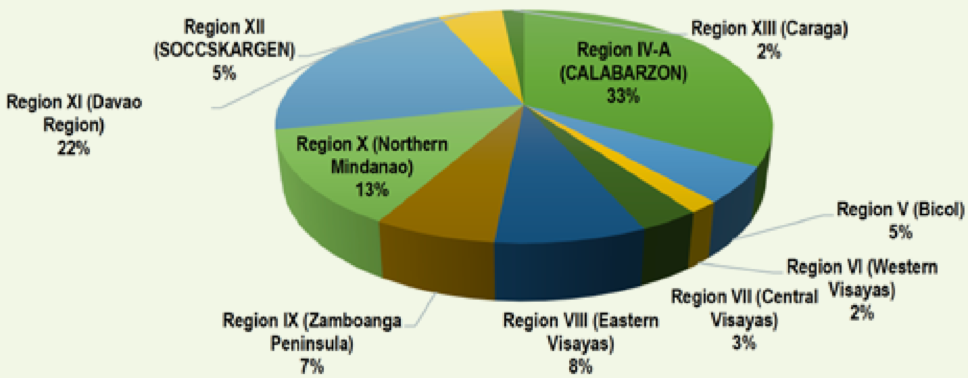
Coconut Oil Mills. In 2018, there were 60 coconut oil mills nationwide with an annual aggregate capacity of 3,420,554 MT. The 60 oil mills were operating in 10 regions, namely, CALABARZON, Bicol Region, Western Visayas, Eastern Visayas, Central Visayas, Zamboanga Peninsula, Northern Mindanao, Davao Region, SOCCSKSARGEN, and Caraga Region (Table 3.6 and Figure 3.13).

### TABLE 3.6. NUMBER OF COCONUT OIL MILLS BY REGION IN THE PHILIPPINES, 2018

| Region | Number of Plants | Percent Share |
|---|---|---|
| Region IV-A (CALABARZON) | 20 | 33.3 |
| Region V (Bicol Region) | 3 | 5.0 |
| Region VI (Western Visayas) | 1 | 1.7 |
| Region VII (Central Visayas) | 2 | 3.3 |
| Region VIII (Eastern Visayas) | 5 | 8.3 |
| Region IX (Zamboanga Peninsula) | 4 | 6.7 |
| Region X (Northern Mindanao) | 8 | 13.3 |
| Region XI (Davao Region) | 13 | 21.7 |
| Region XII (SOCCKSSARGEN) | 3 | 5.0 |
| Region XIII (Caraga) | 1 | 1.7 |
| Total | 60 | 100.0 |

Source: PCA and UCAP

## FIGURE 3.13. PERCENT DISTRIBUTION OF 60 COCONUT OIL MILLS BY REGION IN THE PHILIPPINES, 2018




Source: PCA and UCAP

Most of the oil mills are in CALABARZON (33.3%) and Davao Region (21.7%). The 13 oil mills operating in Davao Region and the 20 oil mills in CALABARZON accounted for 20.6% and 17.7% of the total copra crushing capacity in the oil milling industry, respectively (Table 3.7).

### TABLE 3.7. COPRA CRUSHING CAPACITIES OF COCONUT OIL MILLS BY REGION IN THE PHILIPPINES, 2018

| Region | Crushing Capacity (MT/Year) | Percent Share |
|---|---|---|
| Region IV-A (CALABARZON) | 606,250 | 17.7 |
| Region V (Bicol Region) | 222,000 | 6.5 |
| Region VI (Western Visayas) | 15,840 | 0.5 |
| Region VII (Central Visayas) | 81,000 | 2.4 |
| Region VIII (Eastern Visayas) | 333,600 | 9.8 |
| Region IX (Zamboanga Peninsula) | 504,300 | 14.7 |
| Region X (Northern Mindanao) | 476,364 | 13.9 |
| Region XI (Davao Region) | 705,600 | 20.6 |
| Region XII (SOCCSKSARGEN) | 444,000 | 13.0 |
| Region XIII (Caraga) | 31,600 | 0.9 |
| Total | 3,420,554 | 100.0 |

Source: PCA and UCAP

As shown in Table 3.8, the average capacity utilization of the oil milling establishments was low, ranging from 38.4% to 69% during the period 2009-2019 due to the low supply of copra available for crushing.

### TABLE 3.8. CAPACITY UTILIZATION OF PHILIPPINE COCONUT OIL MILLS IN COPRA TERMS, 2009 TO 2019

| Year | Annual Rated Capacity ('000 MT) | Estimated Annual Copra Crushed ('000 MT) | Estimated Capacity Utilized (%) |
|---|---|---|---|
| 2009 | 4,502 | 2,121 | 47.1 |
| 2010 | 4,770 | 2,912 | 61.0 |
| 2011 | 4,770 | 1,869 | 39.2 |
| 2012 | 4,818 | 2,124 | 44.1 |
| 2013 | 4,826 | 2,578 | 53.4 |
| 2014 | 4,677 | 1,798 | 38.4 |
| 2015 | 4,306 | 1,934 | 44.9 |
| 2016 | 3,975 | 1,719 | 43.2 |
| 2017 | 3,990 | 1,913 | 47.9 |
| 2018 | 3,420 | 2,033 | 59.4 |
| 2019 | 3,420 | 2,363 | 69.1 |

Based on calculated oil production
Source: PCA and UCAP

The lowest average capacity utilization of the coconut oil mills was recorded in 2014 when the coconut scale infestation damaged many coconut trees in the country, especially in CALABARZON (Figure 3.14). The oil mills had high-capacity utilization in 2010 and 2019 due to the large supply of copra available because of favorable climate during those years. Only 59.4% of the aggregate annual copra crushing capacity of 3,420,554 MT was utilized in 2018. Crushing capacity utilization in 2018 was lower than in 2019 (69%). The oil milling industry is, therefore, characterized as having over-capacity due to the stagnant farm sector (Dy and Reyes, 2006).

Appendix Table 1 shows the list of oil mills operating per region in 2018. In terms of copra crushing capacity, the top nine oil mills are all located in the Mindanao region. These oil mills together account for approximately 46% of the total milling capacity of the entire coconut oil milling industry. Granexport Manufacturing Corp. is the largest oil mill,

**FIGURE 3.14. COMPARISON OF THE ANNUAL RATED CAPACITY AND THE CAPACITY UTILIZATION OF PHILIPPINE COCONUT OIL MILLS IN COPRA TERMS FROM 2009 TO 2019**


Source: PCA and UCAP

followed by Interco, Davao Bay Coconut Oil Mills Inc., and Cargill Oil Mills Philippines Inc. Other large companies are Wilmar Edible Oil Phils. Inc., International Copra Export Corp., Dipolog Oil Mill, Third Millennium Oil Mills Inc., and World Venture Commodities Inc.

Fourteen large oil milling companies are members of the Philippine Coconut Oil Producers Association (PCOPA). These companies are Granexport Manufacturing Corporation, Cargill Oil Mills Philippines Inc., Legaspi Oil Company Inc., Cagayan de Oro Oil Company Inc., Ludo & Lu Ym Corp., New Asia Oil Inc., Philippine International Development Inc., Samar Coco Products Manufacturing Corp., San Pablo Manufacturing Corp., SC Global Coco Products Inc., Southern Luzon Coconut Oil Mill Inc., Tantuco Enterprises Inc., Globe Coco Products Manufacturing Corp., and World Venture Commodities Inc.

Aside from the unstable supply of copra, another problem encountered by coconut oil mills is the low quality of copra due to the traditional tapahan method of processing copra. The poor quality of copra has increased the processing cost of oil mills. The low quality of copra has led also to a high level of Polycyclic Aromatic Hydrocarbons (PAH) and aflatoxin in the production of crude coconut oil that could make these products unmarketable in the export market (PCA, 2012).

Coconut Oil Refineries. There were 39 oil refineries operating in the Philippines in 2018 with a total annual refining capacity of 1,993,400 MT (Tables 3.9 and 3.10). Of this total, 13 were also operating as coconut oil mills.

### TABLE 3.9. NUMBER OF COCONUT OIL REFINERIES BY REGION IN THE PHILIPPINES, 2018

| Region | Number of Plants | Percent Share |
|---|---|---|
| Region IV-A (CALABARZON) | 6 | 15.4 |
| Region V (Bicol Region) | 1 | 2.6 |
| Region VII (Central Visayas) | 3 | 7.7 |
| Region VIII (Eastern Visayas) | 1 | 2.6 |
| Region IX (Zamboanga Peninsula) | 2 | 5.1 |
| Region X (Northern Mindanao) | 9 | 23.0 |
| Region XI (Davao Region) | 9 | 23.0 |
| Region XII (SOCCSKSARGEN) | 1 | 2.6 |
| Region XIII (Caraga) | 1 | 2.6 |
| Total | 39 | 100.0 |

Source: PCA and UCAP

The 39 oil refineries are spread in 10 regions, namely, the National Capital Region, CALABARZON, Bicol Region, Central Visayas, Eastern Visayas, Zamboanga Peninsula, Northern Mindanao, Davao Region, SOCCSKSARGEN, and Caraga. Table 10 shows that the most concentrated regions in terms of the number of oil refineries are Northern Mindanao (23%), Davao Region (23%), CALABARZON (15%), and the National Capital Region (15%).

The highest aggregate refining capacity of nine oil refineries (463,500 MT) was reported in Northern Mindanao, accounting for 23% of the total refining capacity of all refineries in the country (Table 3.10). This was followed by Davao Region with 431,000 MT, or 21.6% share, and the National Capital Region, with 423,000 MT (21.2% share).

#### TABLE 3.10. REFINING CAPACITIES OF COCONUT OIL REFINERIES BY REGION IN THE PHILIPPINES, 2018

| Region | Refining Capacity (MT/Year) | Percent Share |
|---|---|---|
| NCR (National Capital Region) | 423,000 | 21.2 |
| Region IV-A (CALABARZON) | 153,000 | 7.7 |
| Region V (Bicol Region) | 12,000 | 0.6 |
| Region VII (Central Visayas) | 261,000 | 13.1 |
| Region VIII (Eastern Visayas) | 36,000 | 1.8 |
| Region IX (Zamboanga Peninsula) | 175,000 | 8.8 |
| Region X (Northern Mindanao) | 463,500 | 23.3 |
| Region XI (Davao Region) | 431,000 | 21.6 |
| Region XII (SOCCSKSARGEN) | 3,000 | 0.2 |
| Region XIII (Caraga) | 7,500 | 0.4 |
| Total | 1,993,400 | 100.0 |

Sources: PCA and UCAP

Based on refining capacity, the top seven refineries include Wilmar Edible Oils Philippines with two refineries in Zamboanga Peninsula and Northern Mindanao, Lu Do & Lu Ym Oleochem Corp. in Central Visayas, International Copra Export Corp. in Davao Region, Malabon Soap & Oil Company and Tans-Asia (Phils.) Oil Mfg. in the National Capital Region, and World Venture Commodities Inc. and Granexport Manufacturing Corp., both located in Northern Mindanao (Appendix Table 2). The aggregate refining capacity of these companies accounted for 47.5% of the total annual refining capacity of all the refineries operating in 2018.

Eleven large processing and exporting refiners are members of the Coconut Oil Refiners Association (CORA). These refiners are the San Pablo Manufacturing Corporation, Limketkai Manufacturing Inc., Lu Do & Lu Ym Oleochem. Corp., AFTA Corporation, Malabon Soap & Oil Company, International Oil Factory, Licup Oil Mills Inc., Caraga Oil Refining, Tantuco Enterprises Inc., Oleo Fats, and Agana Circle Enterprises.

***Desiccated Coconut Processing Companies***. In 2019, there were 21 medium-scale desiccated coconut processing plants operated by 19 companies with an aggregate annual production capacity of 449,1546 MT (Table 3.11). Three of the 19 companies operated two desiccated processing plants each in different locations. These companies were Franklin Baker Company of the Philippines, Peter Paul Philippine Corp., and Superstar Coconut Products Inc. Franklin Baker Company of the Philippines, with plants in Laguna and Davao, is the largest desiccated coconut producer with a capacity of 61,800 MT per year (Appendix Table 3). The other two top producers of desiccated coconut are Peter Paul Philippines Corp. and Superstar Coconut Products Inc. with plant capacities of 44,000 MT and 48,000 MT per year, respectively. The two desiccated coconut processing plants of Peter Paul Philippines are in Quezon and Sorsogon, while the two desiccated coconut processing plants of Superstar Coconut Products Inc. are situated in Quezon and Davao. The aggregate production capacity of these three major desiccated coconut processing companies accounted for 34.2% of the overall desiccated coconut industry's production capacity.

### TABLE 3.11. NUMBER OF DESICCATED COCONUT PLANTS BY REGION IN THE PHILIPPINES, 2019

| Region | Number of Desiccated Coconut Plants | Percent Share |
|---|---|---|
| Region IV-A (CALABARZON) | 6 | 28.6 |
| Region V (Bicol Region) | 2 | 9.5 |
| Region VII (Central Visayas) | 1 | 4.8 |
| Region VIII (Eastern Visayas) | 1 | 4.8 |
| Region X (Northern Mindanao) | 3 | 14.3 |
| Region XI (Davao Region) | 6 | 28.6 |
| Region XII (SOCCSKSARGEN) | 1 | 4.8 |
| Region XIII (Caraga) | 1 | 4.8 |
| Total | 21 | 100.0 |

Source: PCA and UCAP

The 21 desiccated coconut processing plants are spread in eight regions, namely, CALABARZON, Bicol Region, Central Visayas, Eastern Visayas, Northern Mindanao, Davao Region, SOCCSKSARGEN, and Caraga Region. As regards the regional distribution of the desiccated coconut processing plants, most of the plants are operating in CALABARZON and Davao Region. About 57.2% of the 21 desiccated coconut processing plants are found in these regions (Table 3.12).

As shown in Table 3.12, the six desiccated coconut processing plants operating in Davao Region posted the highest aggregate annual production capacity (147,880 MT), followed by the same number of desiccated processing plants in CALABARZON at 114,900 MT.

### TABLE 3.12. AGGREGATE ANNUAL PRODUCTION CAPACITIES OF 21 DESICCATED COCONUT PLANTS BY REGION IN THE PHILIPPINES, 2019

| Region | Production Capacity (MT/Year) | Percent Share |
|---|---|---|
| Region IV-A (CALABARZON) | 114,900 | 25.6 |
| Region V (Bicol Region) | 44,200 | 9.8 |
| Region VII (Central Visayas) | 324 | 0.1 |
| Region VIII (Eastern Visayas) | 25,000 | 5.6 |
| Region X (Northern Mindanao) | 64,850 | 14.4 |
| Region XI (Davao Region) | 147,880 | 32.9 |
| Region XII (SOCCSKSARGEN) | 22,000 | 4.9 |
| Region XIII (Caraga) | 30,000 | 6.7 |
| Total | 449,154 | 100.0 |

Source: PCA and UCAP

The desiccated coconut processing plants were initially established to produce desiccated coconut only, but through time the processing plants have developed into integrated multi-product plants (Costales, 2019). The desiccated coconut processing companies found the integrated approach more profitable since they could utilize their coconut wastes, such as coconut water, coconut cream, and coco shells, to produce more value-added products and avoid wastage.

Franklin Baker Company of the Phils. and Superstar Coconut Products Inc. are two of the three large, desiccated coconut processing companies that produce both desiccated coconut and non-traditional coconut products. These firms are among the large producers and exporters of coconut water, virgin coconut oil, and coco sugar.

***Coco Shell Processing Companies.*** In 2019, there were 15 small - to large-sized coco shell charcoal plants in the Philippines with an aggregate annual production capacity of 321,114 MT (Tables 3.13 and 3.14). Most of the coco shell charcoal plants (47%) are operating in Davao Region (Table 3.13). However, the aggregate annual production capacity (254,534 MT) of the three coco shell charcoal plants in Northern Mindanao was much higher than the combined annual production capacity (44,430 MT) of seven coco shell charcoal plants in the Davao Region (Table 3.14). This can be explained by the fact that Jacobi Carbons Philippines Inc., the largest coco shell charcoal plant in the country, is operating in Northern Mindanao. The production capacity of Jacobi Carbons Philippines Inc. is 252,974 MT per year, which accounts for 78.8% of the total production capacity of the coco shell charcoal industry (Appendix Table 4). Other major coco shell charcoal producing companies are the Davao Central Inc. and Visayas Activated Carbon, but the annual production capacities of these companies (20,000 MT and 11,500 MT per year, respectively) were relatively much lower compared with that of Jacobi Carbons Philippines Inc.

### TABLE 3.13. NUMBER OF COCO SHELL CHARCOAL PLANTS BY REGION IN THE PHILIPPINES, 2019

| Region | Number of Plants | Percent Share |
|---|---|---|
| Region IV-A (CALABARZON) | 3 | 20 |
| Region VIII (Eastern Visayas) | 2 | 13 |
| Region X (Northern Mindanao) | 3 | 20 |
| Region XI (Davao Region) | 7 | 47 |
| Total | 15 | 100 |

Source: PCA and UCAP

### TABLE 3.14. AGGREGATE ANNUAL PRODUCTION CAPACITIES OF COCO SHELL CHARCOAL PLANTS BY REGION IN THE PHILIPPINES, 2019

| Region | Production Capacity (MT/Year) | Percent Share |
|---|---|---|
| Region IV-A (CALABARZON) | 10,050 | 3.1 |
| Region VIII (Eastern Visayas) | 12,100 | 3.8 |
| Region X (Northern Mindanao) | 254,534 | 79.3 |
| Region XI (Davao Region) | 44,430 | 13.8 |
| Total | 321,114 | 100.0 |

Source: PCA and UCAP

Eight coco shell charcoal plants are vertically forward integrated into activated carbon processing. These are Jacobi Carbons Philippines Inc. (Misamis Oriental), Davao Central Chemical Corp. (Davao City), BF Industries Inc. (Davao City), Industrial Carbon Technology Corp. (Davao City), Philips Carbon Inc. (Davao City), Visayas Activated Carbon Inc. (Leyte), Green Carbon Inc. (Leyte), and PJKMB Enterprise (Rizal).

In Davao, where most of the coco shell charcoal processing plants are located, the manufacturers are in competition with one another for coco shell supplies and are experiencing limited supply of raw materials. Firms are clustered in Davao Region because Davao is the top coconut-producing region in the Philippines and it is also a strategic place for exports as it has logistical capacities such as ports and airports (Ordinario et al, 2019).

Coco Shell-Based Activated Carbon Manufacturing Companies. As of June 2020, activated carbon was produced by 14 plants with a total annual production capacity of 85,585 MT (Tables 3.15 and 3.16). As mentioned earlier, eight of the 14 activated carbon plants operating in the country are also manufacturing coco shell charcoal. The majority of the activated carbon manufacturing plants are in Mindanao. Production of activated carbon is highly concentrated in Davao Region. Approximately 43% are in Davao Region while 21.4% are in Northern Mindanao (Table 3.15).

### TABLE 3.15. NUMBER OF ACTIVATED CARBON PLANTS BY REGION IN THE PHILIPPINES, JUNE 2020

| Region | Number of Plants | Percent Share |
|---|---|---|
| Region IV-A (CALABARZON) | 2 | 14.3 |
| Region VII (Central Visayas) | 1 | 7.1 |
| Region VIII (Eastern Visayas) | 1 | 7.1 |
| Region IX (Zamboanga Peninsula) | 1 | 7.1 |
| Region X (Northern Mindanao) | 3 | 21.4 |
| Region XI (Davao Region) | 6 | 42.9 |
| Total | 14 | 100.0 |

Source: PCA and UCAP

Davao Region posted the highest aggregate annual production capacity (37,675 MT/year with 44.0% share), followed by Central Visayas (24,000 MT or 28% share) and Northern Mindanao (18,120 MT/year with 21.2% share) (Table 3.16).

The top four activated carbon manufacturing companies are Cenapro Chemical Corp., Philippine- Japan Active Carbon Corp., Premium AC Corporation, and Jacobi Carbons Philippines Inc., (Appendix Table 5). Among the 14 activated carbon manufacturing companies, Cenapro Chemical Corp., which is situated in Central Visayas, has the largest production capacity (24,000 MT per year). Its production capacity accounts for 28% of the total production capacity of the entire activated carbon industry. Philippine- Japan Active Carbo Corp. and Premium AC Corporation, both the second largest activated carbon manufacturers, are operating in Davao Region while the third one (i.e., Jacobi Carbons Philippines Inc.) is situated in Northern Mindanao.

### TABLE 3.16. AGGREGATE PRODUCTION CAPACITIES OF 14 ACTIVATED CARBON PLANTS BY REGION IN THE PHILIPPINES, JUNE 2020

| Region | Number of Plants | Percent Share |
|---|---|---|
| Region IV-A (CALABARZON) | 4,110 | 4.8 |
| Region VII (Central Visayas) | 24,000 | 28.0 |
| Region VIII (Eastern Visayas) | 600 | 0.7 |
| Region IX (Zamboanga Peninsula) | 1,080 | 1.3 |
| Region X (Northern Mindanao) | 18,120 | 21.2 |
| Region XI (Davao Region) | 37,675 | 44.0 |
| Total | 85,585 | 100.0 |

Source: PCA and UCAP

Jacobi Carbons' activated carbon processing facility, with its size and sophistication, represents the state-of-the-art in carbon activation technology (Jacobi Group, 2015). Its facility is the world's largest coconut shell activated carbon plant with a new level of automation. The Jacobi Carbons Philippines Inc.'s facility includes a charcoal granulation plant, multiple activation kilns with a nominal capacity of more than 20,000 MT per year, grinding and pulverizing capacity, specialty impregnation and water/acid washing. Cenapro Chemical Corp., a family-owned corporation, developed and concentrated its niche into manufacturing granulated charcoal mainly to produce activated carbon. It has exported its products to Japan, Korea, and Europe. Philippine-Japan Active Carbon Corp. is the only company granted by the Philippine government to operate at 100% Japanese capitalization. The company is also one of the largest coconut-based activated carbon manufacturers in the world. Meanwhile, Premium AC Corporation has four state of the art activation kilns and has a plant capacity of 750 MT per month.

Nine activated carbon manufacturing companies are members of the Philippine Activated Carbon Manufacturers Association (PACMA). These are composed of the BF Industries, Inc., Davao Central Chemical Corporation, Green Carbon Inc., Golden Activated Carbon Corporation, Jacobi Carbons Philippines,

MAPECON Green Charcoal Philippines Inc., Donau Carbon Philippines Corporation, Philippine-Japan Activated Carbon Corp., and Premium AC Corporation.

***Oleochemical Companies.*** There were eight oleochemical companies in the Philippines making intermediate coconut-based chemicals like fatty alcohol, fatty acids, methyl ester, and glycerin in 2018. The oleochemical companies are operating in only four regions in the country, namely: CALABARZON, the National Capital Region, Zamboanga Peninsula, and Northern Mindanao (Table 3.17). Most of the companies (53.3%) are concentrated in CALABARZON. Twenty percent of the 15 oleochemical companies are operating in the National Capital Region and another 20% are in Northern Mindanao.

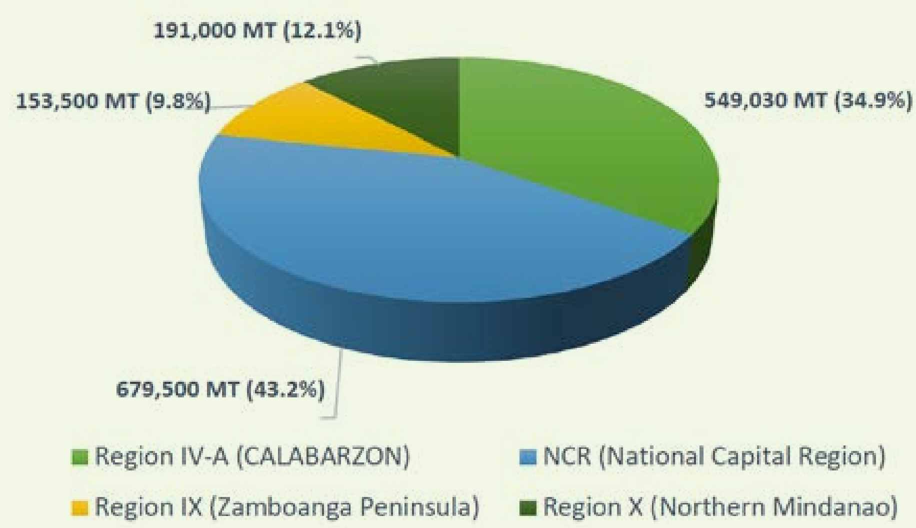
### TABLE 3.17. NUMBER OF OLEOCHEMICAL PLANTS BY REGION IN THE PHILIPPINES

| Region | Number of Plants | Percent Share |
|---|---|---|
| Region IV-A (CALABARZON) | 8 | 53.3 |
| NCR (National Capital Region) | 3 | 20.0 |
| Region IX (Zamboanga Peninsula) | 1 | 6.7 |
| Region X (Northern Mindanao) | 3 | 20.0 |
| Total | 15 | 100.0 |

Source: PCA and UCAP

Of the 15 oleochemical manufacturers, nine are producing coco methyl ester (CME) while 11 are into glycerin production (Appendix Table 6). Other common oleochemical products being produced by these companies are fatty alcohol, fatty acid, fatty acid distillate, acid oil, soap noodles, sulfonates, esterquats, and amides. The total production capacity of these oleochemical plants in 2018 was 1,573,030 MT per year (Figure 3.15). Almost half (i.e., 679,500 MT or 43%) of the total annual production capacity was generated from the National Capital Region, followed by CALABARZON (549,030 MT or 34.9%). The largest oleochemical plant is Chemrez Technologies Inc., which is operating in the National Capital Region. Chemrez's annual production capacity at 600,000 MT accounts for 38% of the overall production capacity of the oleochemical industry (Appendix Table 6). Other large oleochemical companies are Pilipinas Kao Inc. (Misamis Oriental), Tantuco Enterprises (Quezon), Philippine International Development Inc. (Zamboanga City), and United Coconut Chemicals Inc. (Batangas).

FIGURE 3.15. AGGREGATE ANNUAL PRODUCTION CAPACITY (MT) OF OLEOCHEMICAL PLANTS BY REGION IN THE PHILIPPINES, 2018




Source: PCA and UCAP

Five oleochemical manufacturing companies organized the Philippine Oleochemical Manufacturers Association (POMA). These companies include Chemrez Technologies Inc., JNJ Oleochemicals Inc., PAN Century Surfactants Inc., Sakamoto Orient Chemicals Corp., and the United Coconut Chemicals Inc. (COCOCHEM).

Biodiesel Companies. As of March 2020, there were 12 operational Department of Energy-accredited coco-biodiesel manufacturers in the country with a total production capacity of 607,900 MT of CME per year (Table 3.18).

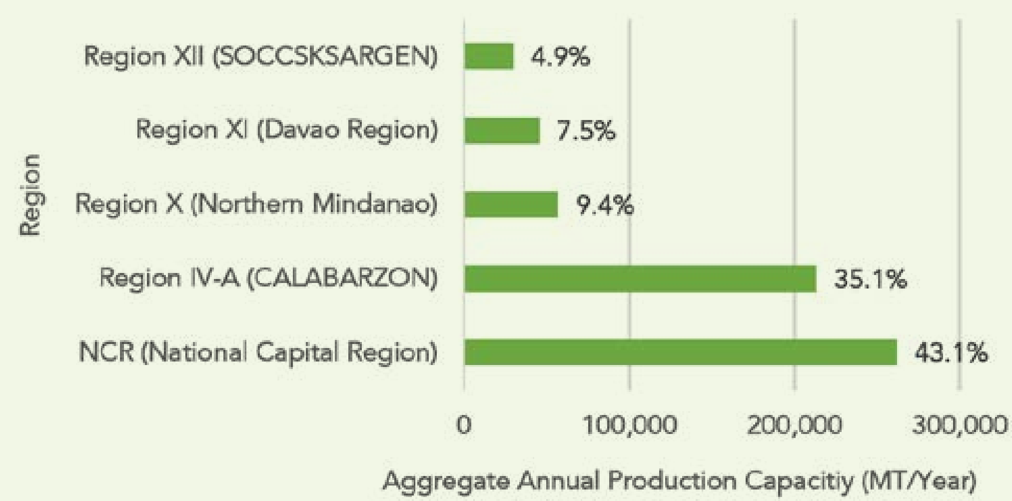
### TABLE 3.18. NUMBER OF BIODIESEL MANUFACTURERS BY REGION IN THE PHILIPPINES, MARCH 2020

| Region | Number of Plants | Percent Share |
|---|---|---|
| NCR (National Capital Region) | 4 | 33.3 |
| Region IV-A (CALABARZON) | 3 | 25.0 |
| Region X (Northern Mindanao) | 2 | 16.7 |
| Region XI (Davao Region) | 2 | 16.7 |
| Region XII (SOCCSKSARGEN) | 1 | 18.3 |
| Total | 12 | 100.0 |

Source: Department of Energy (DOE)

While the country produces a substantial volume of coco biodiesel, investors find it difficult to venture into large-scale production because of the huge capitalization requirement. The biodiesel manufacturers are operating in five regions of the country. Fifty-eight percent of these manufacturers are clustered in the National Capital Region and CALABARZON. Five biodiesel plants are also located in Mindanao island (i.e., Northern Mindanao, Davao Region, and SOCCSKSARGEN).

### FIGURE 3.16. ANNUAL PRODUCTION CAPACITIES OF 12 BIODIESEL MANUFACTURERS BY REGION IN THE PHILIPPINES, MARCH 2020




Source: DOE

Figure 3.16 show that the highest aggregate annual CME production capacity is recorded in the National Capital Region (262,000 MT or 43.1%), followed by CALABARZON (213,300 MT or 35.1%) and Northern Mindanao (57,000 MT or 9.4%).

The largest biodiesel manufacturers in the country are Chemrez Technologies Inc., whose plant is situated in Quezon City (National Capital Region), and Tantuco Enterprises Inc. located in Quezon province (CALABARZON). Both companies have 90,000 MT per year production capacity each. The aggregate annual production capacity of 180,000 MT of these companies accounts for 29.6% of the overall CME capacity of the industry (Appendix Table 7). The other leading biodiesel companies are Pure Essence International (NCR), JNJ Oleochemicals Inc. (CALABARZON), Golden Asia International Inc. (NCR), and Mt. Holly Coco Industrial Inc. (CALABARZON). As of March 2020, the DOE issued a notice to proceed construction to three new companies in Region IV-A and Region X. Two of these new companies have large plant capacities. Bio Renewable Energy Ventures (Misamis Oriental) has a production capacity of 150,000 MT per year while Greentech Biodiesel Inc. (Quezon) has a production capacity of 100,000 MT/year.

***Virgin Coconut Oil (VCO) Processing Companies.*** In 2018, 42 VCO processing plants were operating in nine regions, namely: CALABARZON, Bicol Region, Central Visayas, Eastern Visayas, Zamboanga Peninsula, Northern Mindanao, Davao Region, Caraga, and BARMM. As shown in Table 3.19, the majority (40.5%) of the processing plants are in CALABARZON while about 17% and 14% are processing in Central Visayas and Davao Region, respectively. The top producing firms are Peter Paul Philippines, Franklin Baker Company of the Philippines, Ica Translink Philippines, Primex Coco Products Incorporated, Pacific Basic Foods Incorporated, Celebes Coconut Corporation, Muenster Ingredients, Axelum Inc., Coco Davao Incorporated, and Superstar Coconut Products Inc. Desiccated coconut processing plants, which have the flexibility to produce VCO, are the main producers of VCO (Costales, 2019). The desiccated coconut route of VCO processing uses the dry cold press process which is suited for mass production. There are 12 desiccated coconut processing plants in the country with the potential capacity to produce 831 MT/day of VCO. Of the country's VCO export volume, 80% is supplied by large, desiccated coconut processing companies.

### TABLE 3.19. NUMBER OF VCO PROCESSING PLANTS BY REGION IN THE PHILIPPINES, 2018

| Region | Number of Plants | Percent Share |
|---|---|---|
| Region IV-A (CALABARZON) | 17 | 40.5 |
| Region V (Bicol Region) | 2 | 4.8 |
| Region VII (Central Visayas) | 7 | 16.7 |
| Region VIII (Eastern Visayas) | 2 | 4.8 |
| Region IX (Zamboanga Peninsula) | 2 | 4.8 |
| Region X (Northern Mindanao) | 3 | 7.1 |
| Region XI (Davao Region) | 6 | 14.3 |
| Region XIII (Caraga) | 1 | 2.4 |
| BARMM | 2 | 4.8 |
| Total | 42 | 100.0 |

Sources of basic data: PCA and UCAP

Other VCO processors in the country are composed of micro, small and medium enterprises (MSMEs). They use the wet process (i.e., fermentation and centrifuge) of producing VCO (Costales, 2019). The MSMEs vary in terms of the volume processed, or scale of production, and the equipment and accessories for extraction. The micro enterprises use the traditional method of extraction while the small and medium scale enterprises operating an integrated coconut processing facility use more mechanized and automated processing lines. Moreover, the micro-VCO enterprises usually sell to the local market while the small to medium scale enterprises are more export oriented.

Thirty-one VCO manufacturing companies organized the Virgin Coconut Oil Processors and Traders Association of the Philippines Inc. (VCOPTAP). These companies include Andy Albao Corporation, Ahya Coco

Organic Food Mfg. Corp., Amazing Foods Corp., Century Pacific Agricultural Ventures Inc., Coco Asenso Corp., Cocoplus Aquarian Development Corp., Cocoveda Natural Products Inc., Control Union Philippines Inc., CT Coco Wonders Inc., Dignity Products & Services Inc., Filipina Organics Coconut Products, Franklin Baker Company of the Phils., Fresh Consumer Trade & Logistics Inc., Galo Organic and Natural Ventures, Giga Natural Products Specialist Corp., Green Life Coco Products, Hacienda Macalauan Inc., Hancole Corporation, Leyte Koko Oil Inc. Organix Solutions Inc., Pasciolco Agri-Ventures, Peter Paul Philippine Corporation, PIIS Farmers Association, Prosource International Inc., Quezon Federation and Union of Coop. Inc., San Pablo Mfg. Corp./Legaspi Oil Co. Inc. SC Global Coco Products, The Churner Group Inc., Wellness Care International, Arch Tower Trading, and Team Consultants and Management Services Co., Ltd.

***Coco Coir Processing Companies.*** As shown in Table 3.20, most (71%) of the coir processing plants are operating in Mindanao. Approximately 32% are in the Caraga region while about 12% and 16% are in Northern Mindanao and Davao Region, respectively. The remaining 29.1% are scattered in several regions such as MIMAROPA (4.24%), CALABARZON (6.06%), Bicol Region (4.24%), Western Visayas (2.42%), and Eastern Visayas (3.64%).

### TABLE 3.20. NUMBER OF DECORTICATING/COIR PROCESSING PLANTS BY REGION IN THE PHILIPPINES, 2018

| Region | Number of Plants | Percent Share |
|---|---|---|
| Region IV-A (CALABARZON) | 10 | 6.1 |
| Region IV-B (MIMAROPA) | 7 | 4.2 |
| Region V (Bicol Region) | 7 | 4.2 |
| Region VI (Western Visayas) | 4 | 2.4 |
| Region VII (Central Visayas) | 14 | 8.5 |
| Region VIII (Eastern Visayas) | 6 | 3.6 |
| Region IX (Zamboanga Peninsula) | 5 | 3.0 |
| Region X (Northern Mindanao) | 20 | 12.1 |
| Region XI (Davao Region) | 27 | 16.4 |
| Region XII (SOCCSKSARGEN) | 13 | 7.9 |
| Region XIII (Caraga) | 51 | 30.9 |
| BARMM | 1 | 0.6 |
| Total | 165 | 100.0 |

Source: PCA and UCAP

The country's top coir processing plants are Pilipinas Ecofiber Corporation, Rong Ming Cocofiber Industries Corporation, Tropical Prime Coir Corporation, Jiffy Coir Products of the Philippines Inc., Jin Qi Xiang Ventures Inc., Dondon Marketing, and All Bright Resources International Inc.

Costales (2019) reported that coco coir/peat processors in the country are mainly MSMEs. Their processing plants are relatively small in scale or capacity and the level of technology is relatively inferior compared to processors in India and Sri Lanka. Their basic product is coco coir with some commercializing coco peat as a by-product. Aside from baled and raw coco coir, some of the processors forward integrate into twine, geonets and biologs, which are essential materials in soil erosion control.

Coconut Sugar. In 2018, there were 33 coconut sugar processing plants in the country. The coconut sugar processing plants are operating in eight regions, namely: MIMAROPA, CALABARZON, Central Visayas,

Northern Mindanao, Davao region, SOCCSKSARGEN, Caraga, and BARMM. Most of the companies (75.7%) are concentrated in Mindanao. Eighteen percent of the 33 coconut sugar companies are operating in MIMAROPA and CALABARZON, and another 6.1% are in Central Visayas (Table 3.21).

**TABLE 3.21. NUMBER OF OPERATING COCONUT SUGAR PROCESSING PLANTS BY REGION IN THE PHILIPPINES, 2018**

| Region | Number of Plants | Percent Share |
|---|---|---|
| Region IV-A (CALABARZON) | 5 | 15.2 |
| Region IV-B (MIMAROPA) | 1 | 3.0 |
| Region VII (Central Visayas) | 2 | 6.1 |
| Region X (Northern Mindanao) | 6 | 18.2 |
| Region XI (Davao Region) | 1 | 3.0 |
| Region XII (SOCCSKSARGEN) | 13 | 39.4 |
| Region XIII (Caraga) | 4 | 12.1 |
| BARMM | 1 | 3.0 |
| Total | 33 | 100.0 |

Source: PCA and UCAP

As described by Costales (2019), "most of the MSME coco sugar processor-exporters are small and medium size based on capital assets. Generally, the level of processing technology used is still based on the traditional method of coco sugar processing. There are only a few processors like Benevelle Corporation and Treelife that are into mechanized processing. They also produce other products since sap can be processed into other forms such as coco vinegar, coco balsamic, coco jam, coco cider, coco wine and coco spirit (lambanog). Treelife and Benevelle corporations have an integrated coconut processing plant located near the coconut farms which they manage and operate. Some of the sugar processing enterprises, especially those that process intermediate products such as coco syrup, locate their processing plants at the urban centers where there are stable power and water utilities. Processors directly process the sap into coco sugar and/ or procure from village level processors coco syrup which is then processed into coco sugar. The village level processors are micro- and small entrepreneurs and farmers who forward integrate."

***Coconut Water Processing Companies.*** As of 2018, there are a total of 14 coconut water processing plants in the Philippines (Table 3.22). The 14 coconut water processing companies are spread in only six regions (i.e., CALABARZON, Central Visayas, Eastern Visayas, Northern Mindanao, Davao Region, and SOCCSKSARGEN). Table 3.22 show that the most concentrated regions in terms of the number of coconut water processing plants are CALABARZON and Davao Region.

**TABLE 3.22. NUMBER OF OPERATING COCONUT WATER PROCESSING PLANTS BY REGION IN THE PHILIPPINES, 2018**

| Region | Number of Plants | Percent Share |
|---|---|---|
| Region IV-A (CALABARZON) | 6 | 42.9 |
| Region VII (Central Visayas) | 2 | 14.3 |
| Region VIII (Eastern Visayas) | 1 | 7.1 |
| Region X (Northern Mindanao) | 1 | 7.1 |
| Region XI (Davao Region) | 3 | 21.4 |
| Region XII (SOCCSKSARGEN) | 1 | 7.1 |
| Total | 14 | 100.0 |

Source: PCA and UCAP

Seven large desiccated coconut processing companies produce coconut water and coconut water concentrate as well as other coconut products for the export market. These are Celebes Coconut Corp., Axelum Resources Corp., Primex Coco Products Inc., Ahya Coco Organic Food Manufacturing Corp., SC Global Food Products Inc., Franklin Baker Company of the Phils., and Tropicana Food Products, Inc. Eight manufacturers process coconut water only either for the domestic or export market. These companies include Ekayen Buko Juice, Damian's Milky Way, Pepsi Cola Products Inc., Wetaniyah Export Trading Inc., Foli Food Beverage Corp., Tolman Manufacturing Inc., and Superstar Coconut Products Inc.

# Coconut Trading Sector

The coconut trading system in the Philippines is multi-layered. Coconut raw materials from farmers generally pass through several marketing channels before reaching the processing plants. For example, copra passes through at least two to three market intermediaries (i.e., barangay/village trader – municipal/secondary trader – lead/big trader-trucker) before reaching the oil mill (Idrovo et al., 2006). The lead copra trader provides their network of intermediaries with cash advance payment. Likewise, Costales (2019) reported that desiccated coconut processing companies give financial advances to preferred consolidators so the latter can provide interest-free and collateral credit to their trader-agents and farmer- suppliers to ensure cornering future deliveries.

Coconut processors most often link with a network of traders and trader-assemblers to procure their raw materials (e.g., copra, dehusked nuts, whole mature nuts, fresh young nuts, coco shells, coco husks, and coco shell charcoal). The local traders have direct contact with the farmers and usually have established long relationships with them (Costales, 2019). The trader-assemblers consolidate the supply of raw materials (e.g., copra for oil millers; whole dehusked nuts for desiccators and virgin coconut oil processors, coco shells for coco shell charcoal processors, coco husks for decorticating plants, and fresh young nuts for coconut water processors) from local traders. One assembler with a network of local traders can secure the produce of 150 to 200 farmers (Costales, 2019). Meanwhile, large assemblers can consolidate the output from more than 2,000 farmers through small assemblers and a network of traders. The common procurement practice of the traders and trader-assemblers/consolidators is to pick up the raw coconut materials from different coconut farms or designated pick-up points using their own or rented vehicles.

As shown in Table 3.23, there are 2,285 PCA-registered domestic traders engaged in buying and selling copra only and 94 domestic traders who handle both copra and different kinds of processed coconut products. The total number of other traders engaged in local trading of coconut raw materials is as follows: 706, whole nuts/mature nuts; 178, fresh young nuts; 55, coconut shells; 325, coco shell charcoal; and 4, coco husks and coir. In addition, there are 15 traders who sell fresh young nuts in domestic and export markets, while there are 18 exporters of fresh young nuts. There are only seven traders of coconut seedlings.

### TABLE 3.23. NUMBER OF PCA-REGISTERED COCONUT DOMESTIC TRADERS, PROCESSORS, AND EXPORTERS IN THE PHILIPPINES, 2019

| Types of Traders | Number |
|---|---|
| Domestic copra traders | 2,285 |
| Domestic traders of copra and multi-coconut products | 94 |
| Domestic traders of coconut shells | 55 |
| Domestic traders of whole nuts/mature nuts | 706 |
| Domestic traders of coconut fiber, husk, coir, and peat | 4 |
| Domestic traders of fresh young nuts | 178 |
| Domestic traders & exporters of fresh young nuts | 15 |

1A processor producing and trading different coconut products is counted only once.
Source: PCA

There are 365 processors of food and non-food coconut products who sell their products locally and/or export their products directly to international markets. There are also some small processors who indirectly export their coconut products through brokers such as the E.U. Sons Trading Corporation, Eisellgen House of Trade, Lee Commodities International Corp., Manuel Igual Inc., and Raco Commodities Philippines Inc., (Costales, 2019). These are large and traditional brokers who organized themselves as the Association of Coconut Brokers Inc. (ACBI).

# Product Forms

Traditional coconut products refer to food and non-food products (derived from the meat, shell, water, husk, and other parts of the coconut) that the country started to export as early as 1979 (Boceta, 1999). These traditional products are copra, coconut oil, desiccated coconut, copra meal, coco shell charcoal, activated carbon, and oleochemicals. Thus, any coconut product and by-product other than the traditional coconut products are considered nontraditional.

The Coconut Farmers and Industry Roadmap covers all the traditional coconut products because these coconut products still dominate the export market and contribute 84% to the country's total revenue from coconut products exported. Moreover, selected promising nontraditional coconut products such as virgin coconut oil, coco water, coco coir, and coco sap products are covered in the roadmap because they are gaining market shares in both the domestic and international market due to their health and environmental benefits.

Sustainable growth and global competitiveness of the various coconut industry value chains are dependent on the productivity of coconut farms which provide the coconut-based industries' feedstocks and raw materials. Thus, improving the productivity, efficiency, profitability, and sustainability of coconut farms should be at the core of the industry roadmap.

This chapter presents the trends in production, area, and nut productivity from 2009–2019, including the production outlook and strategic interventions to sustain growth of the production sector. Significant discrepancies were observed in the coconut statistics between the PSA and PCA in the regional roadmap drafts submitted. The COCOFIRM Program used the PSA data and strongly recommends PCA to harmonize their coconut statistics data with that of PSA. PSA is the agency mandated to serve as the central statistical authority of the Philippine government for statistics in agriculture and other sectors of the economy.

# Trend in Coconut Production

The Philippine coconut landscape has changed from 2009 to 2019. Ranking of traditional major production regions continuously shifted in terms of hectarage, volume of nut production, and nut productivity per tree. Over the span of 11 years and despite the continuous planting, replanting, and fertilization programs undertaken by PCA, nut production in the country declined from 15.6 B in 2009 to 14.7 B (2.8 B tons copra equivalent) in 2019 (Figure 3.17).

**FIGURE 3.17. ANNUAL NUT PRODUCTION AND GROWTH RATE (%) IN THE PHILIPPINES, 2009–2019**


Source: PSA

The highest coconut production achieved by the country was 15.8 B nuts (3.0 B tons copra equivalent) in 2012. However, the 2012 production was followed by a continuous decline until 2017 to a low of 13.8 B nuts. Thereafter, there was an upward trend until 2019. Recovery was slow, and even with a growth of 2% in 2017 and 5% in 2018, the country's nut production of 14.7 B in both 2018 and 2019 was only equivalent to the volume of production in 2015 and was even 7% lower than in 2009 (Figure 3.17).

**FIGURE 3.18. PERCENT CONTRIBUTION OF MAJOR ISLANDS TO TOTAL NUT PRODUCTION, 2019**


Source: PSA, 2019

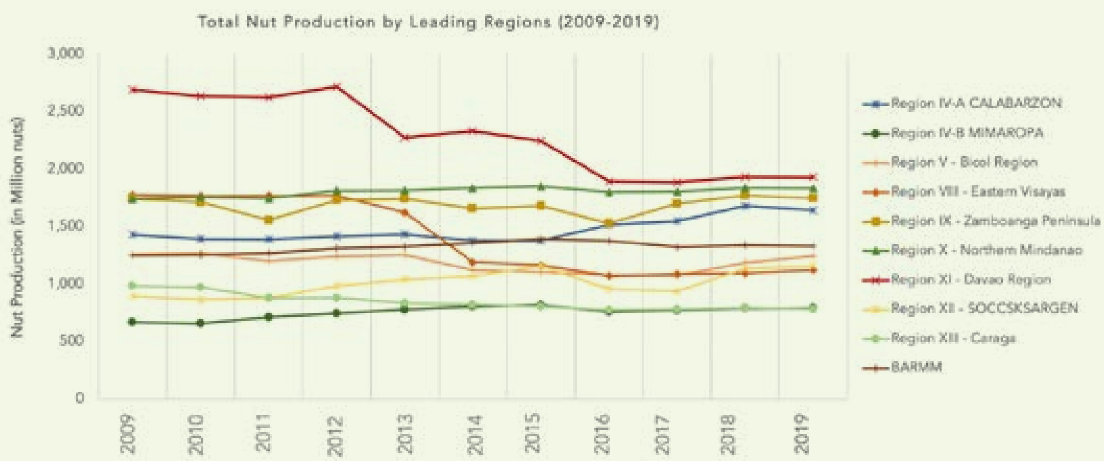
Decline in nut production was evident during the years 2010, 2011, 2013–2016, and 2017. The average yearly growth rate of nut production from 2009–2019 was only 1.37 % (Figure 3.17). Possible factors causing the decline and the areas most affected will be discussed in another section using regional and provincial data trends.

Percent contribution of each major island to total nut production showed that Mindanao comprised almost 60% of the country's total nut production both in 2009 and 2019. Meanwhile, Luzon garnered 26.5% in 2009 but was reduced to 23.4% in 2019. Visayas contributed only 13.95% in 2009 and 17.17% in 2019 (Figure 3.18).

Four regions in Mindanao are considered the top coconut producers, with Davao Region as the highest nut producer both in 2009 and 2019 (Figure 3.19). This ranking was attained despite the huge reduction in the volume of nuts produced by Davao Region due to loss of bearing trees and decline of tree productivity. The contribution of Davao Region to the national production declined from 17.2% in 2009 to only 13.1% in 2019.

Meanwhile, Zamboanga Peninsula maintained its steady production and remained 3rd in rank, while Northern Mindanao jumped from 4th in 2009 to 2nd in 2019, and BARRM from 7th to 5th from 2009 to 2019, respectively. CALABARZON improved its ranking from 5th to 4th while Eastern Visayas dropped from 2nd in 2009 to 8th in 2019. From 2009–2019, Eastern Visayas suffered a net loss of 36.76% in production, equivalent to 124.7 M nuts, more than a 3rd of its 2009 production of 1.78 B nuts.

**FIGURE 3.19. TOTAL NUT PRODUCTION IN THE PHILIPPINES, 2009–2019**



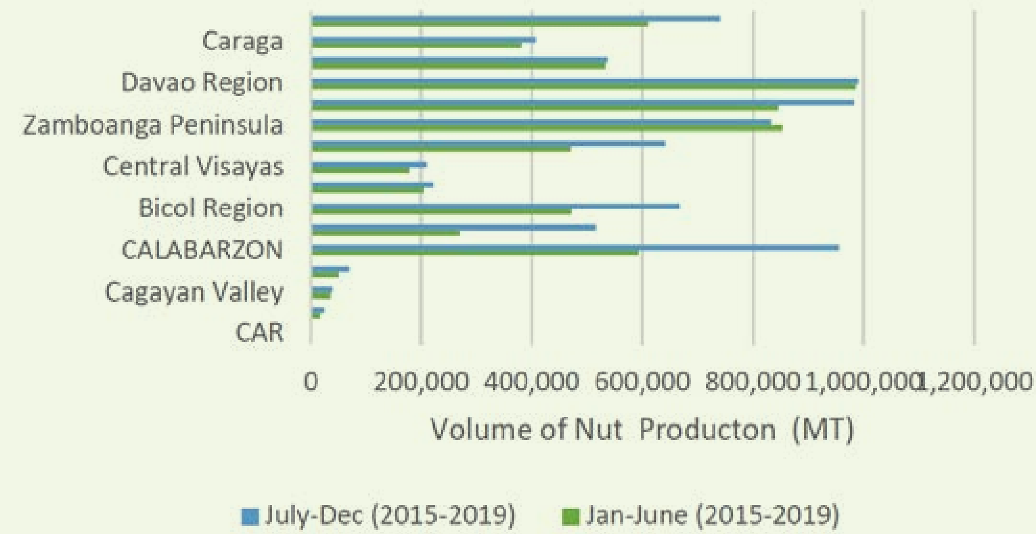

Source: PSA

All the top eight regions produced over a B nuts in 2019. The top four regions —three of which are in Mindanao (Davao Region, Northern Mindanao, and Zamboanga Peninsula) and CALABARZON in Luzon— produced over 1.5B nuts each (Figure 3.19). Meanwhile, BARRM, Bicol Region, SOCCSKSARGEN, and Eastern Visayas were in the 2nd tier of top producers, with more than 1 B but less than 1.5 B nut production in 2019 (Figure 3.19).

# Seasonality of Volume of Coconut Production in the Philippines

A trend of semestral variation in coconut production can be observed from 2015 to 2019. Nut production was consistently higher by about 22% during the second half of the year compared with the first half. More than 1.4B nut difference can be noted during the aforementioned period (Figure 3.20) (PSA 2015–2019).

**FIGURE 3.20. COMPARISON OF THE TOTAL NUT PRODUCTION DURING JAN-JUNE AND JULY-DEC AVERAGES OF 2015-2019**

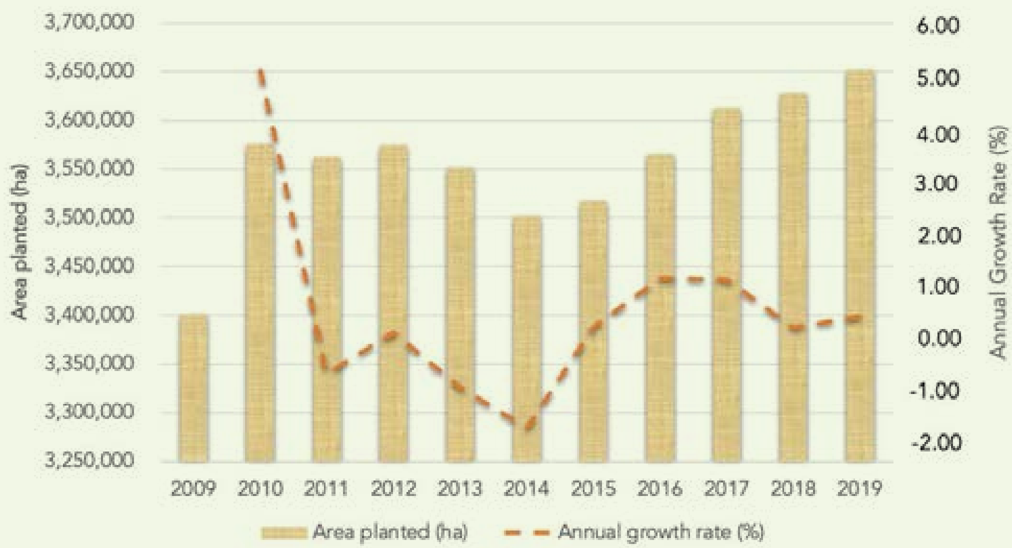



Source: PSA

Figure 3.20 presents the difference between January-June and July- December nut production per region from 2015 to 2019. Among the top producers, Davao Region, Zamboanga Peninsula, and SOCCSKSARGEN had less than 10% differences of -0.3%, 2.4%, 0.7%, respectively. Meanwhile, CALABARZON, Bicol Region, Eastern Visayas, Northern Mindanao, and BARRM significantly had larger difference of -61.3%, -41.6%, -36.5%, -16.2%, and -21.2%, respectively. Notably, MIMAROPA gained the highest difference, as the second half of the year yielded 90.3% more than the first half. Among the regions in Visayas, nut yield was more variable in Central Visayas (-17.3%) and Eastern Visayas (36.5%) compared with Western Visayas ( - 8.3% difference).

Summer rains have been reported to have positive correlations with yield of the succeeding year. About 60% of the variation in annual yield was reportedly due to the changes in the duration of dry spell in the preceding two years (Matthew J et al., 1988).

FIGURE 3.21. TOTAL AREA PLANTED TO COCONUTS AND ANNUAL GROWTH RATE FROM 2009-2019




Source: PSA

# Trend In Coconut Area and Number of Bearing Trees (2009–2019)

In 2019, 13.3 M ha of land were devoted to agricultural production. Over the past 11 years (2009–2019), there was limited agricultural land expansion in the country with a net increase of only 2.05% (PSA, 2020) and a notable decline of 0.2 M ha in the past three years. Coconut occupied 27.4% (3.65 M ha) of the total agricultural areas in the country. Coconut farms with wide spaces in between trees and unique frond architecture offer vast potential for intercropping high-value crops and raising livestock without opening new areas for expansion. About 80% of the coconut lands are monocropped (Rosales, 2020) and utilizing the available land under coconuts for intercropping will greatly contribute to increased agricultural production. If even just half of the 3 M ha of coconut lands could be utilized for intercropping, at 70% effective intercropping area per hectare of coconut land, then about 1 M ha will be added to agricultural production.

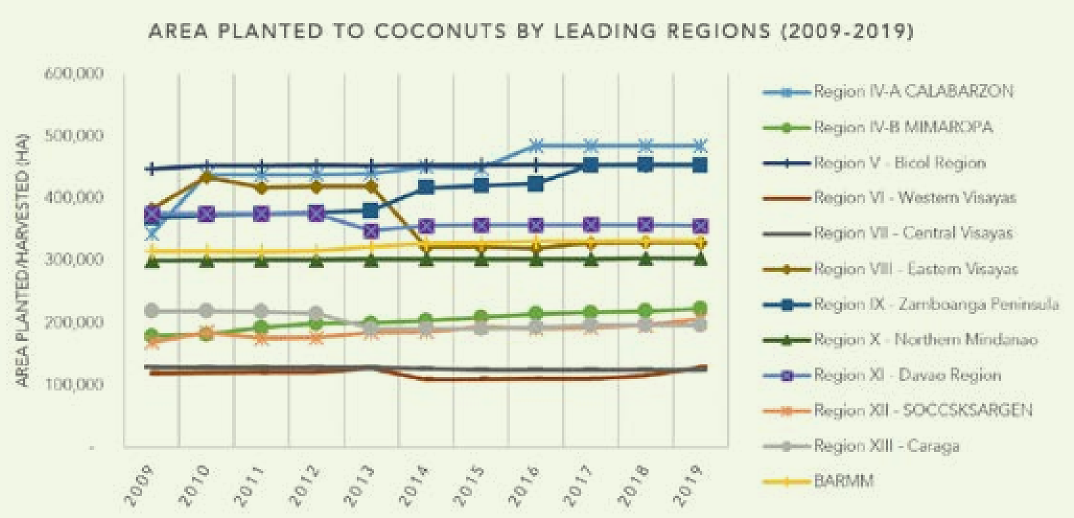
Areas planted to coconuts in 2009–2019 increased by 7.36%, (equivalent to 250,000 ha) from 3.40 M ha in 2009 to 3.65 M ha in 2019 (Figure 3.21). However, this increase in area with a corresponding increment in the number of bearing trees (Figure 3.22) failed to increase nut production (Figures 3 and 4), resulting in a decline in 1 B nuts during the same period.

Based on hectarage, the coconut-producing regions can be divided into three categories: (1) regions with more than 300,000 ha planted to coconut; (2) regions with more than 100,000 ha but less than 250,000 ha; and (3) and regions with less than 50,000 ha.

Starting with the highest hectarage in 2019, regions belonging to the first category (>300,000 ha) include CALABARZON, Zamboanga Peninsula, Bicol Region, Davao Region, ARMM, Eastern Visayas, and Northern Mindanao. Meanwhile, MIMAROPA, SOCCSKSARGEN, Caraga Region, Western Visayas, and Central Visayas fall under the second category (>100,000 ha). Minor production areas such as Central Luzon, Cagayan Valley, Ilocos Region, and CAR can be listed under the third category (<50,000ha).

Analyzing the trend in coconut hectarage, there has been a considerable increase of 5% from 2009- 2010. This sharp increment can be attributed to the increase in hectarage at CALABARZON (95,000 ha), Eastern Visayas (40,000 ha), and SOCCSKSARGEN (16,000 ha) (Figure 3.22). This additional hectarage amounts to about 86% or 175,000 ha increase in the given one-year period.

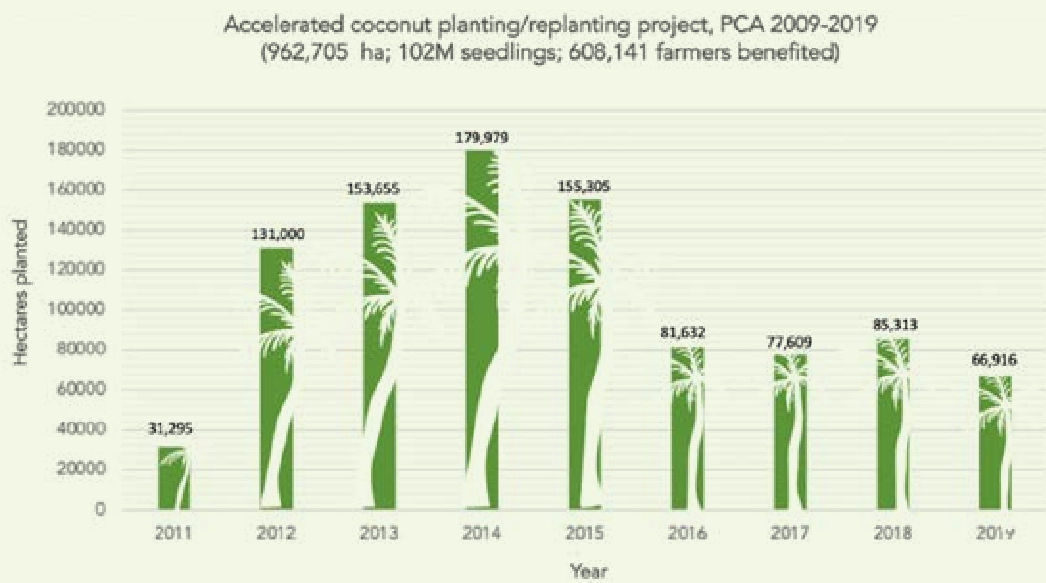
**FIGURE 3.22 AREA PLANTED TO COCONUTS BY REGION FROM 2009–2019**




Source: PSA

From 2015 onwards, CALABARZON replaced the Bicol Region as the region with the largest coconut hectarage. Bicol Region ranked 1st in 2009 but slid to 3rd place in 2019 with a net increase of only 6,230 ha over the last 10 years. In addition, four regions had a net loss in coconut area. These regions include two major producers, Eastern Visayas and Davao Region. Davao Region slid from 2nd to 3rd place while Eastern Visayas dropped from 2nd to 6th place in 2009 and 2019, respectively.

**FIGURE 3.23. ACCELERATED COCONUT PLANTING/REPLANTING PROJECT, PHILIPPINES, 2009–2019**




Source: PSA

The loss of coconut areas in the four regions was compensated by the huge expansion of coconut areas in other regions. Based on PSA data, coconut hectarage increased from 3.40 M ha in 2009 to 3.65 M in 2019 (Figure 3.22). On the other hand, PCA's planting/replanting program from 2010/2011 to 2019 reported a total accomplishment of more than 962, 705 ha planted with almost 102 M trees, benefiting 608,141 farmers (Figure 3.23). There is no data on the percent survival of these replanted trees. Assuming 75% survival, and including the 2,366 ha of coconut farms applied for conversion from 2009-2019 (Figure 3.24), the planting/replanting program should have added /replaced about 720,000 ha of coconut area. This figure is much greater than the 250,000 ha net increase reported by PSA (2020). Thus, harmonization of PCA and PSA coconut statistics can be

## FIGURE 3.24. REGIONAL DISTRIBUTION OF COCONUT LANDS APPLIED FOR CONVERSION, 2009–2019


Source: PSA

## FIGURE 3.25. NUMBER OF BEARING COCONUT TREES AND ANNUAL GROWTH RATE, 2009–2019

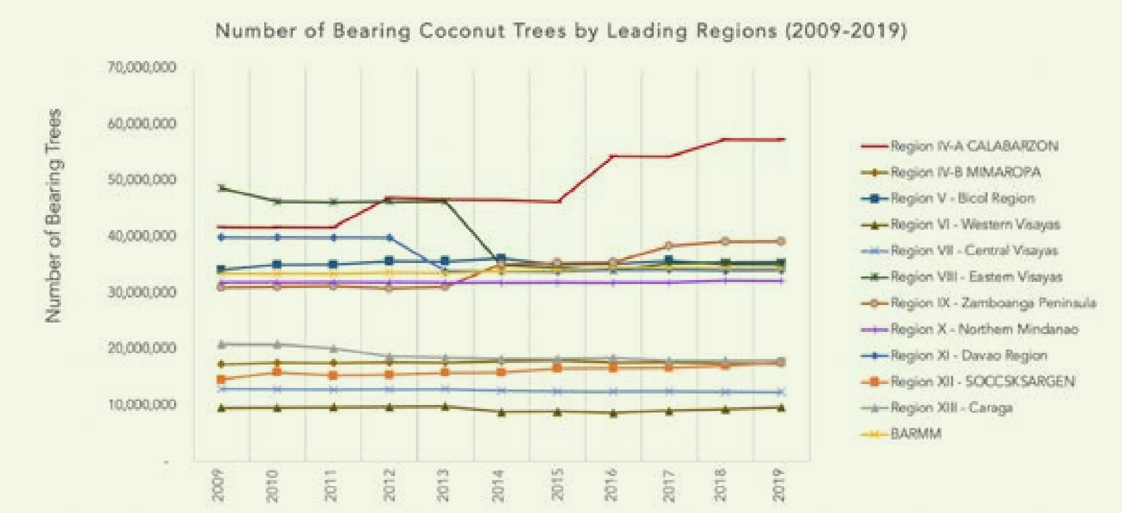

Source: PSA

considered an urgent concern, considering its importance for program planning, and policy and decision making.

The regional distribution of coconut lands that applied for conversion from 2009-2019 is presented in Table 8. Bicol Region and Caraga Region had more than 300 ha converted while CALABARZON, MIMAROPA, Eastern Visayas, Davao Region, and SOCCSKSARGEN had more than 200 ha. Meanwhile, Western Visayas and Central Visayas had also converted between 100-120 ha of coconut lands and the rest (except for BARRM with no reported conversion) had converted less than 10 ha.

Consistent with the net increase in coconut hectarage, the number of bearing trees also increased by 7.07 M palms from 2009-2019, or a total of about 348 M trees (Figure 3.25). Ironically, this increase in the number of bearing trees was not able to offset the loss in production. From a peak of 344 M bearing trees in 2012—which was also the year the country attained its highest nut production—the number of bearing trees declined until 2015. This decline incurred losses amounting to 14.5 M trees. Recovery started from 2016 to 2018, thus increasing the number of bearing trees to 347 M. By 2019, the number of bearing trees further increased to 348 M, the highest in the past 11 years. The recovery in the number of bearing trees in the past four years suggests that there are 18 M new productive trees, comprising 5% of the total number of bearing trees.

**FIGURE 3.26. NUMBER OF BEARING COCONUT TREES BY REGION, 2009-2019**

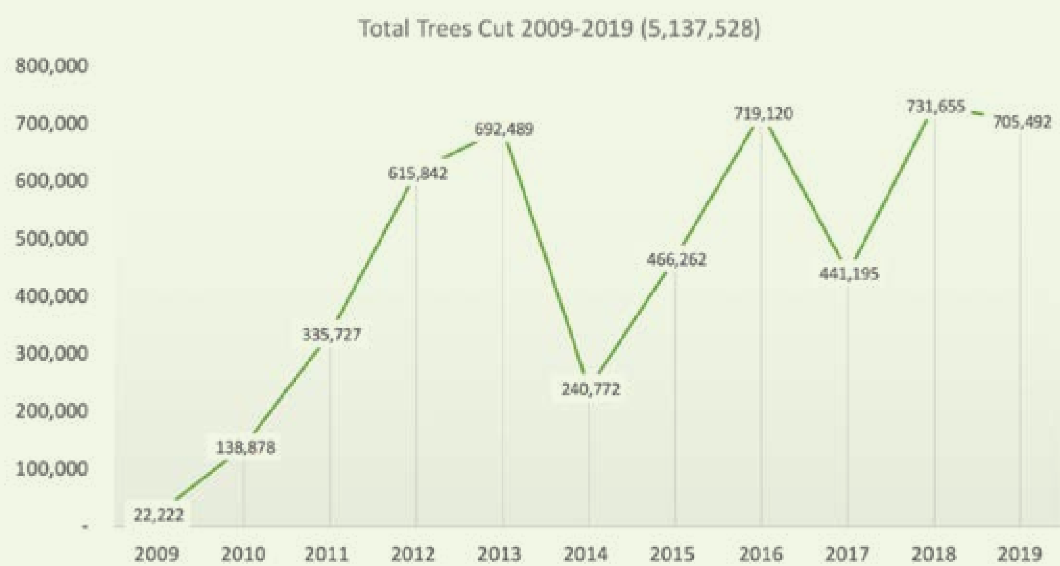



Source: PSA

Classifying the number of bearing coconut trees by region, CALABARZON, Zamboanga Peninsula, Eastern Visayas, Davao Region, Bicol Region, BARRM, and Northern Mindanao are part of the first cluster. These regions produce more than 30M bearing trees each. The second cluster, with at least 10 M bearing trees, comprises Caraga, MIMAROPA, SOCCSKSARGEN, Central Visayas, and Western Visayas (Figure 3.26). Lastly, the third cluster which has 3 M or less bearing trees are Central Luzon, Cagayan Valley, Ilocos Region, and CAR (data not presented).

Consistent with the significant increase in the area planted in CALABARZON, the number of bearing trees in the region reached 53.7 M, comprising 16.5% of the total number of bearing trees. A total of 15.6 M bearing trees had been added to CALABARZON from 2011 to 2019. Zamboanga Peninsula also had consistently increased its number of bearing trees starting 2012, gaining more than 8.3 M trees by 2019. Meanwhile, BARRM had a slow but consistent increase in the number of bearing trees, at 1 M trees from 2009-2019. However, the increase in the number of bearing trees was partly offset by the sharp decline of high-yielding trees in Davao Region (6 M bearing trees) and Eastern Visayas (11.3 M bearing trees) in 2014.

**FIGURE 3.27. NUMBER OF TREES CUT, 2009-2019 BASED ON RA 8048**




Source: PCA

From 2010/2011-2014, the 37 M surviving trees (assuming 75% survival rate) planted by PCA in 496,000 ha were projected to start producing by 2019. However, taking into account the 5.1 M trees cut under RA 8048 for the same period (Figure 3.27), and the net loss of 22.3 M bearing trees lost by Eastern Visayas (13.1 M), Davao Region (5.8 M), Caraga Region (2.9 M), and Central Visayas (0.543 M), only about 9.9 M bearing trees would have been added. Based on PSA data, there was still a net increase of 7.7 M of bearing trees from 2009-2019 despite the incurred net losses of the four major producing regions including Eastern Visayas and Mindanao.

Continuing the PCA initiative, an additional 466,775 ha were planted/replanted with coconut trees by the PCA program from 2015-2019. Of the total number of trees planted/replanted, 33 % of surviving trees would be productive in 2020 while 50.5% of surviving trees would be productive in 2021. Projections of productivity of surviving trees in succeeding years are as follows: 67.1 % in 2022, 85.3% in 2023, and 100% will be productive by 2024. Assuming 75% survival for replanted/planted trees, there should be an additional 720,000 ha or 7.2 B young bearing trees by 2024.

With good management and barring disasters that will severely reduce yield per tree, or worse, reduce the number of bearing trees, nut production should pick up in the next few years and increase significantly and sustainably. Monitoring of survival and field growth of replanted/newly planted trees should be part of the program implementation and evaluation. Further, the criteria for priority and targets of the planting/replanting program should be reviewed.

# Trend in Coconut Yield (nut/tree/year) 2009-2019

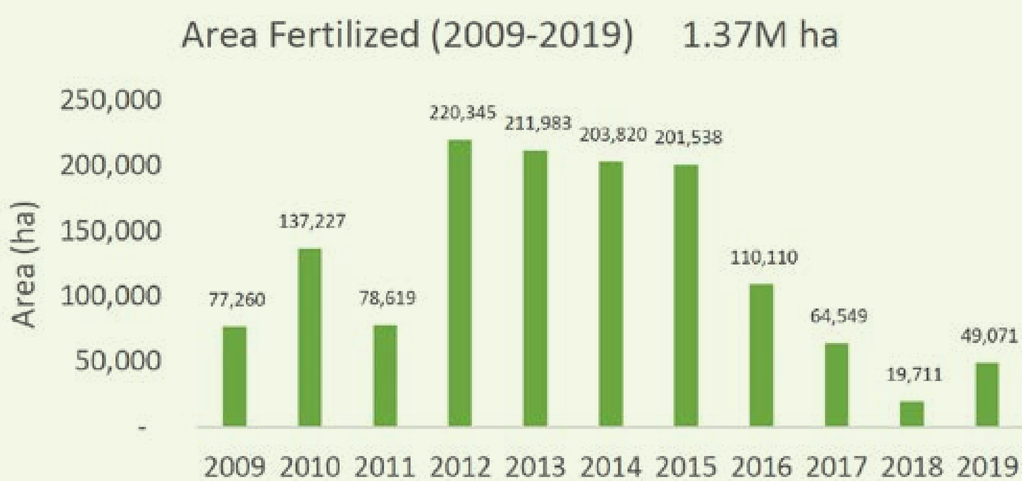
Nut productivity per year fluctuated from 2009-2019, with a general downward trend, from a national average of 46 nuts/tree/year in 2009 down to 44 nuts/tree/year in 2019

Figure 3.29. Maps of crop suitability (PCA, 2019) and average provincial yield superimposed with volume of nut production, and regional yield per tree per year by region (2009 and 2019)

## FIGURE 3.28 NUT PRODUCTIVITY PER TREE PER YEAR, PHILIPPINES, 2009-2019.


Source: PSA

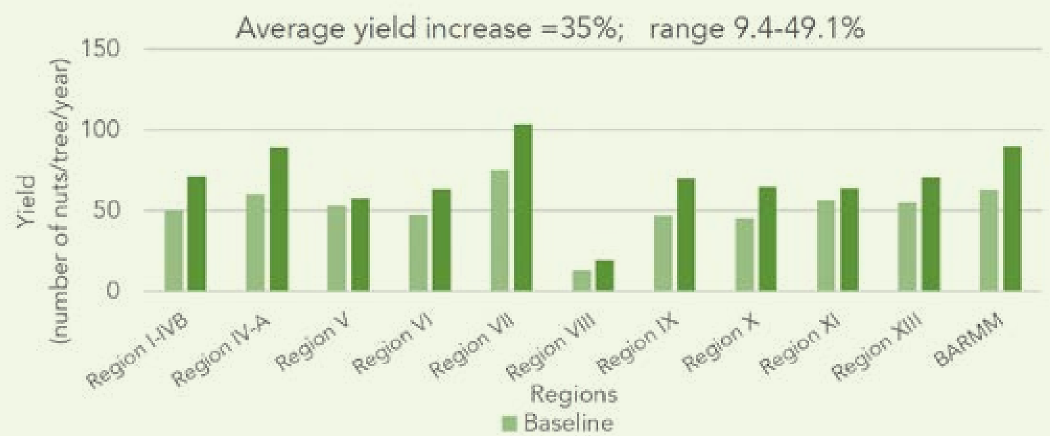
## FIGURE 3.30. AREA FERTILIZED THROUGH THE FERTILIZATION PROGRAM OF PCA, 2009–2019




Source: PSA

Coconut productivity varied across regions. Figure 3.29 presents the PCA suitability map, 2019 total nut production superimposed with computed nut yield per tee per province, and regional computed nut yield/tree/year.

FIGURE 3.31. EFFECT OF THE FERTILIZATION PROJECT ON NUT YIELD/TREE A YEAR AFTER FERTILIZER APPLICATION, PHILIPPINES




Source: PSA, 2019

SOCCSKSARGEN, Davao Region and Northern Mindanao had the highest yield per tree in 2019, although Davao Region's yield had declined from 68 nuts/tree in 2009 to 57 nuts/tree in 2019. The rest of Mindanao regions, except BARRM, had average or above average yields. In Visayas, only Western Visayas had higher than average yield of 53 nuts/tree.

Areas of high suitability do not always produce the highest yields. This observation is evident from the low tree productivity particularly in the major coconut production grids – CALABARZON, (Quezon in particular), Bicol Region, and Eastern Visayas. Yield per tree in these production grids since 2009 to 2019 was below average and is continuously declining. It is particularly concerning th at CALABARZON, which aggressively increased its production area by almost 95,000 ha in the past 11 years, was the 2nd lowest yielder in 2009 and the lowest in 2019. Likewise, CAR, Central Visayas, and BARRM are in the same category of below- average yield both in 2009 and 2019.

Yield gap analysis of these regions, on a provincial and even municipal level, will identify strategic interventions that will delineate areas, where fertilization will have a high response and replanting of damaged, old unproductive trees, and expansion planting of selected open-pollinated varieties (OPVs) and hybrids, will be prioritized. BARRM, which belongs to the tier of top producers and has increasing coconut hectarage (thus, relatively young coconut population), has to be given particular attention on promoting the adoption of Good Agricultural Practices (GAP) to increase their tree productivity.

The fertilization program of PCA reported an accomplishment of 1.37 M ha fertilized from 2009– 2019 (Figure 3.30). The area covered by the program is equivalent to 37.6% of the country's coconut hectarage in 2019. PCA (June 2020) reported an average of 35% increase in the yield of fertilized trees, ranging from 9% in Bicol Region to a high of 49% in BARRM (Figure 37).

The impact of such yield increase on national production could have been significant. However, PSA production statistics during the past 11 years do not reflect this trend, but rather a net loss in production and a declining nut productivity per tree. A review and recalibration of the fertilization program is strongly recommended to identify strategic areas where fertilization can have a high and sustainable impact. Fertilization strategy should be two-pronged: (1) using inorganic fertilizer for conventional production system and (2) using organic fertilizers and other inputs to cater to the growing green and organic markets for coconut and intercrops.

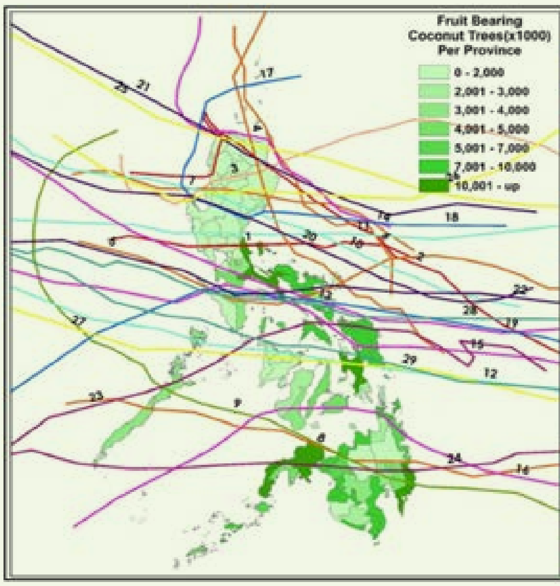
## Effects of Multiple Stresses in Coconut Production Trends (2009–2019)

Climate-related events, such as strong typhoons (Figure 38), not only cause more than a billion pesos worth of damages but also affected tree growth and productivity.

Yield reduction due to loss of coconut areas and/or reduced nut productivity per tree can be attributed to the numerous strong and super typhoons that occurred multiple times a year since 2011, the severe El Niño that lasted for 18 months in 2015–2016, and the cocolisap outbreak in CALABARZON and Basilan in 2014. Losses in coconut areas and bearing trees could also be due to rampant illegal logging of coconuts and land conversion. Climate-related risks and hazards are important considerations that should be included in the criteria for identifying suitable areas and priorities for replanting and expansion planting.

Maintaining trees of varying growth stages could buffer the impact of typhoon and drought, thus continuing and expanding the planting and replanting (with good management practices) are important for sustainable growth of the production sector. Regional and provincial targeting will be critical in the short term. Correspondingly, strategically located regional and provincial seed gardens for both hybrids and selected OPVs with sufficient capacity should limit long hauls in transporting planting materials across regions.

**FIGURE 3.32. TYPHOON TRACK CHART, OCCURRENCE, AND DAMAGES OF MORE THAN PHP 1 B, PHILIPPINES, 2009–2019.**




| Name Typhoon (Name/no) | | Date | Damage | Name Typhoon (Name/no) | | Date | Damage |
|---|---|---|---|---|---|---|---|
| 1 | Ondoy (Ketsana) | Sep, 2009 | ₱11.2 B | 16 | Ruby (Hagupit) | Dec, 2014 | ₱3.35 B |
| 2 | Pepeng (Parma) | Oct, 2009 | ₱39.6 B | 17 | Seniang (Jangmi) | Dec, 2014 | ₱1.45 B |
| 3 | Juan (Megi) | Oct, 2010 | ₱8.22 B | 18 | Lando (Koppu) | Oct, 2015 | ₱14.4 B |
| 4 | Bebeng (Aere) | May, 2011 | ₱2.25 B | 19 | Nona (Melor) | Dec, 2015 | ₱7.04 B |
| 5 | Juaning (Nock-ten) | Jul, 2011 | ₱4.44 B | 20 | Karen (Sarika) | Oct, 2016 | ₱3.86 B |
| 6 | Mina (Nanmadol) | Aug, 2011 | ₱40.9 B | 21 | Lawin (Haima) | Oct, 2016 | ₱3.74 B |
| 7 | Pedring (Nesat) | Sep, 2011 | ₱15.6 B | 22 | Nina (Nock-ten) | Dec, 2016 | ₱6.12 B |
| 8 | Sendong (Washi) | Dec, 2011 | ₱2.07 B | 23 | Urduja (Kai-tak) | Dec, 2017 | ₱3.75 B |
| 9 | Pablo (Bopha) | Dec, 2012 | ₱42.2 B | 24 | Vinta (Tembin) | Dec, 2017 | ₱2.1 B |
| 10 | Labuyo (Utor) | Aug, 2013 | ₱1.42 B | 25 | Ompong (Mangkhut) | Sep, 2018 | ₱33.9 B |
| 11 | Santi (Nari) | Oct, 2013 | ₱3.3 B | 26 | Rosita (Yutu) | Oct, 2018 | ₱2.9 B |
| 12 | Yolanda (Haiyan) | Nov, 2013 | ₱89.6 B | 27 | Usman | Dec, 2018 | ₱5.41 B |
| 13 | Glenda (Rammasun) | Jul, 2014 | ₱34.6 B | 28 | Tisoy (Kammuri) | Dec, 2019 | ₱5.9 B |
| 14 | Jose (Halong) | Aug, 2014 | ₱1.62 B | 29 | Ursula (Phanfone) | Dec, 2019 | |
| 15 | Mario (Fung-wong) | Sep, 2014 | ₱3.4 B | | | | |

Source: PAG-ASA

# Consumption of Coconut Products

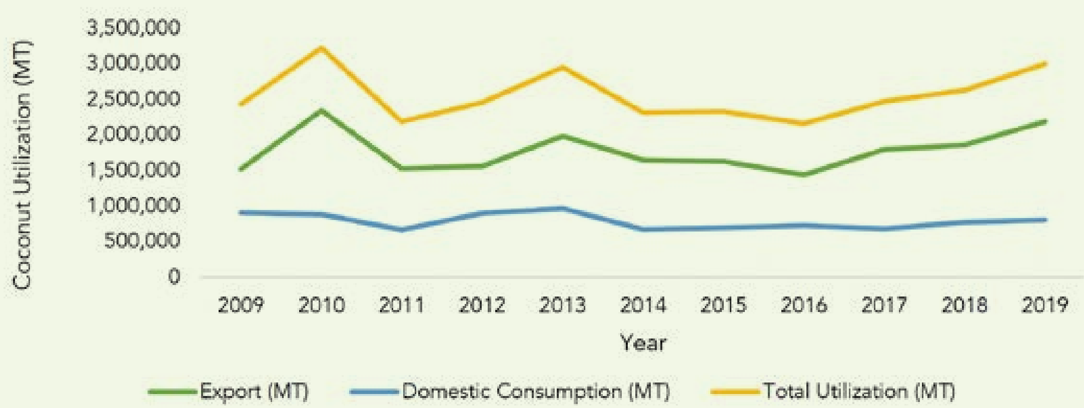
During the period 2009–2019, the country's domestic consumption of coconut products, on average, accounted for a lower share (31%) of the total coconut utilization compared to coconut exports' share of 69% (Table 3.24). While the country's volume of coconut exports grew at a much faster rate (6.5%/year, on average), domestic coconut consumption appeared to exhibit a relatively flat trend. The average annual growth rate was only 0.4%/year during the 11-year period under review (Table 3.24 and Figure 3.33).

### TABLE 3.24. TOTAL EXPORTS, DOMESTIC CONSUMPTION, AND UTILIZATION OF COCONUT PRODUCTS IN COPRA TERMS, PHILIPPINES, 2009–2019

| Year | Export (MT) | Domestic Consumption (MT) | Total Utilization (MT) |
|---|---|---|---|
| 2009 | 1,514,941 | 913,000 | 2,427,941 |
| 2019 | 2,189,583 | 806,000 | 2,995,583 |
| Annual Average (2009–2019) | 1,770,310 | 786,398 | 2,556,708 |
| % Share, 2009 | 62.0 | 38.0 | 100.0 |
| % Share, 2019 | 73.0 | 27.0 | 100.0 |
| % Share, 2009–2019 | 69.0 | 31.0 | 100.0 |
| Annual Growth Rate (%) | 6.5 | 0.4 | 3.9 |

1Includes coconut oil (CNO) for oleochemicals domestic consumption in copra terms
Source of basic data: PCA, PSA and UCAP

### FIGURE 3.33. DOMESTIC CONSUMPTION, EXPORT VOLUME AND TOTAL UTILIZATION OF COCONUT, PHILIPPINES, 2009–2019




Source: PCA, PSA and UCAP

The domestic coconut consumption data published by UCAP classified local coconut consumption into manufactured oil, homemade oil, and food nuts (i.e., mature husked nuts and young nuts). On average, local consumption of manufactured coconut oil (597,000 MT per year) during the period 2009-2019 accounted for the largest share (approximately 76%) of the total domestic consumption of coconut, followed by food nuts (113,671 MT or 14.5%) (Table 3.25 and Figure 3.34). Manufactured oil includes coconut oil used for cooking, margarine, shortening, laundry soap, and filled milk formulation.

The biggest consumers of mature husked nuts are desiccated coconut manufacturers, followed by coconut milk/cream producers, virgin coconut oil producers, and households (Agustin, 2012). Young coconuts are mainly utilized for salads and for their water as a non-carbonated, healthy beverage, or sports drink. Home-made oil is mainly intended for home consumption and its share was the lowest at approximately 10% in the same period.

### TABLE 3.25. DOMESTIC CONSUMPTION OF COCONUT BY TYPE OF PRODUCT, PHILIPPINES, 2009–2019

| | Domestic Consumption (MT) | | | |
|---|---|---|---|---|
| Year | Manufactured Oil | Home-made oil | Food Nuts | Total |
| 2009 | 786,000 | 46,000 | 74,092 | 906,092 |
| 2019 | 497,000 | 126,500 | 182,500 | 806,000 |
| Annual Average | 597,000 | 75,277 | 113,671 | 786,398 |
| % Share, 2009 | 86.7 | 5.1 | 8.2 | 100.0 |
| % Share, 2019 | 61.7 | 15.7 | 22.6 | 100.0 |
| % Share, 2009-2019 | 75.9 | 9.6 | 14.5 | 100.0 |
| Annual Growth Rate (%) | -1.9 | 11.2 | 11.6 | 0.4 |

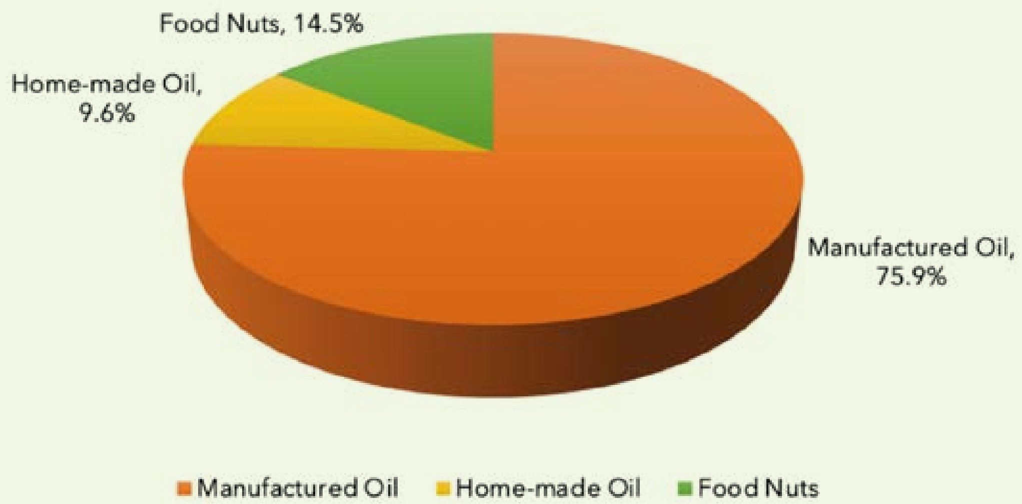
1Includes CNO for oleochemicals domestic consumption in copra terms.

Source of basic data: PCA, PSA and UCAP

Domestic consumption of manufactured coconut oil in copra terms exhibited a decreasing trend (-2.6%/year) from 786,000 MT in 2009 to 497,000 MT in 2019 (Table 3.25 and Figure 3.35). This decrease could be attributed to the increasing trend in manufactured oil exports (5%/year) in the same period. Conversely, the domestic consumption of homemade oil and food nuts was on the upswing at a rate of 12.5% and 14.0% per year in the same period. Local consumption of food nuts markedly increased from 74,092 MT in 2009 to 182,500 MT in 2019. Similarly, consumption of homemade oil expanded significantly from 46,000 MT in 2009 to 126,500 MT in 2019.

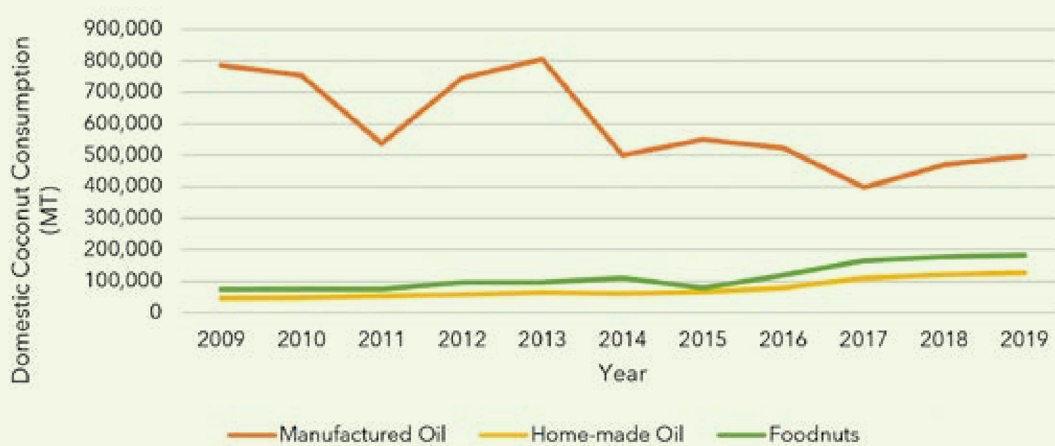
On average, 69% of coconut oil produced in the country during the period 2009-2019 was marketed in the world market (Table 3.26). Only a small proportion (31%) was retained in the country for domestic consumption. The proportion of total coconut oil production for the export market increased markedly from 61% in 2009 to 74% in

**FIGURE 3.34. AVERAGE ANNUAL PERCENT SHARES OF MANUFACTURED OIL, HOMEMADE OIL, AND FOOD NUTS IN THE TOTAL DOMESTIC CONSUMPTION OF COCONUT, PHILIPPINES, 2009–2019**




Source of basic data: PCA, PSA and UCAP

**FIGURE 3.35. DOMESTIC CONSUMPTION OF MANUFACTURED COCONUT OIL, HOME-MADE OIL, AND FOOD NUTS, PHILIPPINES, 2009–2019**




Source of basic data: PCA, PSA and UCAP

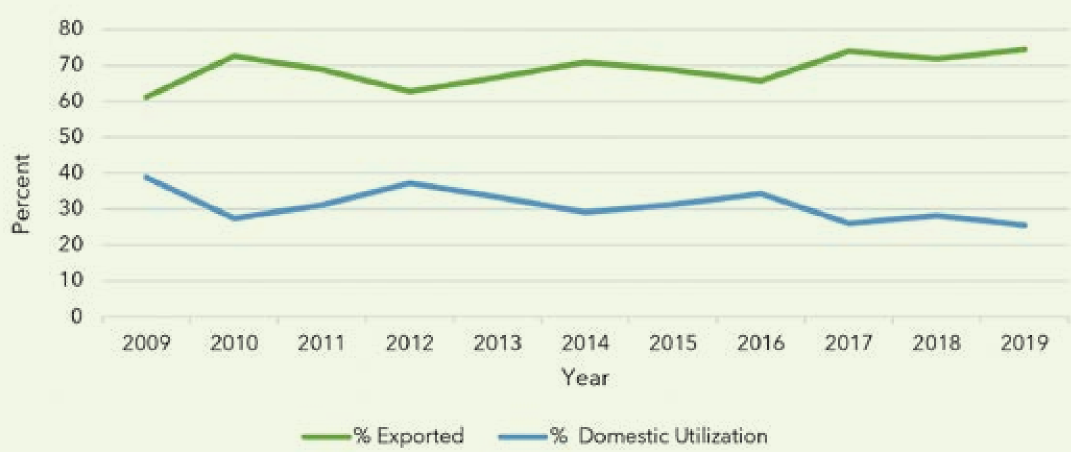
2019 (Table 3.26 and Figure 3.36). Conversely, the proportion retained for domestic consumption/utilization decreased from 39% in 2009 to 26% in 2019.

### TABLE 3.26. VOLUME OF DOMESTIC CONSUMPTION AND EXPORT OF COCONUT OIL, PHILIPPINES, 2009—2019

| Domestic Consumption (MT) | | | | | | Percent | |
|---|---|---|---|---|---|---|---|
| Year | Export (MT) | Manufactured Oil | Home-made Oil | Total | Total Coconut Oil Utilization (MT) | Exported | Domestic |
| 2009 | 1,311,487 | 786,000 | 46,000 | 832,000 | 2,143,487 | 61 | 39 |
| 2010 | 2,130,970 | 754,000 | 49,000 | 803,000 | 2,933,970 | 73 | 27 |
| 2011 | 1,303,878 | 538,000 | 53,000 | 591,000 | 1,894,878 | 69 | 31 |
| 2012 | 1,352,752 | 745,000 | 57,000 | 802,000 | 2,154,752 | 63 | 37 |
| 2013 | 1,741,049 | 805,000 | 64,000 | 869,000 | 2,610,049 | 67 | 33 |
| 2014 | 1,360,275 | 500,000 | 60,000 | 560,000 | 1,920,275 | 71 | 29 |
| 2015 | 1,354,211 | 550,000 | 67,000 | 617,000 | 1,971,211 | 69 | 31 |
| 2016 | 1,153,694 | 524,000 | 79,200 | 603,200 | 1,756,894 | 66 | 34 |
| 2017 | 1,448,621 | 398,000 | 110,800 | 508,800 | 1,957,421 | 74 | 26 |
| 2018 | 1,510,084 | 470,000 | 120,500 | 590,500 | 2,100,584 | 72 | 28 |
| 2019 | 1,820,057 | 497,000 | 126,500 | 623,500 | 2,443,557 | 74 | 26 |
| Ave. | 1,498,825 | 597,000 | 75,727 | 672,727 | 2,171,553 | 69 | 31 |

Source of basic data: PCA, PSA and UCAP

### FIGURE 3.36. PROPORTION OF TOTAL COCONUT OIL PRODUCTION EXPORTED AND UTILIZED DOMESTICALLY, PHILIPPINES, 2009-2019




Source of basic data: PCA, PSA and UCAP

Like the case of coconut oil, desiccated coconut production in the Philippines is mainly geared toward the export market. Agustin (2012) reported that merely less than 3% of the country's total production of desiccated coconut is retained for domestic consumption mainly by institutional users like hotels, pastry and bakery industries. Household consumers in the country are mostly expatriates familiar with desiccated coconut in their native countries.

Domestic sales of copra meal accounted for an annual average of 36% of total copra meal production during the period 2009– 2019. This average implies that a larger proportion of the country's total copra meal production was geared towards the export market. Nevertheless, domestic sales of copra meal exhibited an increasing trend from 278,894 MT in 2009 to 451,547 MT in 2019, or at an average annual growth rate of 38.8% (Table 3.27 and Figure 3.37). This upward trend could be attributed to the growing poultry and livestock industries in the country which utilize copra meal as animal feed.

**TABLE 3.27. TOTAL PRODUCTION, DOMESTIC SALES, AND EXPORTS OF COPRA MEAL, PHILIPPINES, 2009–2019**

| Year | Export (MT) | Domestic Sales (MT) | Total Production (MT) |
|---|---|---|---|
| 2009 | 399,782 | 278,894 | 678,676 |
| 2019 | 304,530 | 451,547 | 756,077 |
| Annual Average (2010–2019) | 453,291 | 255,199 | 708,411 |
| % Share, 2010–2019 | 64.0 | 36.0 | |
| Annual Growth Rate (%) | 7.9 | 38.8 | |

Source of basic data: PCA, PSA and UCAP

For nontraditional coconut products such as virgin coconut oil and coco sugar, Costales (2019) reported that based on PCA and industry sources, the marketing of both products is export-oriented. About 70% of the country's virgin coconut oil and coco sugar production flow to export markets with 30% going to the domestic market. The TRAVERA survey conducted by Costales showed that about 77% of the sugar sales of the enterprises interviewed from 2015 to 2017 were geared toward the export market.

## FIGURE 3.37. DOMESTIC SALES AND EXPORT VOLUME OF COPRA MEAL, PHILIPPINES, 2010–2019


Source of basic data: PCA, PSA and UCAP

Approximately 13.88 M MT of the country's total net disposable coconut supply in 2019 was mostly used for food and nonfood processing (Table 3.28). The total volume of coconut available for food consumption was estimated at 738,170 MT in the same year. Coconut available for food consumption accounted for a miniscule share of only five percent of the total net disposable coconut supply compared with the much larger share (94%) of coconut for food and nonfood processing (Figure 3.38). Of the total net disposable coconut supply, coconut seedlings' share was the lowest at only one percent.

The domestic coconut demand for nonfood processing (7.97 M MT with 54% share) in 2019 was relatively higher than the domestic coconut demand for food processing (5.9 M MT with 40% share) (Table 3.28 and Figure 3.38). This performance could be partly due to the increasing local demand for crude coconut oil by the oleochemical/bio-diesel companies that comply with the mandated 2% blend of coco methyl ester with petroleum diesel.

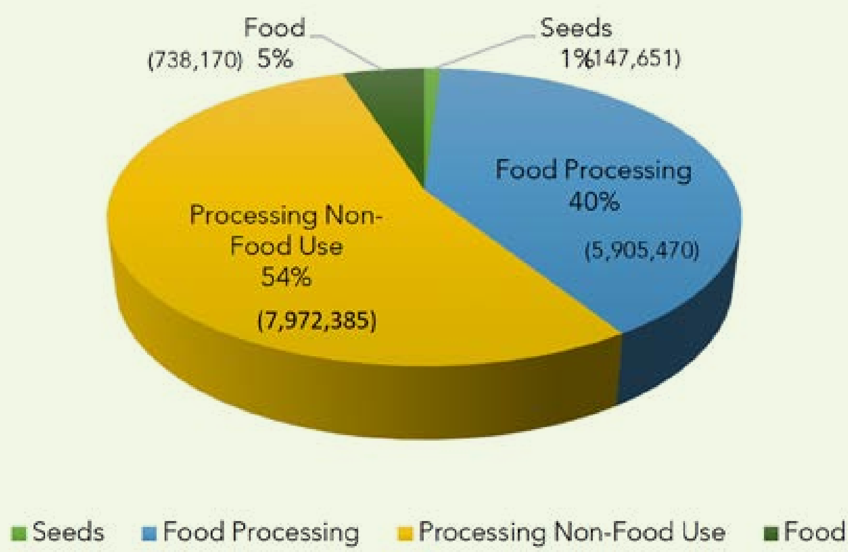
### TABLE 3.28. COCONUT SUPPLY UTILIZATION ACCOUNT, PHILIPPINES, 2019

| | | Domestic Consumption (MT) | | | |
|---|---|---|---|---|---|
| Production (MT) | Net Disposable Supply (MT) | Seeds | Food Processing | Processing (Non Food Use) | Food |
| 14,765,057 | 14,763,676 | 147,651 | 5,905,470 | 7,972,385 | 738,170 |

1Coconut production minus coconut exports (1,471 MT)
Source: CountrySTAT Philippines and PSA

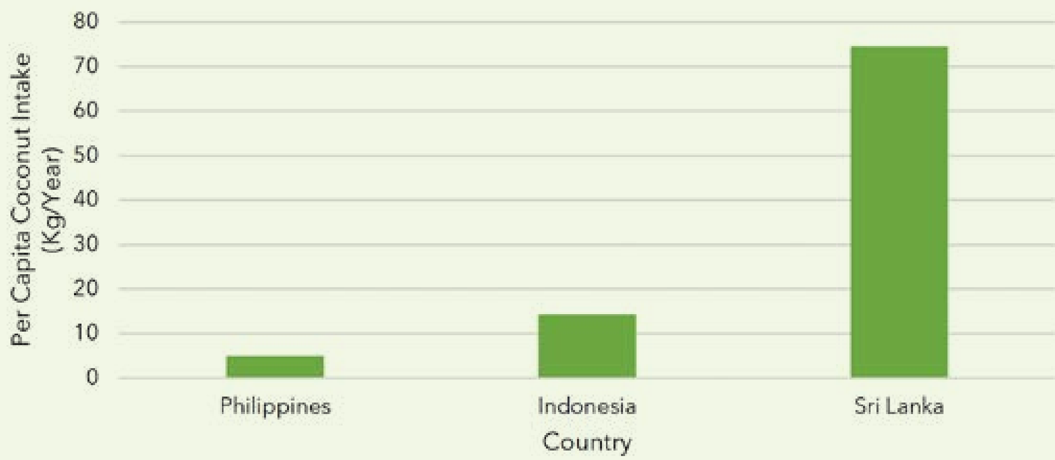
The PSA reported that the annual per capita consumption of coconut decreased from 6.96 kilograms (kg) per capita in 2018 to 6.88 kg per capita in 2019. However, FAO's estimate of Filipinos' annual per capita consumption of coconut in 2018 was much lower compared with PSA's data. As shown in Figure 3.39, Filipinos' annual per capita intake of coconut was only 5.04 kg, much lower than that of the world's largest coconut consumer, Sri Lanka (74.67 kg), and of the world's largest coconut producer, Indonesia (14.24 kg) (FAOstat 2021).

**FIGURE 3.38. PERCENT DISTRIBUTION OF NET DISPOSABLE COCONUT SUPPLY ACCORDING TO DOMESTIC USE, PHILIPPINES, 2019**




Source: CountrySTAT Philippines and PSA

FIGURE 3.39. ANNUAL PER CAPITA COCONUT CONSUMPTION IN THE PHILIPPINES, INDONESIA, AND SRI LANKA




Source: FAOstat 2021

# Trade Performance of Philippine Coconut Products

## Contribution of Coconut Products to the Philippines' Export Earnings

Coconut oil, desiccated coconut, and copra cake are among the top ten agricultural export products in the country. On the average, exports of coconut products generated an aggregate value of US$ 1.83 billion per year during the period 2015–2019 (Table 3.29). This amount accounted for 2.86% of the country's merchandise export earnings in the same period. The coconut export mix consists of traditional and nontraditional coconut products. During the period 2009–2019, the country exported a total of 43 nontraditional coconut products. The top promising nontraditional coconut products consist of virgin coconut oil, coco water, coconut concentrate, liquid coco milk, coco cream, hydrogenated coconut oil, coco husk cubes, coco peat, baled coir, and glycerin.

The largest contribution to the country's export earnings from coconut products came from traditional coconut products with an average of US$ 1.53 B (2.4%) per year during the period 2015–2019. Coconut oil had the biggest contribution (70%) while desiccated coconut (15%) and copra meal (4%) trailed behind. In contrast, exports of nontraditional coconut products accounted for only an average of 0.46% (US$ 292 M) of the country's total foreign exchange earnings. Revenues from exports of traditional coconut products improved from 2015 to 2019 by an average of 5.1%. However, export earnings from nontraditional coconut products declined from US $315 M in 2015 to US$ 287 M in 2019, or by an average of 1% per year. The total export revenue from traditional and non-traditional coconut products, on the other hand, grew by an average rate of 3.9% per year during the period 2015–2019 (Table 3.39).

### TABLE 3.29. CONTRIBUTION OF COCONUT PRODUCTS TO THE TOTAL VALUE OF PHILIPPINE MERCHANDISE EXPORTS, 2015-2019

| Item | Value of Philippines Exports (FOB US$ Million) | | | | | | % Share |
|---|---|---|---|---|---|---|---|
| | 2015 | 2016 | 2017 | 2018 | 2019 | Average | |
| Total Philippine Exports | 58,827 | 57,406 | 62,875 | 69,307 | 70,927 | 63,868 | 100.00 |
| Coconut Products | 1,623 | 1,703 | 2,268 | 1,882 | 1,654 | 1,826 | 2.86 |
| Traditional Coconut Products: | 1,308 | 1,432 | 1,959 | 1,604 | 1,367 | 1,534 | 2.40 |
| Copra | 1 | | | | | a | |
| Coconut oil | 958 | 1,045 | 1,461 | 1,033 | 857 | 1,071 | 1.68 |
| Desiccated coconut | 154 | 195 | 264 | 283 | 249 | 229 | 0.36 |
| Copra meal/cake | 69 | 52 | 43 | 67 | 56 | 57 | 0.09 |
| Oleochemicals | 18 | 33 | 61 | 47 | 37 | 39 | 0.06 |
| Coco shell charcoal | 28 | 15 | 20 | 41 | 41 | 29 | 0.05 |
| Activated Carbon | 80 | 92 | 110 | 133 | 127 | 108 | 0.17 |
| Nontraditional Coconut Products | 315 | 271 | 309 | 278 | 287 | 292 | 0.46 |

Less than one M.
Source of basic data: PCA and PSA

***Copra.*** The total export volume of copra increased from 84 MT in 2009 to 92 MT in 2018, or by an average of 104% per year (Table 3.30 and Figure 3.40). The highest shipment of copra was registered in 2014 due to the high volume of copra imports of Vietnam (1,400 MT valued at US$ 687,465) and the Republic of Korea (555 MT worth US$ 168,000). Total export earnings generated from copra rose from US$ 59,795 in 2009 to US$ 97,951 in 2018, or by 51% per year, on the average. The country stopped exporting copra in 2019 due to lack of supply.

### TABLE 3.30. EXPORT VOLUME AND VALUE OF COPRA, PHILIPPINES, 2009–2018

| Year | Export Volume (MT) | Export Value (FOB US$) |
|---|---|---|
| 2009 | 84 | 59,795.0 |
| 2018 | 92 | 97,951.0 |
| Average (2009–2018) | 259 | 297,468.0 |
| Ave. Annual Growth Rate (2009–2018) | 104% | 51% |

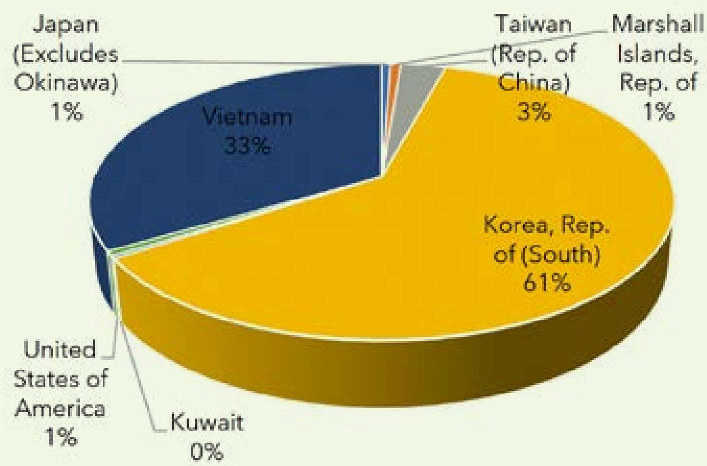
Source of basic data: PCA and PSA

### FIGURE 3.40. EXPORT VOLUME (MT) AND VALUE (FOB US$) OF COPRA, 2009–2018


Source of basic data: PCA and PSA

Eight countries imported copra from the Philippines. During the 11-year period under review, the Philippines still exported limited amounts of copra mainly to the Republic of Korea. The country's export volume of copra to the Republic of Korea was erratic but showed an increasing trend (39.4%/year). Of the total export volume of copra from 2009 to 2018, the Republic of Korea's market share was 61.4% (Figure 3.41). Shipments of copra to other importing countries such as Japan, Taiwan, USA, Vietnam, and Kuwait were done only once during the period 2009– 2018.

**FIGURE 3.41. MARKET SHARES OF IMPORTING COUNTRIES IN THE PHILIPPINES' COPRA VOLUME, 2009–2018**




Source of basic data: PCA and PSA

Coconut Oil. Coconut oil, as a lauric acid oil, constituted a measly 2.2% of the world's oil and fats market in 2019 (Oil World 2020). Nevertheless, coconut oil dominated the international trade among coconut products. The Philippines predominantly captured the world market by supplying approximately 45% of the total world export volume of coconut oil from 2009 to 2018 (Table 3.31). In the international market, the Philippines and Indonesia have maintained the lead by delivering about 76% of the total world shipments averaging 2,098,443 MT per year from 2009 to 2018 (Table 3.31). The Philippines posted a higher average annual growth rate (5.1%/year) than Indonesia, the country's closest competitor (4%/year). Malaysia trailed behind in export volume of coconut oil and registered also the lowest average annual growth rate (1.1%/year) than the Philippines and Indonesia.

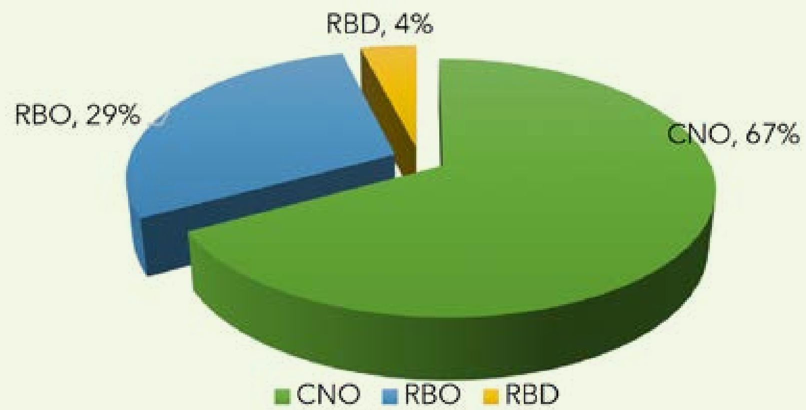
**TABLE 3.31. AVERAGE ANNUAL VOLUME AND GROWTH RATE OF COCONUT OIL EXPORTS OF THREE LEADING COUNTRY EXPORTERS IN THE WORLD, 2009–2018**

| Country | Total Export Volume (MT) | Percent Share | Rank | Ave. Annual Export Volume (MT) | Ave. Annual Growth Rate (%) |
|---|---|---|---|---|---|
| Philippines | 9,396,627 | 45.0 | 1 | 939,663 | 5.1 |
| Indonesia | 6,466,902 | 31.0 | 2 | 646,690 | 4.0 |
| Malaysia | 1,352,114 | 6.0 | 3 | 135,211 | 1.1 |

| Country | Total Export Volume (MT) | Percent Share | Rank | Ave. Annual Export Volume (MT) | Ave. Annual Growth Rate (%) |
|---|---|---|---|---|---|
| World | 20,984,427 | | | 2,098,443 | 2.5 |

Source: FAOstat

**FIGURE 3.42. PERCENT SHARE OF THE TOTAL EXPORT VOLUME OF COCONUT OIL BY TYPE, PHILIPPINES, 2009–2019**




Source of basic data: PCA and UCAP

As mentioned earlier, the Philippines exports three types of coconut oil, namely: crude coconut oil, refined bleached oil or cochin oil, and refined bleached deodorized oil. During the period 2009-2019, crude coconut oil accounted for an average of 67% of the country's total coconut oil export volume per year (Figure 3.42). Refined bleached oil (cochin oil) and refined, bleached deodorized oil accounted for 29% and 4%, respectively.

Historically, the country's volume of coconut oil export was largely affected by fluctuations in coconut production due to climatic changes, e.g., drought and series of typhoons. Despite those year-to-year fluctuations in coconut production, the export volume of crude coconut oil increased at an average rate of 9.3% annually over the period 2009– 2019 (Table 3.32). Crude coconut oil exhibited a 15% increase in export revenue during the same period despite the volatility in coconut oil prices. High export volumes of crude coconut oil were registered in 2010 and 2019 while low export volumes were reported in 2015 and 2016 (Figure 3.43). On the other hand, high export earnings were recorded in 2011 and 2017 due to the rising world price and tight world supply of coconut oil during these years.

#### TABLE 3.32. EXPORT VOLUME AND VALUE OF CRUDE COCONUT OIL, PHILIPPINES, 2009–2019

| Year | Export Volume (MT) | Export Value (FOB US$) |
|---|---|---|
| 2009 | 570,570 | 399,746 |
| 2019 | 825,746 | 579,131,743 |
| Annual Average (2009-2019) | 606,456 | 662,998,863 |
| Average Annual Growth Rate (2009-2019) | 9.3% | 15.0% |

Source: PCA and UCAP

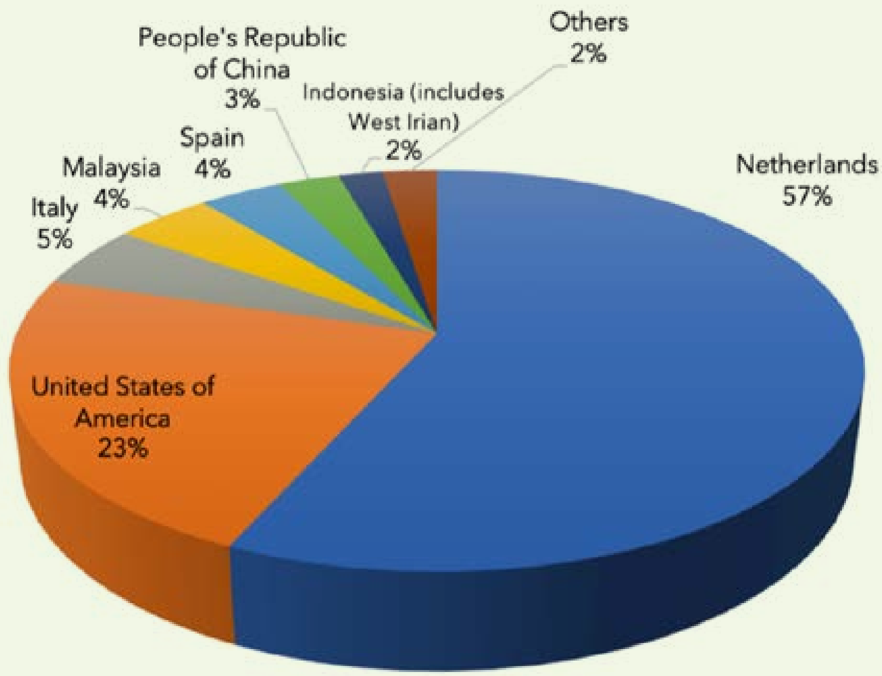
#### FIGURE 3.43. EXPORT VOLUME AND VALUE OF CRUDE COCONUT OIL, 2009–2019


Source of basic data: PCA and UCAP

Among all coconut products, crude coconut oil has remained the biggest earner over the period 2009–2019. Apart from palm kernel oil, coconut oil commands quite a high price compared with other vegetable oils since it is the primary lauric oil among the vegetable oils in the world.

During the period 2009–2019, 57 countries imported the Philippines. About 57% of the Philippine exports of crude coconut oil were directed to the Netherlands, followed by the USA at 23% (Figure 3.44). The remaining balance was absorbed by Italy (5%), Malaysia (4%), Spain (4%), the People's Republic of China (3%), and Indonesia (2%), among other

FIGURE 3.44. MARKET SHARES OF IMPORTING COUNTRIES IN THE PHILIPPINES' EXPORT VOLUME OF CRUDE COCONUT OIL, 2009–2019




Source of basic data: PCA and PSA

importing countries. Crude coconut oil exported to the USA and the Netherlands is used more for refining and production of raw materials for high-value personal care products (Agustin 2012).

The country's export volume of cochin oil increased from 228,606 MT in 2009 to 233,208 MT in 2019, or at an average annual growth rate of 2.3% per year (Table 3.33 and Figure 3.45). The growth in the country's export earnings from cochin oil (7.1%/year) was higher compared to the growth in its export volume during the same period because of the increasing trend in the export price of this product. On average, the export volume of cochin oil from the Philippines was 261,652 MT annually and earned US$ 315.02 M per year in foreign exchange during the period 2009–2019.

### TABLE 3.33. EXPORT VOLUME AND VALUE OF REFINED BLEACHED OIL (COCHIN OIL), PHILIPPINES, 2009–2018

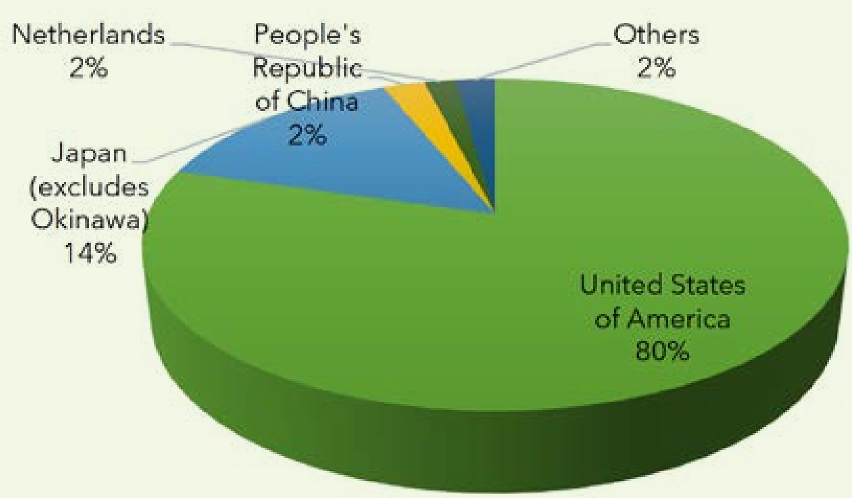
| Year | Export Volume (MT) | Export Value (FOB US$) |
|---|---|---|
| 2009 | 228,606 | 162,727,472 |
| 2019 | 233,208 | 189,943,566 |
| Annual Average (2009-2019) | 261,652 | 315,022,076 |
| Average Annual Growth Rate (2009-2019) | 2.3% | 7.1% |

Source: PCA and PSA

### FIGURE 3.45. EXPORT VOLUME AND VALUE OF REFINED BLEACHED OIL (COCHIN OIL), PHILIPPINES, 2009–2019


Source: PCA and PSA

### FIGURE 3.46. MARKET SHARES OF IMPORTING COUNTRIES IN THE PHILIPPINES' EXPORT VOLUME OF REFINED BLEACHED OIL (COCHIN OIL), 2009–2019




Source: PCA and PSA

The United States was the biggest export market for Philippine cochin oil with 80% market share, followed by Japan with 14% market share during the period under review (Figure 3.46). Other foreign buyers of Philippine cochin oil were the Peoples' Republic of China and the Netherlands with the same miniscule market share of 2%. Cochin oil is a preferred raw material by the importing countries for the production of edible and non-edible products with improved quality.

Compared to the volume of exports of crude coconut oil and cochin oil, the Philippines exported a smaller volume of RBD oil during the period 2009–2019. Nevertheless, shipments of RBD oil improved significantly from 2009 to 2019 at an average of 32.2% and 22.5% per year in volume and value terms, respectively (Table 3.34 and Figure 3.47). The volume of RBD oil exports markedly increased from 25,184 MT valued at US$ 21 M in 2009 to 78,173 MT worth approximately US$ 68.28 M in 2019.

### TABLE 3.34. EXPORT VOLUME AND VALUE OF REFINED, BLEACHED, DEODORIZED (RBD) OIL, 2009 –2019

| Year | Export Volume (MT) | Export Value (FOB US$) |
|---|---|---|
| 2009 | 25,184 | 21,002,040 |
| 2019 | 78,173 | 68,278,859 |
| Average (2009–2019) | 35,241 | 46,211,125 |
| Average Annual Growth Rate (2009–2019) | 32.2% | 22.5% |

Source: PCA and PSA

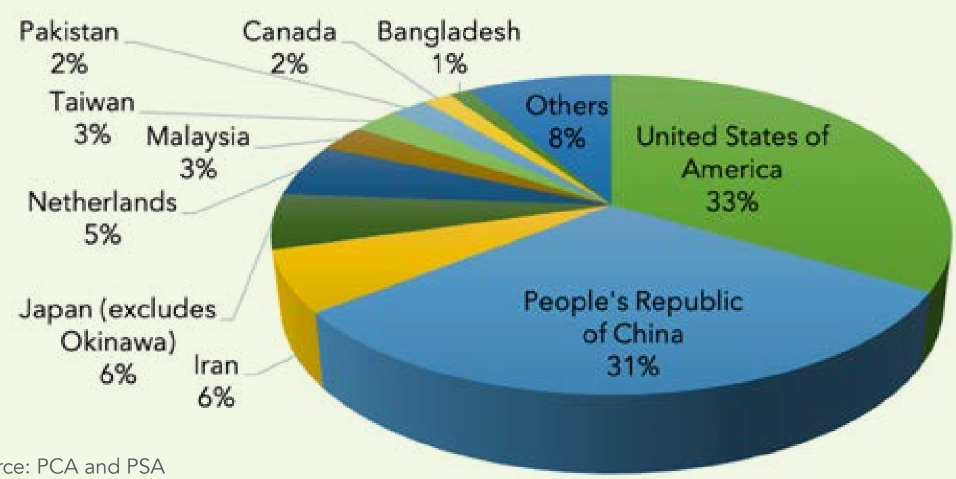
A total of 67 countries imported RBD oil from the Philippines in 2009–2019. The United States and the People's Republic of China are the major markets for refined coconut oil accounting for 33% and 31% of the country's volume of exports of RBD oil, respectively, from 2009 to 2019 (Figure 3.48). The United States has remained among the top two exporters of crude coconut oil, cochin oil, and RBD oil. This data suggests that the Philippines has already recovered from the massive smear campaign against coconut oil by the American Soybean Association in the past. Moreover, the information campaign launched by the United States Council for Research/Information on the medicinal or therapeutic value of coconut oil being a medium-chain triglyceride (MCT) has been successful. Other countries importing RBD oil were Iran, Japan, Netherlands, Malaysia, Taiwan, Canada, Pakistan, and Bangladesh.

FIGURE 3.47. EXPORT VOLUME AND VALUE OF REFINED BLEACHED DEODORIZED (RBD) OIL, PHILIPPINES, 2009—2019


Source: PCA and PSA

At export destinations, RBD oil is not consumed as cooking oil, but it is further processed mainly as feedstock for oleochemicals. These oleochemicals, such as fatty alcohols, fatty acids, and methyl ester are processed further into high-value consumer products such as shampoos, detergents, surface-active agents, cosmetics, pharmaceuticals, plastics, and synthetic resins (Agustin, 2012). Utilization in the food sector at importing countries is only as specialty oil for specific uses. As confectionery fat, it is used in the preparation of ice cream, in imitation chocolates where it is used in place of cocoa butter along with cocoa powder, and as spray oil for crackers.

FIGURE 3.48. MARKET SHARES OF IMPORTING COUNTRIES IN THE PHILIPPINES' RBD OIL EXPORT VOLUME, 2009-2019




Source: PCA and PSA

***Copra Meal.*** During the period 2009 to 2019, the country's export volume of copra meal was erratic (Table 3.35 and Figure 3.49). The highest volume of copra meal exports was recorded in 2013 at 751,962 MT valued at US$ 143.85 M while the lowest was registered in 2019 at 304,531 MT, worth approximately US$

55.65 M. On average, the export volume of copra meal during the same period was 453,340 MT and export earnings generated amounted to US$ 76.58 M per year.

### TABLE 3.35. EXPORT VOLUME AND VALUE OF COPRA MEAL, PHILIPPINES, 2009–2019

| Item | Export Volume (MT) | Export Value (FOB US$) |
|---|---|---|
| 2009 | 399,782 | 47,925,863 |
| 2019 | 304,531 | 55,647,689 |
| Annual Average (2009–2019) | 453,340 | 76,580,950 |
| Ave. Annual Growth Rate (2009–2019) | 8.7% | 9.4% |

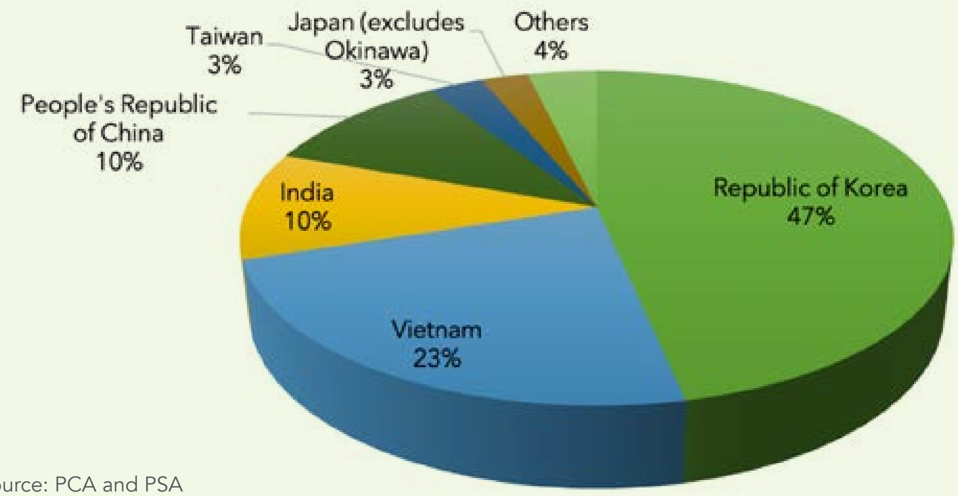
Source: PCA and PSA

### FIGURE 3.49. EXPORT VOLUME AND VALUE OF COPRA MEAL, PHILIPPINES, 2009–2019


Source: PCA and PSA

Europe was once the leading export market for Philippine copra meal but due to more stringent regulations imposed in the international copra market, export to this destination has ceased. The country's export market for copra meal thus shifted to Asia. For the last 11 years, the Republic of Korea was the leading export market for copra meal with

**FIGURE 3.50. MARKET SHARES OF IMPORTING COUNTRIES IN THE PHILIPPINES' EXPORT VOLUME OF COPRA MEAL, 2009 –2019**




Source: PCA and PSA

a 47% market share of the total copra meal export volume of the country (Figure 3.50). Vietnam followed with a 23% market share. The Republic of Korea and Vietnam were the two leading export markets for copra meal due to the growing livestock industry in these countries. Other export markets for Philippine copra meal were the People's Republic of China, India, Japan, and Taiwan. Both the People's Republic of China and India had the same market share of 10%. Likewise, both Japan and Taiwan registered a miniscule market share of 3%.

Desiccated Coconut. The Philippines is the world's top exporter of desiccated coconut with 31% market share, followed by Indonesia (20%) and Sri Lanka (10%) during the period 2009–2019 (Table 3.36). These countries have long-established desiccated coconut industries.

**TABLE 3.36. AVERAGE ANNUAL VOLUME AND GROWTH RATE OF DESICCATED COCONUT BY LEADING COUNTRY EXPORTERS IN THE WORLD, 2009–2019**

| Country | Total Export Volume (MT) | Percent Share | Rank | Average Annual Export Volume (MT) | Ave. Annual Growth Rate (%) |
|---|---|---|---|---|---|
| Philippines | 1,231,939 | 31 | 1 | 111,994 | 11 |
| Indonesia | 805,118 | 20 | 2 | 73,193 | 6 |
| Sri Lanka | 417,763 | 10 | 3 | 37,978 | 11 |

| Country | Total Export Volume (MT) | Percent Share | Rank | Average Annual Export Volume (MT) | Ave. Annual Growth Rate (%) |
|---|---|---|---|---|---|
| World | 4,031,992 | | | 366,545 | 12 |

Source: FAOstat

Exports of desiccated coconut brought average annual earnings of approximately US$ 215 M to the country during the period 2009–2019 (Table 3.37). The total value of desiccated coconut exports from the Philippines reached as high as US$ 282.95 M in 2018. The country's lowest volume of exports of desiccated coconut was 67,259 MT in 2015 due to the shortage in the supply of raw materials. The short supply was attributed to the ramifications of El Niño and the series of typhoons in 2015 (Figure 3.51). Since 2016, the country's export volume of desiccated coconut increased for four consecutive years due to improved coconut production resulting from favorable weather condition. The country's highest export volume of desiccated coconut was in 2019.

The country's volume of exports of desiccated coconut increased from 116,421 MT in 2009 to 155,033 MT in 2019 or by an average annual growth rate of 5.2% per year (Table 3.37). Meanwhile, export earnings from desiccated coconut posted faster growth rate at an average of 11.1% per year in the same period.

### TABLE 3.37. EXPORT VOLUME AND VALUE OF DESICCATED COCONUT, PHILIPPINES, 2009 –2019

| Year | Export Volume (MT) | Export Value (FOB US$) |
|---|---|---|
| 2009 | 116,421 | 145,756,839 |
| 2019 | 155,035 | 249,263,454 |
| Annual Average (2009–2019) | 110,460 | 215,093,123 |
| Average Growth Rate (2009–2019) | 5.2% | 11.1% |

Source: PCA and PSA

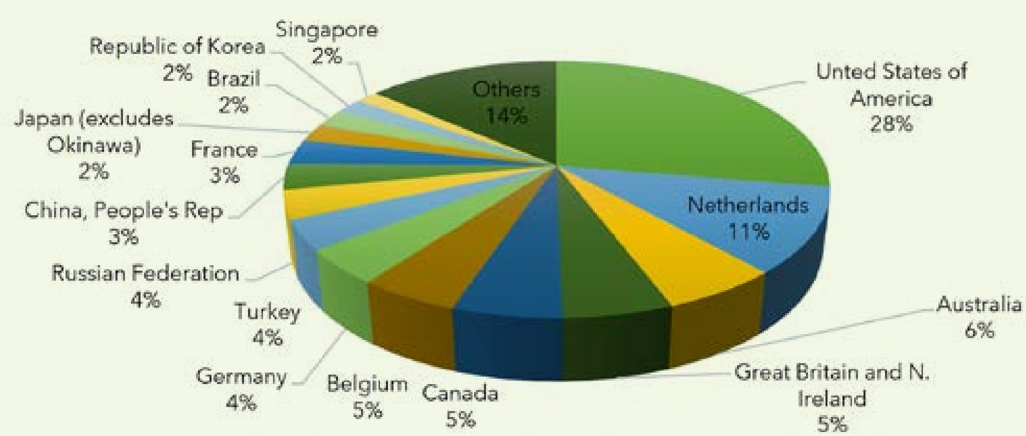
Among the country's major coconut export products, desiccated coconut has the most diverse market. This product penetrated about 109 countries all over the world and it also commands the highest price. The bulk of the country's desiccated coconut export during the period 2009-2019 went to the United States with a market share of 28% (Figure 3.52). The Netherlands was the main European buyer of Philippine desiccated coconut with a market share of 11%. Other importing countries from Europe were Great Britain, Northern Ireland, Belgium, Germany, France, and Russian Federation. Moreover, Australia, Canada, Turkey, the Peoples Republic of China, the Republic of Korea, Japan, Brazil, and Singapore imported desiccated coconut from the Philippines during the 11-year period under review.

Coconut Shell Charcoal. The Philippines was the world's second major exporter of coconut shell charcoal, also referred to as coco shell charcoal. The country exhibited a

**FIGURE 3.51. EXPORT VOLUME AND VALUE OF DESICCATED COCONUT, PHILIPPINES, 2009–2019**


Source: PCA and PSA

**FIGURE 3.52. MARKET SHARES OF IMPORTING COUNTRIES IN THE PHILIPPINES' EXPORT VOLUME OF DESICCATED COCONUT, 2009–2019**




Source: PCA and PSA

market share of 18%, next to Indonesia with a relatively much larger market share of 68% during the period 2012–2017 (Table 3.38). India ranked third with 11% market share, but it posted a faster growth in export volume (52%/year) compared with the Philippines (11%/year).

During the period 2009–2019, the country's export volume of coconut shell charcoal averaged 51,594 MT annually valued at approximately US$ 23.57 M. The export volume and value increased, on the average, by 20.3% and 24.1% per year, respectively, in the same period (Table 3.39). It was in 2019 that the export volume and value of coconut shell charcoal hit its peak at 87,879 MT earning approximately US$ 40.54 M compared with its export volume of 34,746 MT and export receipts of US$ 11.18 M in 2009. (Figure 3.53). The significant increase in the country's shipments of coconut shell charcoal in recent years could be due to the high demand from activated carbon manufacturers in Japan and China since they consider Philippine coconuts as the best source of charcoal.

### TABLE 3.38. AVERAGE ANNUAL VOLUME AND GROWTH RATE OF COCO SHELL CHARCOAL BY THREE LEADING COUNTRY EXPORTERS IN THE WORLD, 2012–2017

| Country | Total Export Volume (MT) | Percent Share | Rank | Average Annual Export Volume (MT) | Ave. Annual Growth Rate (%) |
|---|---|---|---|---|---|
| Indonesia | 1,299,823 | 68 | 1 | 216,637 | 30 |
| Philippines | 343,524 | 18 | 2 | 57,254 | 11 |
| India | 214,281 | 11 | 3 | 35,714 | 52 |
| World | 1,902,888 | | | 317,148 | 11 |

Source: International Coconut Community

### TABLE 3.39. EXPORT VOLUME, VALUE AND PRICE OF COCONUT SHELL CHARCOAL, PHILIPPINES, 2009–2019

| Year | Export Volume (MT) | Export Value (FOB US$) |
|---|---|---|
| 2009 | 34,746 | 11,181,943 |
| 2019 | 87,879 | 40,544,407 |
| Average (2009–2019) | 51,594 | 23,571,520 |
| Ave. Annual Growth Rate (2009–2019) | 20.3% | 24.1% |

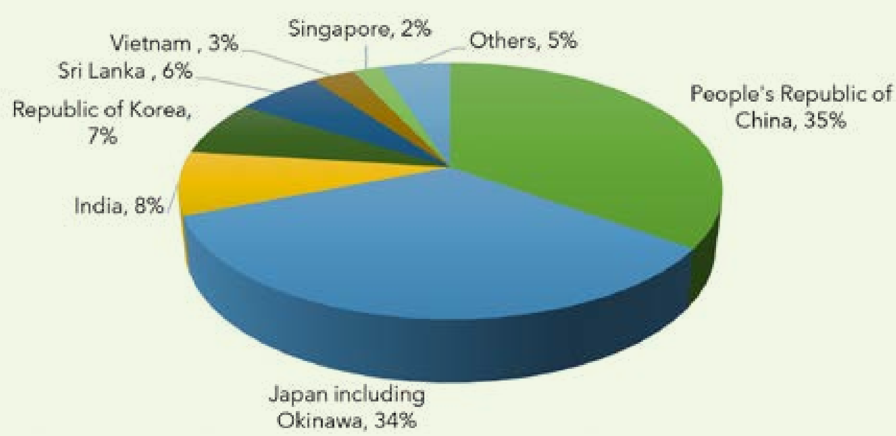
Source: PCA and PSA

## FIGURE 3.53. PHILIPPINE EXPORT VOLUME AND VALUE OF COCONUT SHELL CHARCOAL, 2009–2019


Source: PCA and PSA

A total of 32 countries imported coco shell charcoal from the Philippines. Japan, China, and the Republic of Korea were the main importers. From 2009 to 2017, Japan was the country's leading export market for coconut shell charcoal. However, the People's Republic of China replaced Japan starting 2018. During the period 2009–2019, the average market share of the People's Republic of China in the total Philippine export volume of coconut shell charcoal was 35%, followed closely by Japan at 34% (Figure 3.54).

## FIGURE 3.54. MARKET SHARES OF IMPORTING COUNTRIES IN THE PHILIPPINES' EXPORT VOLUME OF COCONUT SHELL CHARCOAL, 2009–2019




Source: PCA and PSA

India and the Republic of Korea—the third and fourth major export markets for Philippine coconut shell charcoal, respectively—exhibited a market share of only 8% and 7%, respectively. Other foreign buyers of coco shell charcoal were Sri Lanka, Vietnam, Singapore, Turkey, USA, and Hong Kong. These importing countries use coconut shell charcoal in the production of activated carbon and in other industries that utilize its derivative products.

Activated Carbon. Coco shell charcoal-based activated carbon ranks third in generating high export earnings among the country's traditional coconut products. From 2012 to 2015, the Philippines was the top exporter of coco shell charcoal-based activated carbon in the international market with a market share of 15% (Table 3.40). India ranked second, posting an average market share of 13%. Other leading world exporters were Sri Lanka (7%) and Indonesia (4%).

### TABLE 3.40. AVERAGE ANNUAL EXPORT VOLUME OF ACTIVATED CARBON BY LEADING COUNTRY EXPORTERS IN THE WORLD, 2012–2015 AND 2016–2017

| Country | Average Annual Export Volume (MT) (2012-2015) | Percent Share | Rank | Average Annual Export Volume (MT) (2012-2015) | Percent Share | Rank |
|---|---|---|---|---|---|---|
| Philippines | 76,307 | 15 | 1 | 66,070 | 11 | 2 |
| India | 64,282 | 13 | 2 | 78,535 | 13 | 1 |
| Sri Lanka | 33,969 | 7 | 3 | 37,289 | 6 | 3 |
| Indonesia | 23,218 | 4 | 4 | 21,355 | 4 | 4 |
| World | 519,727 | | | 587,417 | | |

Source: International Coconut Community

Starting in 2016, however, India's shipments of coco shell-based activated carbon surpassed that of the Philippines (Table 3.41). During the period 2016–2017, India, with a market share of 13%, dethroned the Philippines as the top exporter of coco shell charcoal-based activated carbon in the world. The Philippines dropped to second rank and exhibited a lower market share of 11% in this period.

During the 11-year period under review (2009–2019), the volume of coco shell-based activated carbon exported to the international market showed an increasing trend from 20,027 MT in 2009 to approximately 78,252 MT in 2019, or by an average of 17.6% per year (Table 3.41 and Figure 3.55). The country's export earnings from this coconut-based product rose markedly from US$ 25.80 M in 2009 to US$ 127.10 M in 2019, or by 20.8% annually, on average. For the past four consecutive years, export revenue generated from coco shell-based activated carbon reached more than US$ 100 M per year. In 2018, Davao Region (Region 11) accounted for more than half of the total coconut shell-based activated carbon exports (PSA, 2019).

The country's export market for coco shell-based activated carbon is more diverse compared with coco shell charcoal. The country shipped this product to 100 various destinations in the international market. Japan, Germany, and the USA were the main destinations of coco shell-based activated carbon. These three countries absorbed 45% of the total export volume of coco shell-based activated carbon from the Philippines during the period 2009–2019 (Figure 3.56). Japan, a major consumer of activated carbon, had the largest market share at 18% due to its proximity to the Philippines. Moreover, a Japanese-owned activated carbon manufacturing company operating in the Philippines has marketing tie-ups with Japanese trading companies. Germany, the second major buyer of activated carbon from the Philippines, had a market share of 15%, followed by USA at 12%. The growth in Germany's imports of activated carbon from the Philippines could be attributed to its laws encouraging the use of organic materials to reduce pollution, provide cleaner water, and have better health options (Ordinario et al. 2019). Shipments of activated carbon from the Philippines also went to the People's Republic of China (7%), Republic of Korea (6%), Sri Lanka (4%), Indonesia (4%), Taiwan (3%), Netherlands (3%), African countries such as Ghana and South Africa (4%), Canada (2%), Italy (2%), USSR (2%), Italy (2%), Singapore (2%), Australia (1%) and France (1%). Aside from the widespread use of activated carbon in the food processing industry and for water treatment, it is also being used in the gold mining industry, especially in African countries. The major importers of activated carbon were the gold mining companies, the brewery industry, and soft drink companies. Activated carbon is used in gold mining to recover gold from cyanide solution using the carbon-in-pulp or carbon-in-leach processes. In the brewery and soft drink industries, activated carbon is used mainly to purify the water used in production.

## TABLE 3.41. EXPORT VOLUME AND VALUE OF ACTIVATED CARBON, PHILIPPINES, 2009–2019

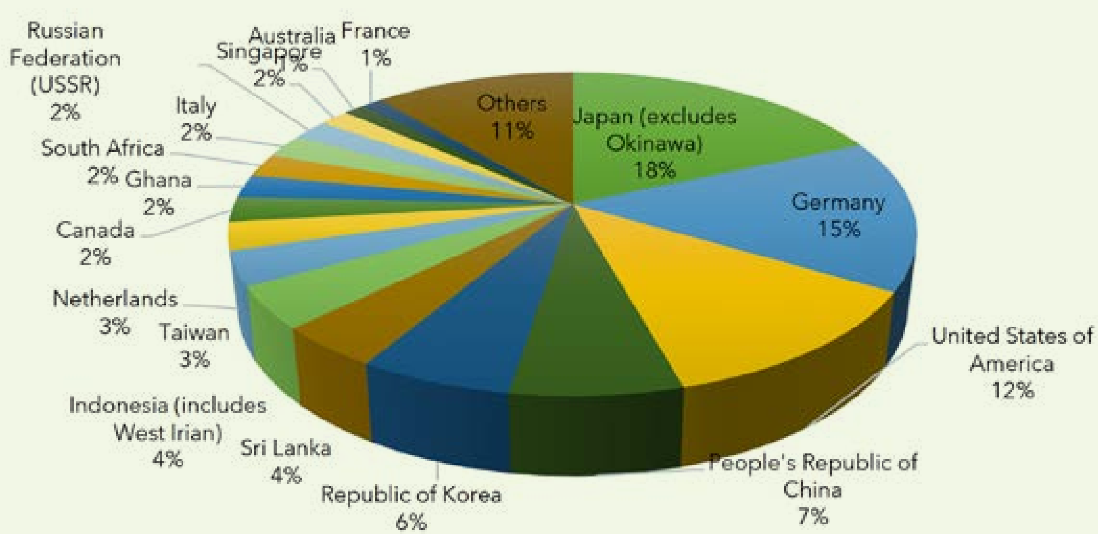
| Year | Export Volume (MT) | Export Value (FOB US$) |
|---|---|---|
| 2009 | 20,027 | 25,807,979 |
| 2019 | 78,252 | 127,101,864 |
| Average (2009–2019) | 50,901 | 79,951,363 |
| **Average Annual Growth Rate (2009–2019)** | **17.6%** | **20.8%** |

*Source: PCA and PSA*

## FIGURE 3.55. PHILIPPINE EXPORT VOLUME AND VALUE OF ACTIVATED CARBON, 2009–2019


Source: PCA and PSA

## FIGURE 3.56. MARKET SHARES OF IMPORTING COUNTRIES IN THE PHILIPPINES' EXPORT VOLUME OF ACTIVATED CARBON, 2009–2019




Source: PCA and PSA

Oleochemicals. Oleochemicals using coconut oil as feedstock are sometimes referred to as cocochemicals. The major traditional intermediate oleochemicals exported by the Philippines are coco fatty alcohol, coco fatty acid, and coco methyl ester. Nontraditional oleochemical exports include refined and crude glycerin, alkanolamide, coco diethanolamide, coco acid oil, hydrogenated coconut oil, and fatty acid distillates. Glycerin is the by-product of oleochemicals production.

On average, export earnings generated by traditional oleochemicals during the period 2009–2019 amounted to US$ 27.88 M (Table 3.42). The country's export earnings from traditional oleochemicals increased from approximately US$ 12.68 M in 2009 to US$ 37.04 M in 2019, or by an average growth rate of 22.3% per year (Table 3.42). The highest export revenue from traditional oleochemicals amounting to US$ 61.42 M was posted in 2017.

### TABLE 3.42. EXPORT VOLUME AND VALUE OF TRADITIONAL OLEOCHEMICALS IN COPRA TERMS, 2009–2019

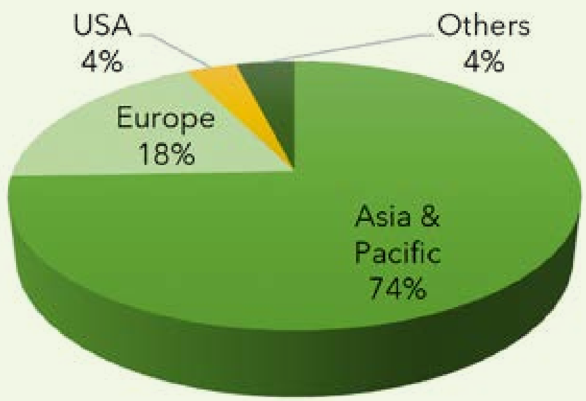
| Year | Volume (MT) | Value ( FOB US $) |
|---|---|---|
| 2009 | 23,375 | 12,678,993 |
| 2019 | 45,684 | 37,041,716 |
| **Average (2009–2019)** | **37,085** | **27,875,205** |
| **Ave. Annual Growth Rate (2009–2019)** | **10.2%** | **22.3%** |

Note: Oleochemicals include coco fatty alcohol, coco fatty acid, and coco methyl ester
*Source: PCA and PSA*

During the period 2009–2019, the country's major export markets for traditional oleochemicals were Asia and the Pacific, Europe, and the United States of America. The average market share of Asia and Pacific in the total Philippine export volume of oleochemicals was 74%, followed by Europe (18%) and the USA trailing behind with only 4% average export market share (Figure 3.57).

Coconut oil-based biodiesel, which is also referred to as coco-biodiesel, is basically coco methyl ester. Among the country's traditional oleochemical products, coco methyl ester exhibited the highest growth rate at 102.6% in export volume and 141.6% in export revenue from 2009 to 2019 (Table 3.43). The volume of exports of coco methyl ester increased markedly from 1,743.50 MT worth approximately US$ 1.86 M in 2009 to 23,956.50 MT in 2019 valued at US$ 32.43 M in 2019 (Table 3.43 and Figure 3.58). The country shipped out an average of 7,996.50 MT of coco methyl ester worth the US $ 12.83 M annually during the 11-year period under review.

## FIGURE 3.57. MARKET SHARES OF IMPORTING COUNTRIES IN THE PHILIPPINES' EXPORT VOLUME OF TRADITIONAL OLEOCHEMICALS, 2009–2019




Source: PCA and PSA

## TABLE 3.43. EXPORT VOLUME AND VALUE OF COCO METHYL ESTER (CME), 2009–2019

| Year | Export Volume (MT) | Export Value (FOB $US) |
|---|---|---|
| 2009 | 1,743.50 | 1,859,877 |
| 2019 | 23,956.50 | 32,438,285 |
| **Annual Average (2009–2019)** | **7,996.45** | **12,831,175.09** |
| **Average Annual Growth Rate (2009–2019)** | **102.6%** | **141.6%** |

*Source: PCA and PSA*

## FIGURE 3.58 PHILIPPINE EXPORT VOLUME AND VALUE OF COCO METHYL ESTER, 2009-2019


Source: PCA and PSA

Of the 10 countries that imported coco methyl ester from the Philippines, the leading buyers during the period 2009–2019 were Thailand (15%), Malaysia (13%), Germany (11%), Vietnam (9%), the Peoples Republic of China (9%), and Hong Kong (8%) (Figure 3.59).

### FIGURE 3.59. MARKET SHARES OF IMPORTING COUNTRIES IN THE PHILIPPINES' EXPORT VOLUME OF COCO METHYL ESTER, 2009–2019


Source: PCA and PSA

The country's shipment of coco fatty acid during the period 2009–2019 was highly erratic (Figure 3.60). The highest export volume of coco fatty acid was in 2013 at 30,380.97 MT worth approximately FOB US$ 193.92 M. Exports of coco fatty acid decreased from 2,140.23 MT valued at US$ 1.53 M in 2009 to

1.852.12 MT worth US$ 534,004 in 2019 (Table 3.44).

### TABLE 3.44. EXPORT VOLUME AND VALUE OF FATTY ACID, PHILIPPINES, 2009–2019

| Year | Export Volume (MT) | Export Value (FOB $US) |
|---|---|---|
| 2009 | 2,140.23 | 1,533,414 |
| 2019 | 1,852.12 | 534,004 |
| **Annual Average (2009–2019)** | **8,295.83** | **21,774,580** |
| **Average Annual Growth Rate (2009–2019)** | **46.7%** | **493.5%** |

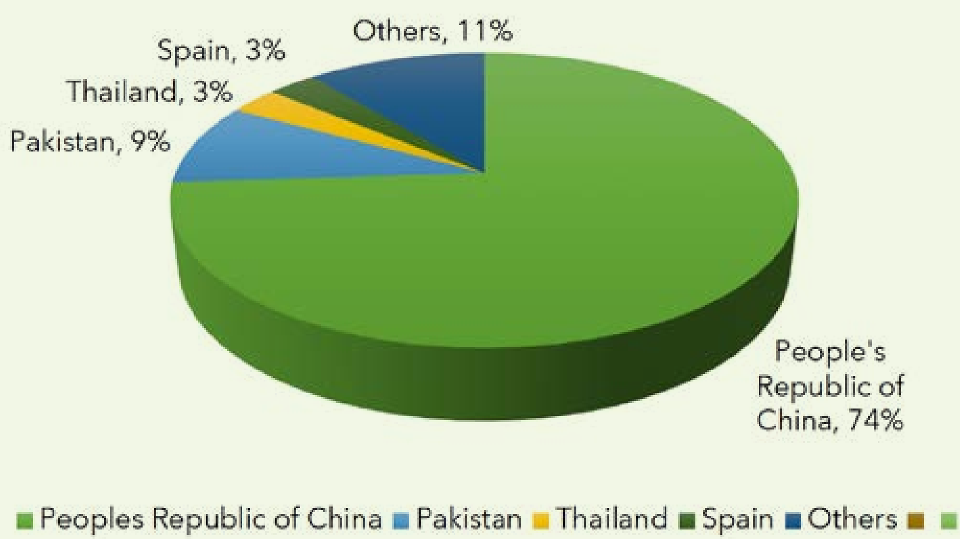
*Source: PCA and PSA*

## FIGURE 3.60. PHILIPPINE EXPORT VOLUME AND VALUE OF FATTY ACID, 2009–2019


Source: PCA and PSA

Figure 3.61 shows that the bulk of coco fatty acid exports during the period 2009–2019 went to the People's Republic of China (74%). Pakistan, Thailand, Spain, Indonesia, and Germany were among 37 other countries that imported coco fatty acid from the Philippines.

## FIGURE 3.61. MARKET SHARES OF IMPORTING COUNTRIES IN THE PHILIPPINES' EXPORT VOLUME OF FATTY ACID, 2009– 2019




Source: PCA and PSA

The volume of exports of coco fatty alcohol declined drastically from 4,674.43 MT worth US$ 5.48 M in 2009 to only 434.98 MT valued at US$ 638,337 in 2019 (Table 3.45 and Figure 3.62). This could be attributed to the shutdown of three out of four oleochemical companies manufacturing coco fatty alcohol because of the discontinued implementation of EO 259 by the Board of Investments (BOI). There was pressure to remove non-tariff barriers after the Philippines became a signatory to the General Agreement on Trade and Tariffs (GATT). EO 259 required all local detergent manufacturers to use fatty alcohol in their detergent formulation. The highest volume of export of coco fatty alcohol was in 2011 at 8,505.37 MT. It generated foreign exchange earnings amounting to US$ 22.46 M. In 2017 and 2018, the country did not export coco fatty alcohol.

### TABLE 3.45. EXPORT VOLUME AND VALUE OF INDUSTRIAL FATTY ALCOHOL, PHILIPPINES, 2009–2019

| Year | Export Volume (MT) | Export Value (FOB $US) |
|---|---|---|
| 2009 | 4,674.43 | 5,483,533 |
| 2019 | 458.06 | 638,337 |
| **Annual Average (2009–2019)** | **1,869.56** | **3,678,874.91** |

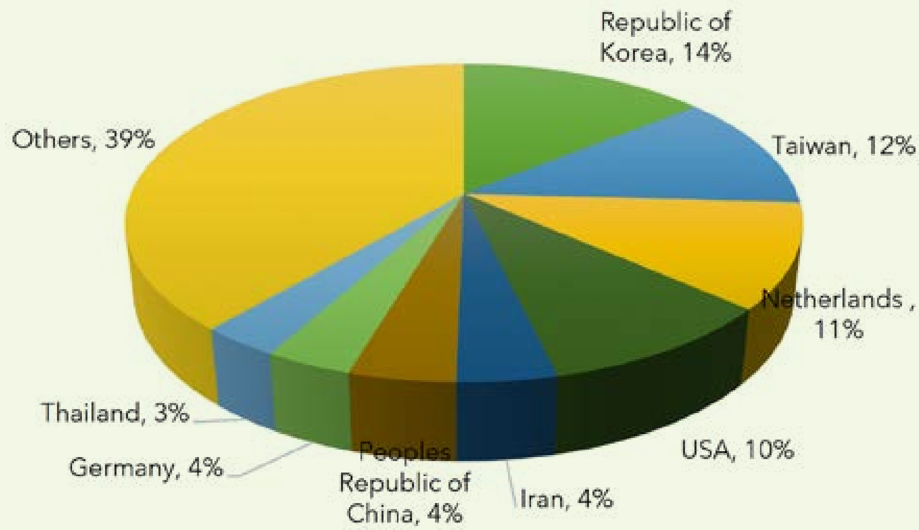
*Source: PCA*

### FIGURE 3.62. PHILIPPINE EXPORT VOLUME AND VALUE OF INDUSTRIAL FATTY ALCOHOL, 2009–2019


Source: PCA and PSA

Among 41 countries that imported coco fatty alcohol from the Philippines, the Republic of Korea was the country's major export market with 14% market share during the period 2009– 2019, followed by Taiwan (12%), Netherlands (11%), and USA (10%) (Figure 3.63). Other foreign buyers of coco fatty alcohol were Iran, the Peoples Republic of China, Germany, and Thailand.

**FIGURE 3.63. MARKET SHARES OF IMPORTING COUNTRIES IN THE PHILIPPINES' EXPORT VOLUME OF INDUSTRIAL FATTY ALCOHOL, 2009–2019**




Source: PCA and PSA

# Trend in the Export Volume and Value of Selected Nontraditional Coconut Products

The trade performance of VCO, coconut water, coco sugar, and coir products are discussed in this section.

***Virgin Coconut Oil***. The Philippines is the top producer and exporter of VCO in the world. The total volume of VCO exports increased from 2,297 MT in 2009 to 18,352MT in 2019, or by an average of 45.2% per year (Table 3.46 and Figure 3.64). Similarly, the total export earnings generated from VCO also increased from US$ 6.14 M in 2009 to approximately US$ 50.67 M in 2019, or by an annual average of 55.3% per year. The highest volume of export of this product was recorded in 2015 due to the high volume of imports from the Netherlands (82,255 MT worth US$ 96.41 M) and the USA (43,544 MT valued at US$ 109.20 M). The increase in the demand for VCO has been attributed to the health benefits of coconut oil as a medium-chain triglyceride (Arancon, 2010). However, from 2016 to 2019, the VCO industry recorded a drop in export volume because of the negative advisory from the American Heart Association (AHA) against saturated fats. The decrease in export volume of VCO accompanied by the declining VCO export price resulted in the negative trend in export earnings from this coconut product during this period. According to the Virgin Coconut Oil Producers and Traders Association of the Philippines (VCOPTAP), the demand for VCO in the USA has already recently recovered from the negative advisory against this commodity.

### TABLE 3.46. EXPORT VOLUME AND VALUE OF VIRGIN COCONUT OIL, PHILIPPINES, 2009–2019

| Year | Export Volume (MT) | Export Value (FOB $US) |
|---|---|---|
| 2009 | 2,297 | 6,144,663 |
| 2019 | 18,352 | 50,665,018 |
| **Annual Average (2009–2019)** | **20,272** | **74,477,741** |
| **Average Annual Growth Rate (2009–2019)** | **45.2%** | **55.3%** |

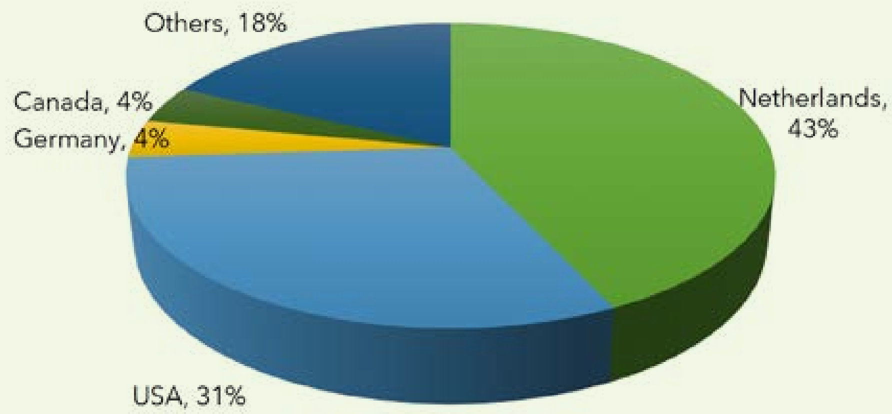
*Source: PCA and PSA*

### FIGURE 3.64. PHILIPPINE EXPORT VOLUME AND VALUE OF VCO, 2009-2019


Source: PCA and PSA

During the period 2009– 2019, a total of 91 countries imported VCO from the Philippines. The Netherlands imported, on the average, approximately US$ 19.57 worth of VCO, accounting for 43% of the country's total volume of VCO exports (Figure 3.65). The increasing awareness of consumers toward healthy lifestyle and diet has driven the demand for VCO in this country (Costales, 2019). Meanwhile, in North America, the United States was the main buyer of Philippine VCO with a market share of 31%. Likewise, the popularity of VCO in North America is increasing as consumers become more aware of its health and nutritional benefits. Shipment of VCO from the Philippines also went to Canada (4%) and Germany (4%), among other importing countries.

**FIGURE 3.65. MARKET SHARES OF IMPORTING COUNTRIES IN THE PHILIPPINES' EXPORT VOLUME OF VCO, 2009–2019**




Source: PCA and PSA

Coconut Water. Coconut water is second to VCO as a major contributor to the country's total export earnings from nontraditional coconut products. The Philippine volume of exports of coconut water increased markedly from 593 liters worth approximately US$ 368,277 in 2009 to 51,839 liters valued at US$ 57.10 M in 2019 (Table 3.47 and Figure 3.66). The country shipped out annually an average of 39,065 liters of coconut water worth US$ 41.06 M during the 11-year period under review. This positive trend could be due to its growing popularity especially in the non-traditional markets because of its beneficial properties as a healthy beverage and as a sports drink (Arancon, 2010). The highest volume of export of this product was recorded in 2017 due to the high volume of imports by the USA (53,864 liters worth US$ 60.89 M). Coconut water is now the fastest-growing new beverage category in the United States and has also gained international popularity in the Netherlands, Australia, Japan, and other countries. Coconut water has caught on among athletes, health nuts, and urbanites in these countries.

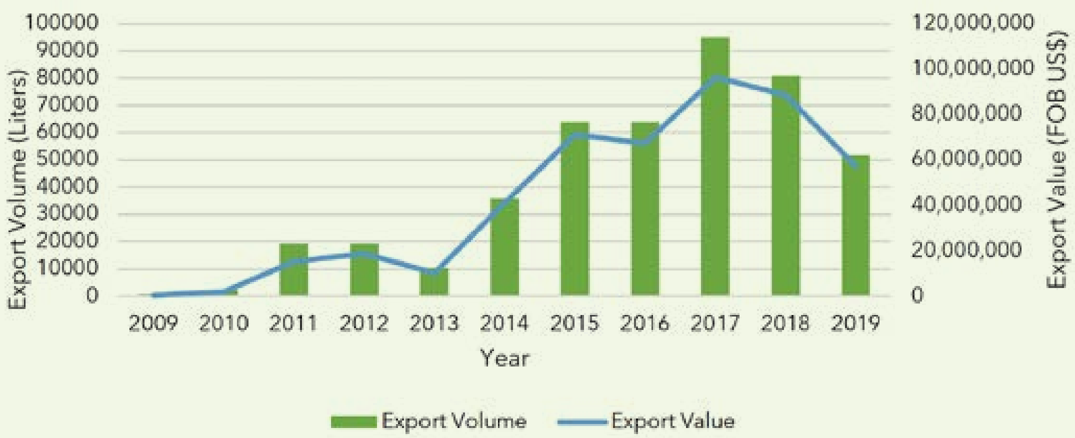
During the period 2009–2019, 78 countries imported coconut water from the Philippines. The country's leading buyers of coconut water during this period were USA (61%), Netherlands (4%), Australia (4%), Canada (3%), Japan (1%), and the United Arab Emirates (1%) (Figure 3.67).

## TABLE 3.47. EXPORT VOLUME AND VALUE OF COCONUT WATER, PHILIPPINES, 2009–2019

| Year | Export Volume (Liters) | Export Value (FOB $US) |
|---|---|---|
| 2009 | 593 | 368,277 |
| 2019 | 51,839 | 57,108,326 |
| **Annual Average (2009–2019)** | **39,065** | **41,066,947** |
| **Average Annual Growth Rate (2009–2019)** | **154.1%** | **167.6%** |

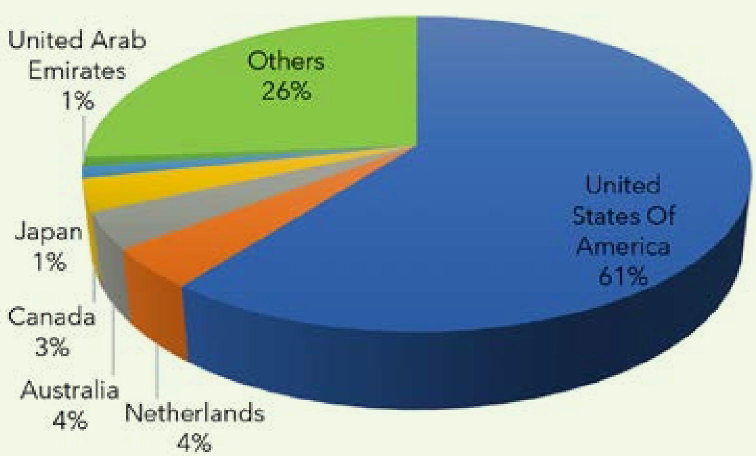
*Source: PCA and PSA*

## FIGURE 3.66. PHILIPPINE EXPORT VOLUME AND VALUE OF COCONUT WATER, 2009–2019




Source: PCA and PSA

## FIGURE 3.67. MARKET SHARES OF IMPORTING COUNTRIES IN THE PHILIPPINES' EXPORT VOLUME OF COCONUT WATER, 2009–2019




Source: PCA and PSA

Since 2017, desiccated coconut processing companies in the Philippines, such as Franklin Baker Co., have started processing and exporting bulk concentrated coconut water to save on transport and packaging costs. The concentrated product can be reconstituted with water or used as a mixing ingredient in the importing countries. The volume of exports of coconut concentrates increased significantly from 125.27 MT worth US$ 230,794 in 2017 to 37,368.68 MT valued at approximately US$ 41.60 M in 2019 (Table 3.48).

### TABLE 3.48. EXPORT VOLUME AND VALUE OF COCONUT CONCENTRATES, PHILIPPINES, 2017–2019

| Year | Export Volume (MT) | Export Value (FOB $US) |
|---|---|---|
| 2017 | 125.27 | 230,794 |
| 2018 | 306.19 | 986,412 |
| 2019 | 37,368.68 | 41,599,578 |
| Annual Average (2009-2019) | 12,600.05 | 14,272,261 |
| Average Annual Growth Rate (2009-2019) | 6,124.4% | 2,222.3% |

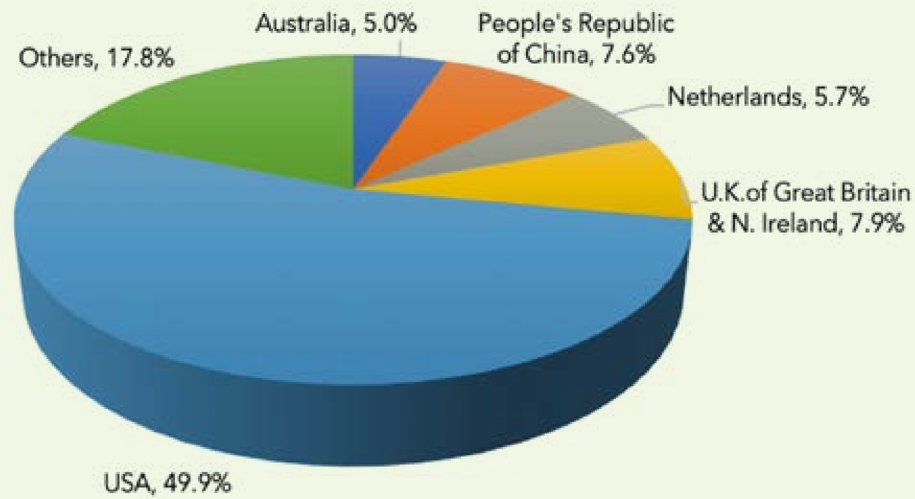
*Source: PCA and PSA*

Thirty-six countries imported coconut concentrates during the period 2017-2019. USA was the top export market for coconut concentrates accounting for almost 50% of the country's total export volume of this product (Figure 3.68). Other major countries importing coconut concentrates from the Philippines were U.K of Great Britain and N. Ireland (7.9%), People's Republic of China (7.6%), Netherlands (5.7%), and Australia (5.0%).

Coconut Sap Products. The PCA started monitoring coco sugar exports only in 2017. Thus, its export growth could not be ascertained because of the absence of historical data (Costales, 2019). On average, the export volume of coconut sugar during the period 2017-2019 was344 MT, and export earnings amounted to US$ 1,186,514 per year. During the three-year period under review, the country's volume of exports of coconut sugar showed an erratic trend (Table 3.49 and Figure 3.69). The volume of export decreased from 404 MT in 2017 to 208 MT in 2018 and again increased to 420 MT in 2019 valued approximately at US$ 1.28 M.

### TABLE 3.49. EXPORT VOLUME AND VALUE OF COCO SUGAR, PHILIPPINES, 2017–2019

**FIGURE 3.68. MARKET SHARES OF IMPORTING COUNTRIES IN THE PHILIPPINES' EXPORT VOLUME OF COCONUT CONCENTRATES, 2017–2019**




Source: PCA and PSA

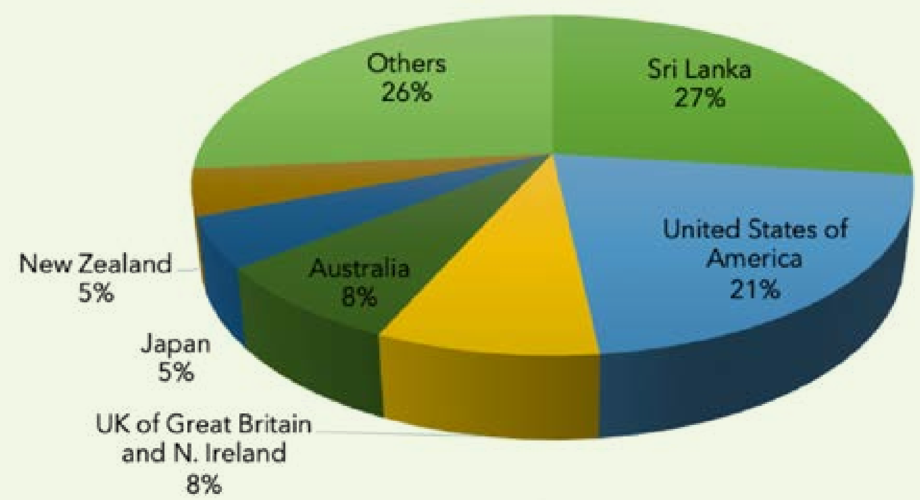
**FIGURE 3.69. PHILIPPINE EXPORT VOLUME AND VALUE OF COCO SUGAR, 2017–2019**


Source: PCA and PSA

| Year | Export Volume (MT) | Export Value (FOB $US) |
| --- | --- | --- |
| 2017 | 404 | 1,537,911 |
| 2018 | 208 | 745,067 |
| 2019 | 420 | 1,276,563 |
| **Annual Average (2017–2019)** | **344** | **1,186,514** |
| **Average Annual Growth Rate (2017–2019)** | **26.6%** | **10%** |

*Source: PCA and PSA*

**FIGURE 3.70. MARKET SHARES OF IMPORTING COUNTRIES IN THE PHILIPPINES' EXPORT VOLUME OF COCONUT SUGAR, 2017–2019**




Source: PCA and PSA

Generally, coconut sugar has also a diverse market penetrating about 24 countries all over the world. In the Asia Pacific Region, Sri Lanka, Australia, Japan, and New Zealand were the main destinations which absorbed 58% of the total export volume of coconut sugar from the Philippines during the period 2017-2019 (Figure 3.70). According to Costales (2019), there is a high demand for imported sugar and large consumption base in the region. The other markets in this region were Taiwan, China, Myanmar, Hong Kong, and Malaysia. Meanwhile, in North America, about 21% of the coco sugar export market share went to the USA. This could be due to the growing popularity of coconut sugar as a natural sweetener alternative to table sugar. Coconut sugar serves as a healthier option for sweeteners due to its organic nature, low Glycemic Index (GI), nutritional content, and elements from raw materials (Costales, 2019). In addition, most of the importers in Europe come from the United Kingdom, Northern Ireland, Belgium, Denmark, Germany, and the Netherlands.

Another coco sap product that has recently emerged for export in recent years is coco honey or syrup. The country's volume of exports of coco honey/syrup exhibited an erratic pattern. The volume of exports of this coco sap product decreased from 382.07 MT valued at approximately US$ 1.53 M in 2017 to 141.67 MT worth US$ 508,270 in 2018 and then rose again to 269.70 MT in 2019 (Table 3.50 and Figure 3.71).

**TABLE 3.50. EXPORT VOLUME AND VALUE OF COCO HONEY/SYRUP, PHILIPPINES, 2009–2019**

| Year | Export Volume (MT) | Export Value (FOB $US) |
|---|---|---|
| 2017 | 382.07 | 1,526,519 |
| 2018 | 141.67 | 508,270 |
| 2019 | 269.70 | 887,156 |
| **Annual Average (2017–2019)** | **264.48** | **973,982** |

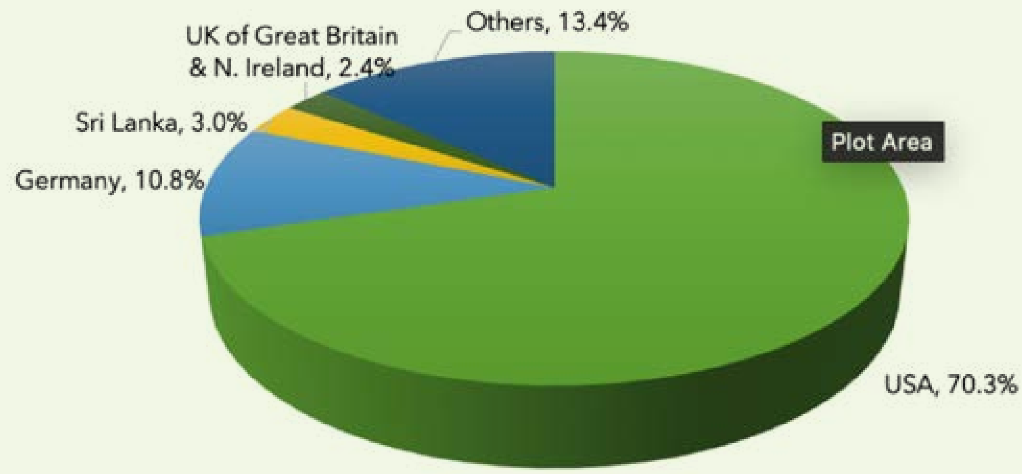
*Source: PCA and PSA*

During the period 2017–2019, a total of 14 counties imported coco honey/syrup from the Philippines. The United States was the leading buyer of Philippine coco honey/syrup, accounting for 70.3% of the total volume of exports of this coco sap product (Figure 3.72). Trailing behind were Germany (10.8%), Sri Lanka (3%), and the United Kingdom of Great Britain, and Northern Ireland (2.4%).

**FIGURE 3.71. PHILIPPINE EXPORT VOLUME AND VALUE OF COCO HONEY/SYRUP, 2017–2019**


Source: PCA and PSA

**FIGURE 3.72. MARKET SHARES OF IMPORTING COUNTRIES IN THE PHILIPPINES' EXPORT VOLUME OF COCONUT CONCENTRATES, 2017–2019**




Sources of basic data: PCA and PSA

Coconut Coir Products. India is the world's top exporter of coconut coir during the period 2009–2019. It has approximately 80% average market share, followed by Sri Lanka with 7% market share (Table 3.51). The Philippines trailed behind with only 2% share in the global coir market. Although the Philippines ranked third, it exhibited the fastest growth rate at an average of 24% per year among the three leading world coir exporting countries. India's average annual growth rate during the 11-year period under review was 19.5% per year, while Sri Lanka showed a negative growth rate (-3.7%/year) in coir export volume.

The Philippines exported nontraditional coir products composed of baled coir, other raw fibers, coco peat/dust, coir twine, coco pads/liner, and coco husk cubes.

**TABLE 3.51. AVERAGE ANNUAL VOLUME AND GROWTH RATE OF COCO COIR BY THREE LEADING COUNTRY EXPORTERS IN THE WORLD, 2009–2019**

| Country | Total Export Volume (MT) | Percent Share | Rank | Average Annual Export Volume (MT) | Ave. Annual Growth Rate(%) |
|---|---|---|---|---|---|
| India | 6,516,726 | 80 | 1 | 592,430 | 19.5 |
| Sri Lanka | 539,591 | 7 | 2 | 49,054 | -3 7 |
| Philippines | 185,589 | 2 | 3 | 16,872 | 24.0 |
| World | 8,155,055 | | | 741,369 | |

*Source: FAOstat*

The country's volume of exports of baled coir decreased from 2,079 MT in 2009 to 544 MT in 2019 (Table 3.52 and Figure 3.73). The highest shipment of baled coir was registered in 2016 due to the high volume of baled coir imports of China (1,139 MT valued at US$ 481,171) and Japan (1,590 MT valued at US$ 2.40 M). The total export earnings generated from baled coir rose from US$ 366,380 in 2009 to US$ 370,182 in 2019 despite the significant decrease in export volume in 2019. This could be attributed to the higher export price in 2019 compared with that in 2009.

## TABLE 3.52. EXPORT VOLUME AND VALUE OF BALED COIR, PHILIPPINES, 2009—2019

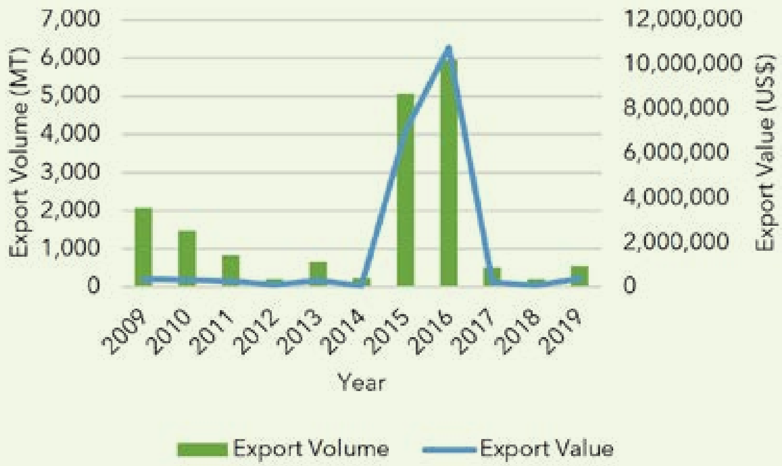
| Year | Export Volume (MT) | Export Value (FOB $US) |
|---|---|---|
| 2009 | 2,079 | 366,380 |
| 2019 | 544 | 370,182 |
| **Annual Average (2009–2019)** | **1,615** | **1,809,340** |

*Source: PCA and PSA*

During the period 2009– 2019, 13 countries imported baled coir from the Philippines, but annual shipments to these countries were irregular. The People's Republic of China and Japan were the country's major export markets for baled coir. The average market share of People's Republic of China in the total Philippine export volume of baled coir was 28%, followed by Japan with 26% (Figure 3.74). Other major importing countries were Australia, Canada, Singapore, Russia, United Kingdom, and the Republic of Korea.

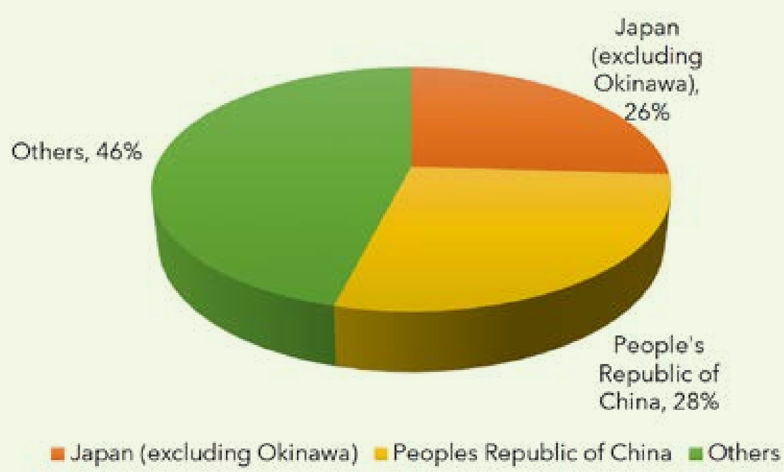
Apart from baled coir, the Philippines also exported other raw fibers, which showed an increasing trend in export volume from 2,815.94 MT in 2009 to 16,011.70 MT in 2019, or by an average of 43% per year (Table 3.53). Similarly, the earnings generated from exporting other raw fibers rose from US $ 416,923 in 2009 to US $ 3.61 M in 2019, or by an average of 60% per year.

## FIGURE 3.73. PHILIPPINE EXPORT VOLUME AND VALUE OF BALED COIR, 2009-2019




Source: PCA and PSA

## FIGURE 3.74. MARKET SHARES OF IMPORTING COUNTRIES IN THE PHILIPPINES' EXPORT VOLUME OF BALED COIR, 2009—-2019




Source: PCA and PSA

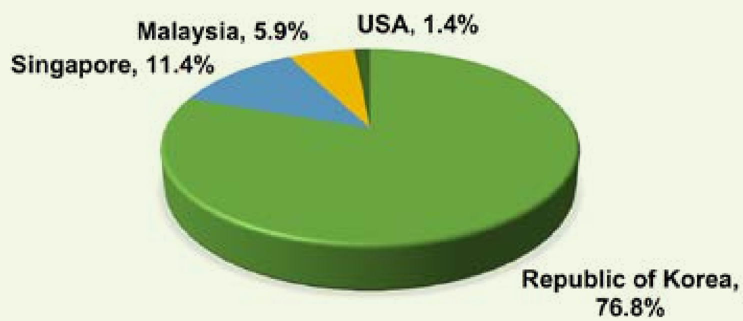
#### TABLE 3.53. EXPORT VOLUME AND VALUE OF OTHER RAW FIBERS, PHILIPPINES, 2009–2019

| Year | Export Volume (MT) | Export Value (FOB $US) |
|---|---|---|
| 2009 | 2,815.94 | 416,923 |
| 2019 | 16,011.70 | 3,982,594 |
| **Annual Average (2009–2019)** | **12,380.15** | **3,614,757** |
| **Average Annual Growth Rate (2009–2019)** | **43%** | **60%** |

*Source: PCA and PSA*

The Philippines exported other raw fibers to 11 countries during the period 2009–2019. The Republic of Korea was the biggest buyer of other raw fibers, accounting for 76.8% of the country's export volume of this coir product (Figure 3.75). Other major export markets of other raw fibers were Singapore with a market share of 11.4%, followed by Malaysia (5.9%), and USA (1.4%).

#### FIGURE 3.75. MARKET SHARES OF IMPORTING COUNTRIES IN THE PHILIPPINES' EXPORT VOLUME OF OTHER RAW FIBERS, 2009-2019




Source: PCA and PSA

From 2009–2019, the country's export volume and value of coconut peat/dust showed a positive trend at 75% and 107% per year, respectively (Table 3.54 and Figure 3.76).

The highest export volume of coconut peat/dust was recorded in 2019 at 64,992 MT valued at approximately US$ 3.93 M while the lowest was registered in 2011 at 1,731 MT valued at US$ 600,972. From 2016 to 2017, the country's export volume of coir peat/dust grew rapidly by 540.25%. This rapid growth rate was due to the sharp increase in China's import volume from 3,342 MT to 22,096 MT. On the average, the country's export volume of coconut peat/dust during the 11-year period under review was 13,903 MT which generated export earnings amounting to US$ 1.43 M per year.

## FIGURE 3.76. PHILIPPINE EXPORT VOLUME AND VALUE OF COCONUT PEAT/DUST, 2009–2019


Source: PCA and PSA

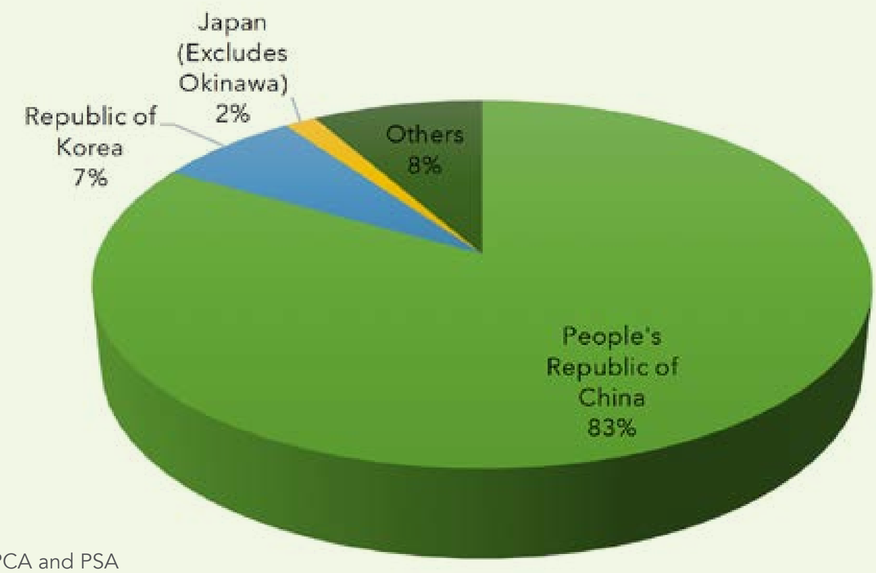
### TABLE 3.54. EXPORT VOLUME AND VALUE OF COIR PEAT/DUST, PHILIPPINES, 2009–2019

| Year | Export Volume (MT) | Export Value (FOB $US) |
|---|---|---|
| 2009 | 3,581 | 660,793 |
| 2019 | 64,992 | 3,926,175 |
| **Annual Average (2009–2019)** | **13,903** | **1,430,420** |
| **Ave. Annual Growth Rate (2009-2019)** | **75%** | **107%** |

*Source: PCA and PSA*

During the period 2009–2019, the Philippines exported coco coir peat/dust to 50 countries. In 2009, the Republic of Korea used to be the leading export market for Philippine coconut peat/dust. However, since 2010 China replaced the Republic of Korea as the top export market for coir peat/dust. On the average, China's export market share was 83% followed by the Republic of Korea with 7% market share. Other export markets were Japan, Taiwan, Hong Kong, Malaysia, Singapore, and USA (Figure 3.77).

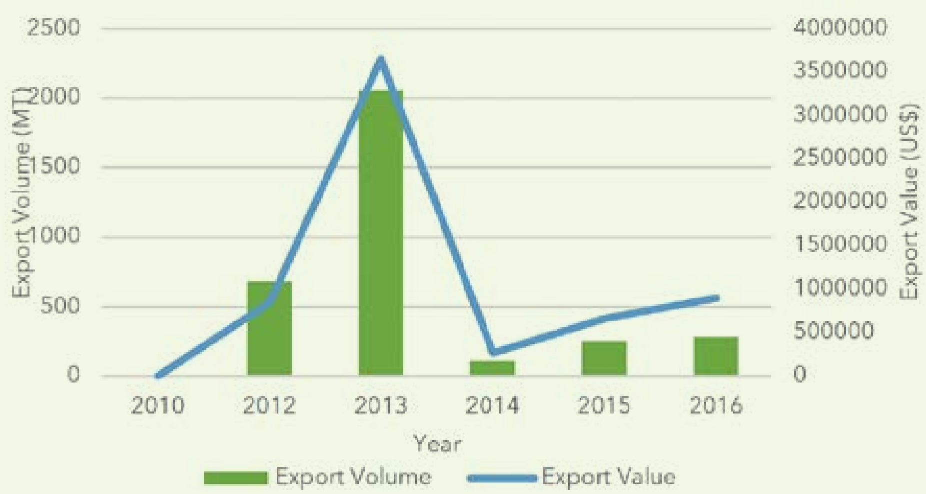
**FIGURE 3.77. MARKET SHARES OF IMPORTING COUNTRIES IN THE PHILIPPINES' EXPORT VOLUME OF COCONUT PEAT/DUST, 2009–2019**




Source: PCA and PSA

The country's shipment of coco twine to 29 countries during the period 2010-2016 was erratic (Figure 3.78). The highest export volume of coco twine was in 2013 at 2,058.2 MT valued at approximately US$ 3.65 M. Exports of coconut twine increased from only 0.08 MT valued at US$ 167 in 2010 to 283.16 MT valued at US$ 899,053 in 2016 (Table 3.55). The country ceased exporting coco twine since 2017.

**FIGURE 3.78. PHILIPPINE EXPORT VOLUME AND VALUE OF COCO TWINE, 2010–2016**




Source: PCA and PSA

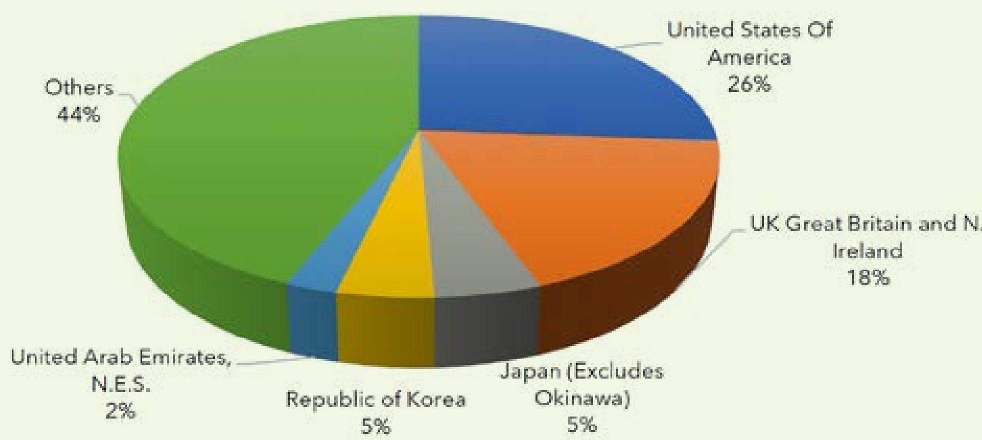
#### TABLE 3.55. EXPORT VOLUME AND VALUE OF COCO TWINE, PHILIPPINES, 2010–2016

| Year | Export Volume (MT) | Export Value (FOB $US) |
|---|---|---|
| 2010 | 0.08 | 167 |
| 2016 | 283.16 | 899,053 |

*Source: PCA and PSA*

The country's leading buyers of coco twine during the period 2010-2016 were USA (26%), United Kingdom (18%), Japan (5%), Republic of Korea (5%), and the United Arab Emirates (2%) (Figure 3.79).

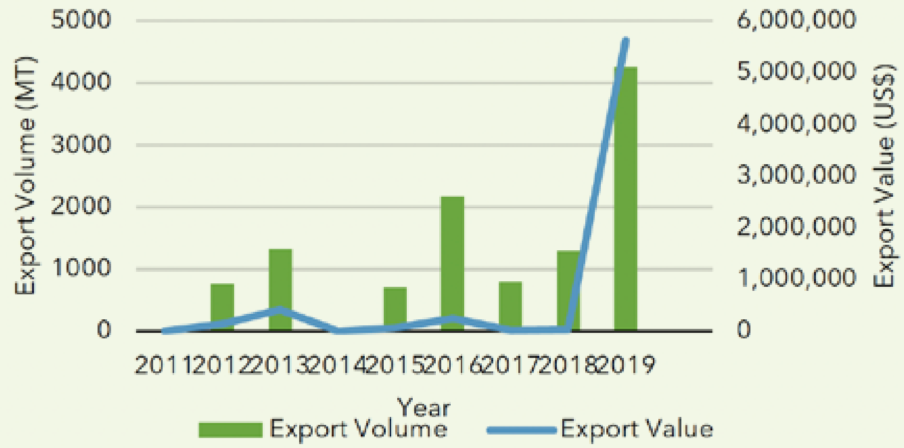
#### FIGURE 3.79. MARKET SHARES OF IMPORTING COUNTRIES IN THE PHILIPPINES' EXPORT VOLUME OF COCO TWINE, 2010-2016




Source: PCA and PSA

The volume of exports of husk cubes increased markedly from only 15 MT valued at US$ 4,654 in 2011 to 4,623 MT worth US$ 15,365 in 2019 (Table 3.56 and Figure 3.80). The country's highest volume of exports of husk cubes was in 2019. The lowest volume was in 2014 because of crop damage caused by typhoon Yolanda that hit Eastern Visayas.

## FIGURE 3.80. ANNUAL HUSK CUBES EXPORT PERFORMANCE, PHILIPPINES, 2011-2019




Source: PCA and PSA

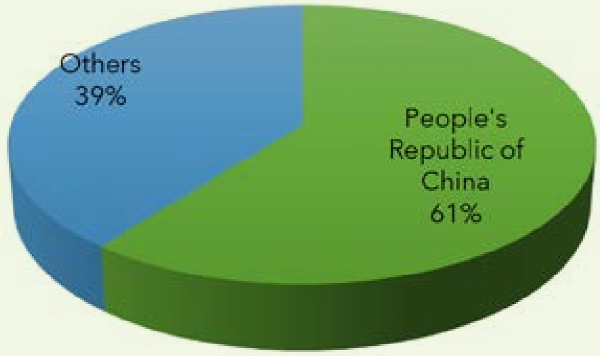
## TABLE 3.56. EXPORT VOLUME AND VALUE OF HUSK CUBES, PHILIPPINES, 2011–2019

| Year | Export Volume (MT) | Export Value (FOB $US) |
|---|---|---|
| 2011 | 15 | 4,654 |
| 2019 | 4,623 | 15,365 |
| **Annual Average (2011–2019)** | **1,033** | **596,097** |
| **Ave. Annual Growth Rate (2011–2019)** | **1,228** | **2,413** |

*Source: PCA and PSA*

Six countries imported husk cubes from the Philippines during the period 2011- 2019. The People's Republic of China was the leading buyer of husk cubes with a market share of 61% (Figure 3.81). Other shipments of husk cubes went to different importing countries such as Canada, Czech Republic, Taiwan, Egypt, Hong Kong, Indonesia, Italy, Republic of Korea, New Zealand, the Netherlands, Portugal, Spain, Switzerland, Thailand, Turkey, United Kingdom, and USA.

**FIGURE 3.81. MARKET SHARES OF IMPORTING COUNTRIES IN THE PHILIPPINES' EXPORT VOLUME OF HUSK CUBES, 2009–2019**




Source: PCA and PSA

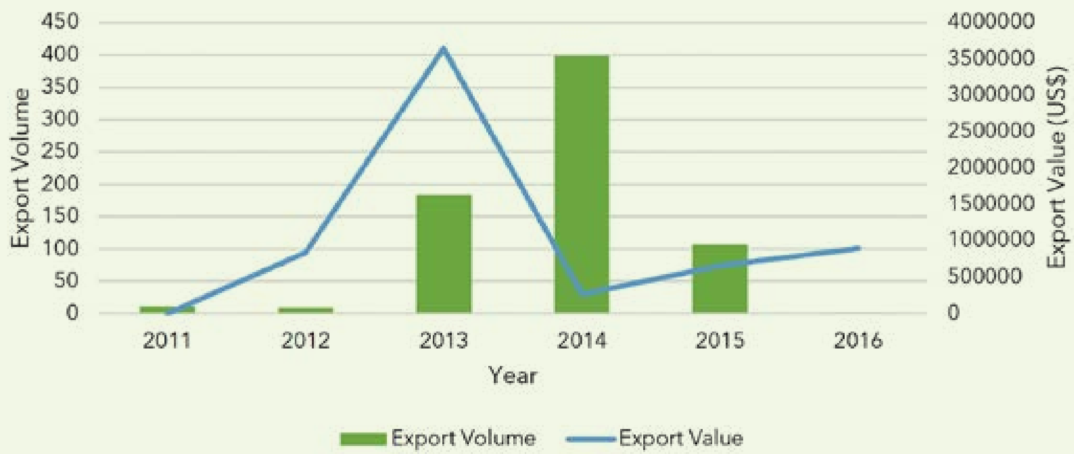
The volume of exports of coco pads/liners declined drastically from 11.60 MT worth US$ 12,044 in 2011 to only 1.32 MT valued at US$ 9,144 in 2016 (Table 3.57 and Figure 3.82). The highest export volume of coco pads/liners was in 2014 at 399 MT US$ 10.64 M of earnings. Starting 2017, the country stopped shipments of coco pads/liners to other countries.

**TABLE 3.57. EXPORT VOLUME AND VALUE OF COCO PADS/LINER, PHILIPPINES, 2011–2016**

| Year | Export Volume (MT) | Export Value (FOB $US) |
|---|---|---|
| 2011 | 11.60 | 12,044 |
| 2016 | 1.32 | 9,144 |
| Annual Average (2011–2016) | 65.00 | 1,747,066 |

*Source: PCA and PSA*

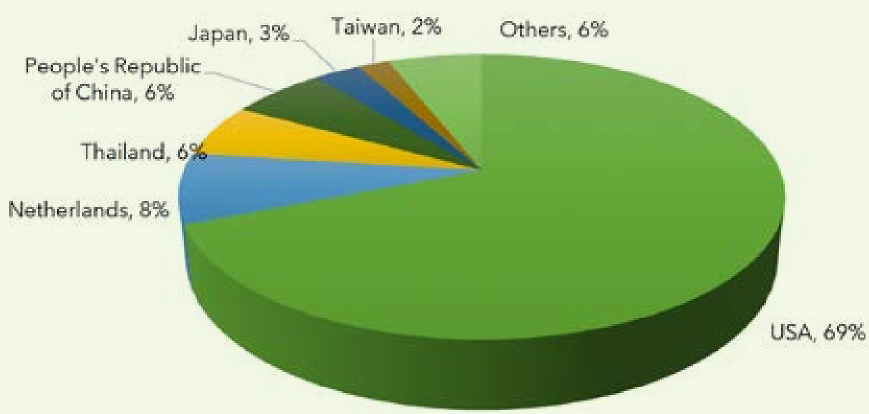
## FIGURE 3.82. PHILIPPINE EXPORT VOLUME AND VALUE OF COCO PADS/LINER, 2011–2016




Source: PCA and PSA

From 2011 to 2016, the country exported coco pads/liners to 20 countries, but shipments to some countries were not sustained. The United States was the country's major export market for coco pads/liners with 69% market share during the period 2011-2016 (Figure 3.83). The Netherlands (8%), Thailand (6%), People's Republic of China (6%), Japan (3%), Taiwan (2%), Singapore (1%), and the Republic of Korea (1%) trailed behind.

## FIGURE 3.83. MARKET SHARES OF IMPORTING COUNTRIES IN THE PHILIPPINES' EXPORT VOLUME OF COCO PADS/LINERS 2011–2016




Source: PCA and PSA

# Comparison of Domestic Copra Price among Major Trading Centers

The domestic price of copra varies among the country's major copra trading centers (Table 3.57 and Figure 3.84). During the period 2015–2019, the highest annual average domestic price of copra was registered in Quezon (PHP 35.01/kg), followed by Legazpi (PHP 33.65/kg), and Davao (PHP 33.34/kg). On the other hand, the lowest annual average domestic copra price in the same period was posted in Iligan (PHP 27.80/kg), followed by Zamboanga (PHP 29.76/kg). Meanwhile, the annual average domestic price of copra in Dumaguete and Cebu were the same (PHP 31.11/kg). The presence of a larger number of oil mills and refineries operating in the provinces of Quezon, Albay, and Davao that all require bigger volumes of copra as raw material in oil milling than those in Cebu, Negros Oriental, Lanao del Norte, and Zamboanga may account for the higher domestic price of copra in the trading centers located in Quezon, Legazpi, and Davao.

### TABLE 3.57. DOMESTIC PRICES OF COPRA IN MAJOR TRADING CENTERS, PHILIPPINES, 2015–2019

| Major Trading Areas | Domestic Price of Copra (PHP/kg) | | | | | Annual Average |
|---|---|---|---|---|---|---|
| | 2015 | 2016 | 2017 | 2018 | 2019 | |
| Quezon | 31.19 | 42.24 | 48.79 | 30.82 | 21.99 | 35.01 |
| Cebu | 27.56 | 38.43 | 44.52 | 26.55 | 18.50 | 31.11 |
| Cagayan de Oro | 29.15 | 40.36 | 46.43 | 28.35 | 19.83 | 32.82 |
| Davao | 29.60 | 41.13 | 46.93 | 28.55 | 20.49 | 33.34 |
| Legazpi | 29.85 | 41.37 | 47.72 | 29.24 | 20.09 | 33.65 |
| Dumaguete | 27.56 | 38.43 | 44.52 | 26.55 | 18.50 | 31.11 |
| Zamboanga | 26.15 | 37.36 | 43.23 | 25.24 | 16.83 | 29.76 |
| Iligan | 24.98 | 34.70 | 41.23 | 23.24 | 14.83 | 27.80 |

*Source: UCAP*

**FIGURE 3.84. ANNUAL AVERAGE DOMESTIC PRICES OF COPRA BY MAJOR TRADING AREA, PHILIPPINES, 2015–2019**


Source: UCAP

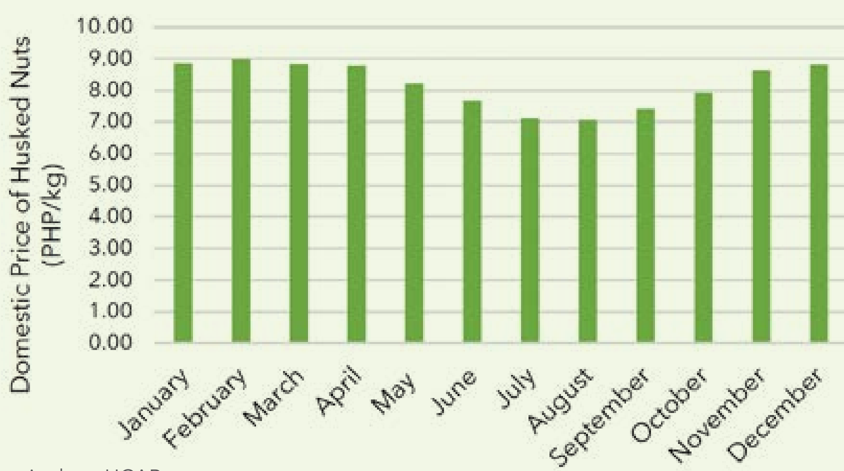
## Seasonal Price Trend of Copra and Husked Nuts

There is apparent monthly variation in the domestic prices of copra and husked nuts during the period 2015-2019 (Figures 3.85 and 3.86). From June to October, which are the rainy season months, the domestic prices of copra and husked nuts were very low compared with other months. This drop in prices could be attributed to high coconut production during the rainy season when there was sufficient water supply conducive for attaining higher coconut yield levels compared with the dry season months. For copra, the highest monthly average price during the five years under review was in January and April. Other months with high monthly average prices of copra were February, May, and December. For husked nuts, the highest monthly average price in the same period was in February, followed by January, March, December, April, and May.

## FIGURE 3.85. MONTHLY AVERAGE PRICES OF COPRA, PHILIPPINES, 2009–2019


Source: UCAP

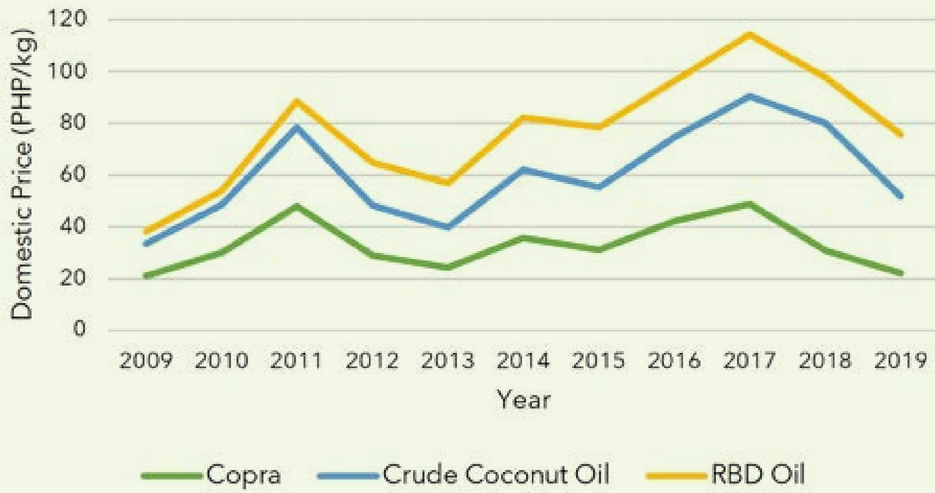
## FIGURE 3.86. MONTHLY AVERAGE PRICES OF HUSKED NUTS, PHILIPPINES, 2009-2019




Source of basic data: UCAP

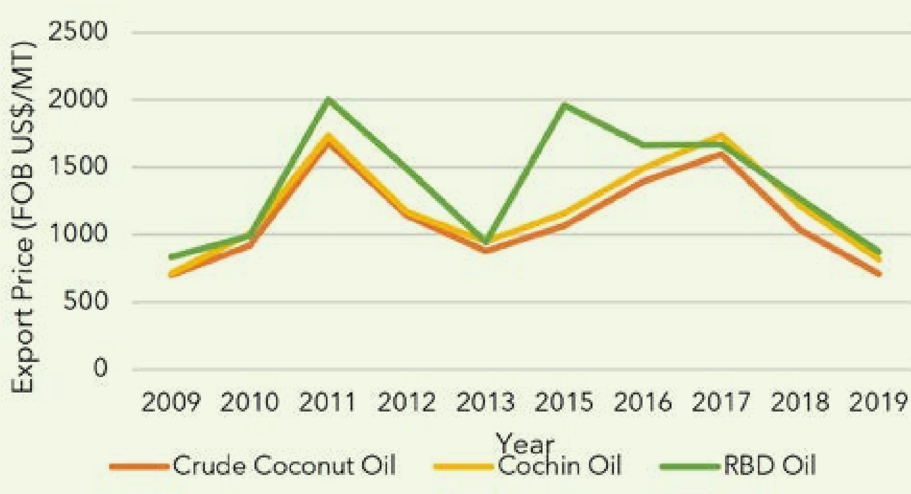
## Historical Price Trend of Coconut Products

**FIGURE 3.87. COMPARATIVE DOMESTIC PRICE TRENDS OF COPRA, CRUDE COCONUT OIL, AND RBD OIL, PHILIPPINES, 2009–2019**




Source of basic data: UCAP

**FIGURE 3.88. COMPARATIVE EXPORT PRICE TRENDS OF CRUDE COCONUT OIL, COCHIN OIL, AND RBD OIL, PHILIPPINES, 2009–2019**

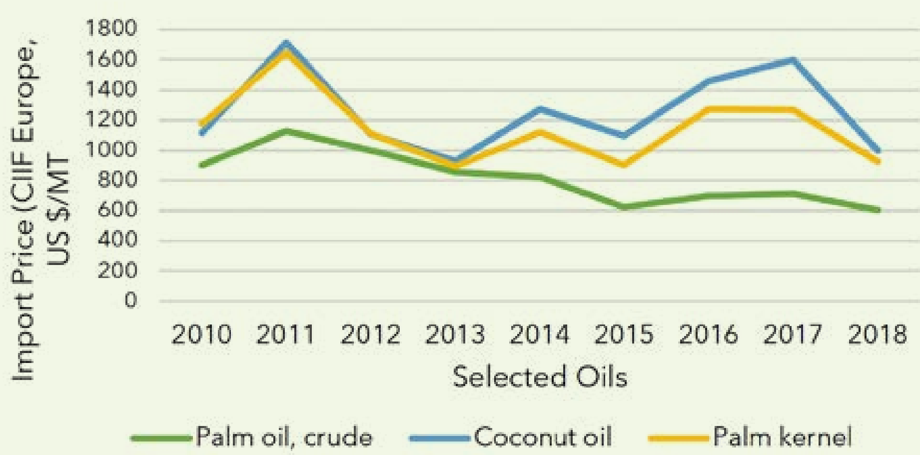



Source of basic data: UCAP

The fluctuation of domestic copra prices from 2009 to 2019 is cyclical (Figure 3.87 and Appendix Table 8) because the domestic copra price is dependent on the coconut oil price in the global market. The domestic and export prices of crude coconut oil and RBD oil follow the same cyclical trend for the same reason (Figure 3.88 and Appendix Table 29). The global coconut oil price, on the other hand, is determined or influenced by the supply and demand situation of other vegetable oils (e.g., palm oil, soybean oil, rapeseed oil, sunflower, palm kernel oil, etc.). Although the Philippines is the biggest exporter of coconut oil in the world, coconut oil is just one of the many vegetable oils produced and traded in the world market. Thus, its price is greatly affected by the movement of prices of other vegetable oils, particularly palm oil, which has the largest share among the internationally traded vegetable oils (Figures 3.89 and 3.90).

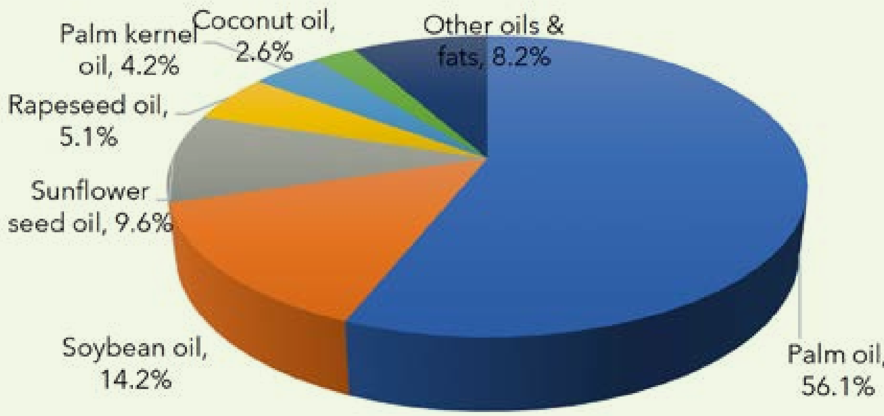
Coconut oil accounted for only 2.6% of the total world export volume of oil and fats during the period 2010–2019 (Figure 3.90) and ranked 6th after palm oil (56.1%), soybean oil (14.2%), sunflower seed oil (9.6%), rapeseed oil (5.1%), and palm kernel oil (4.2%). Coconut oil is a minority in the world oils/fats trade and only a price taker. It takes cue largely from price movements in the international market, notably in soybean oil and palm oil futures markets which, in turn, are also influenced by external factors such as the petroleum oil prices, financial markets, and global macroeconomic developments (Agustin, 2012). An oversupply of palm oil and soybean oil in the international market, which causes prices to drop, likewise leads to a fall in the price of crude coconut oil.

**FIGURE 3.89. COMPARATIVE PRICE (IN US$/MT) TRENDS OF SELECTED WORLD OILS, 2010–2018**




Source of basic data: UCAP

## FIGURE 3.90. AVERAGE ANNUAL PERCENTAGE SHARES OF SELECTED MAJOR OILS IN THE WORLD TOTAL EXPORT VOLUME OF OILS AND FATS, 2010–2019

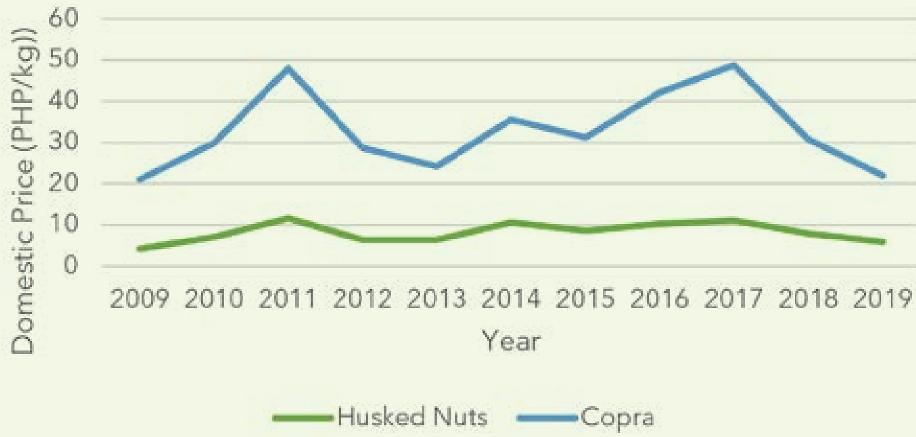



Source of basic data: UCAP

The  desiccated coconut industry is the country's biggest consumer of husked nuts, which are its raw material (Agustin, 2012). The price of desiccated coconut is influenced largely by the price of husked nuts which, in turn, is affected by the price  of copra. The domestic price of husked nuts follows the same cyclical trend as the domestic price of copra (Figure 3.91 and Appendix Table 8). Likewise, the trend in the export price of desiccated coconut follows the same price pattern for domestic prices of husked nuts and copra (Figure 3.92). As mentioned earlier, the price of copra tracks coconut oil prices. According to Agustin (2012), desiccators also watch coconut oil price movements since husked nuts account for over 75% of their processing cost.

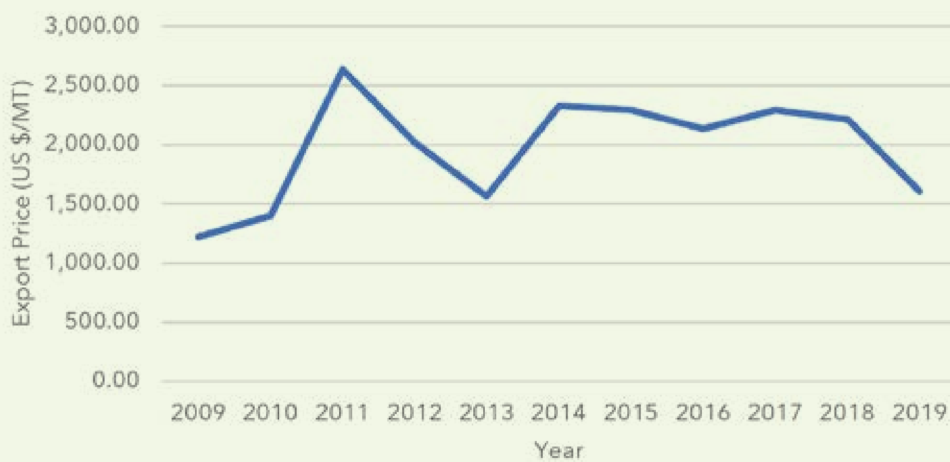
Although the domestic and export prices of desiccated coconut exhibited a cyclical price pattern, desiccated coconut posted positive average annual growth rates of 8.3% and 7.4% per year, respectively (Table 3.58).

## FIGURE 3.91. COMPARATIVE DOMESTIC PRICE TRENDS OF HUSKED NUTS AND COPRA, PHILIPPINES, 2009–2019



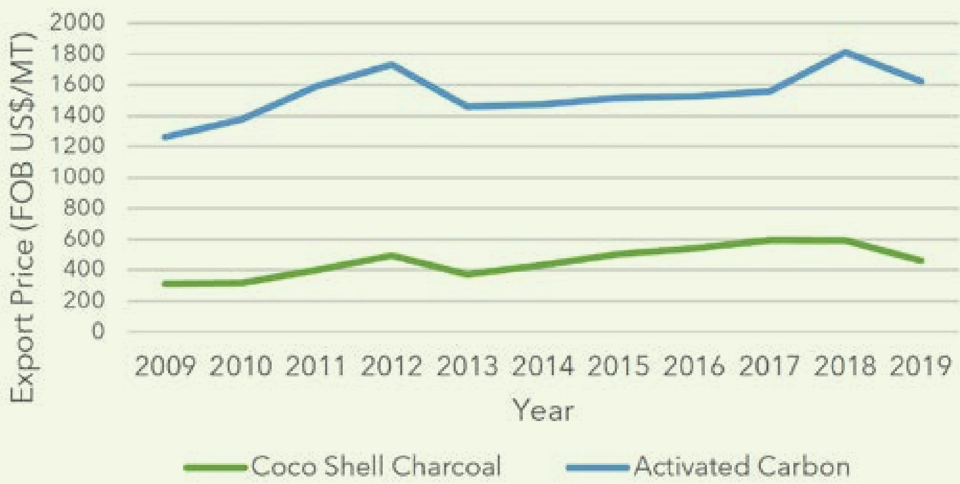

Source of basic data: UCAP

## FIGURE 3.92. EXPORT PRICE OF DESICCATED COCONUT, PHILIPPINES, 2009–2019




Source of basic data: UCAP and PCA

**FIGURE 3.93. EXPORT PRICE OF COCO SHELL CHARCOAL AND ACTIVATED CARBON, PHILIPPINES, 2009–2019**




Source of basic data: UCAP and PCA

The domestic price of copra meal increased from PHP 5.41/kg in 2009 to PHP 10.73/kg, or at an average annual growth rate of 9.5% per year (Appendix Table 11 and Table 3.58). Similarly, its export price grew by 6.6% per year, on average, from FOB US$ 116.28/MT in 2009 to FOB US$ 182.73/MT in 2019.

The export prices of coco shell charcoal and activated carbon have the same historical price pattern (Figure 3.93 and Appendix Table 12). The lowest export prices of both commodities were registered in 2013. During the 11-year period under review, the export price of coco shell charcoal, however, increased faster (5.5%/year, on the average) than the export price of activated carbon (3.0%/year).

The export price of oleochemicals exhibited an increasing trend (17.7%/year, on average) during the period 2009–2019 (Table 3.59). This trend was largely due to the positive growth rates in the export prices of crude and refined glycerin and coco acid oil. Coco methyl ester, one of the exported oleochemicals, posted a negative trend in export price (-0.3%/year, on average) during the period 2013–2019.

## TABLE 3.58. AVERAGE ANNUAL GROWTH RATES IN DOMESTIC AND/OR EXPORT PRICES OF TRADITIONAL COCONUT PRODUCTS AND RAW MATERIALS, PHILIPPINES, 2009–2019

| Type of Traditional Coconut Product/Raw Material | Average Annual Growth Rate (%) | |
|---|---|---|
| | Domestic Price | Export Price |
| Copra | 6.5 | - |
| Crude coconut oil | 10.5 | 6.5 |
| RBD oil | 11.0 | 9.7 |
| Cochin oil | - | 7.2 |
| Desiccated coconut | 8.3 | 7.4 |
| Copra meal | 9.5 | 6.6 |
| Coco shell charcoal | - | 5.5 |
| Activated carbon | - | 3.0 |
| Oleochemicals | - | 17.7 |

*Source of basic data: UCAP and PCA*

## TABLE 3.59. EXPORT PRICES OF COCO METHYL ESTER AND ALL OTHER OLEOCHEMICALS, PHILIPPINES, 2009–2019

| Year | Coco Methyl Ester Export Price (FOB US$/MT) | Oleochemicals Export Price (FOB US$/MT) |
|---|---|---|
| 2009 | - | 972.14 |
| 2010 | - | 1,096.76 |
| 2011 | - | 1,264.24 |
| 2012 | - | 1,790.67 |
| 2013 | 1,560.60 | 3,817.25 |
| 2014 | 2,170.81 | 1,038.82 |
| 2015 | 1,794.30 | 777.65 |
| 2016 | 1,552.85 | 611.52 |
| 2017 | 1,855.70 | 1,428.37 |
| 2018 | 1,592.49 | 1,679.10 |
| 2019 | 1,349.88 | 1,043.40 |
| **Ave. Annual Growth Rate (%)** | **-0.3** | **17.7** |

*ources of basic data: UCAP and PCA*

Among the non-traditional coconut products, virgin coconut oil commanded higher export prices than coco water during the 11-year period under review (Table 3.60). However, the export price of coco water increased much faster (7%/year, on average) than the export price of virgin coconut oil (3.2%/year, on average) in the same period. The country started exporting coco sap sugar and coco syrup/coco honey in 2013. The export prices of coco sugar and coco syrup/honey showed a declining trend at -10.5%/year and – 9.3%/year, on average, respectively (Table 3.60). This could be attributed to the practice of some Filipino exporters who imported low-priced coco sugar from Indonesia, mixed the high-priced organically produced coco sugar from the Philippines with the imported coco sugar and exported the repacked coco sugar at a lower price to other countries.

**TABLE 3.60. EXPORT PRICES OF VIRGIN COCONUT OIL, COCO SAP SUGAR, COCO SYRUP/COCO HONEY, AND COCO WATER, PHILIPPINES, 2009-2019**

| Year | Export Price (FOB US$/MT) | | | |
|---|---|---|---|---|
| | Virgin Coconut Oil | Coco Sap Sugar | Coco Syrup/ Coco Honey | Coco Water |
| 2009 | 2,674.58 | | | 621.12 |
| 2010 | 3,029.48 | | | 894.41 |
| 2011 | 4,672.83 | | | 792.83 |
| 2012 | 4,082.31 | | | 975.76 |
| 2013 | 3,986.55 | | | 975.52 |
| 2014 | 4,418.15 | | | 1,144.67 |
| 2015 | 4,348.44 | | | 1,115.37 |
| 2016 | 2,887.96 | | | 1,053.20 |
| 2017 | 2,576.23 | 3,809.11 | 3,995.35 | 1,013.71 |
| 2018 | 3,472.77 | 3,579.54 | 3,587.69 | 1,097.85 |
| 2019 | 2,760.76 | 3,041.02 | 3,289.47 | 1,101.65 |
| **Ave. Annual Growth Rate (%)** | **3.2** | **-10.5** | **-9,3** | **7.0** |

*Sources of basic data: UCAP and PCA*

Of the nine coir products that the country exported, only four were regularly shipped in international markets. These were coco peat, baled coir, coir dust, and coir husk cubes. The export price of baled coir rose from FOB US$ 176.23/MT in 2009 to FOB US$680.86/MT in 2019, or at average annual growth rate of 7.3% (Table 3.61). Coir husk cubes posted the highest average annual growth rate at 573.5% from FOB US$ 310.27/mt in 2011 to FOB US$ 1,317.71/MT in 2019. As regards coco peat, the export price of this coir by- product has been declining since 2017 and its export price in 2019 was only one-third of its previous export price at FOB US$ 184.53/MT in 2009. Similarly, the export price of coir dust has been decreasing since 2016 or for four consecutive years and its export price in 2019 (FOB US$ 224.02/MT) was 50% lower than its export price (FOB US$ 514.41/MT) in 2010.

## TABLE 3.61. EXPORT PRICES OF COIR PRODUCTS, PHILIPPINES, 2009-2019

| Year | Export Price (FOB US $/MT) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Coco Peat | Coco Twine | Baled Coir | Pads/ Liner | Coir Dust | Coir Husk Cubes | Coir Husk | Other Raw Coir Fiber | Other Coir Products |
| 2009 | 184.53 | - | 176.23 | - | - | - | 866.33 | 148.11 | - |
| 2010 | 206.02 | 2,087.50 | 225.25 | - | 514.41 | - | 950.52 | 207.92 | - |
| 2011 | 351.48 | - | 328.78 | 1,038.28 | 260.15 | 310.27 | - | 312.09 | - |
| 2012 | 164.16 | 1,226.85 | 477.93 | 1,592.00 | 570.67 | 189.41 | - | 313.07 | - |
| 2013 | 214.83 | 1,771.53 | 457.22 | 31,289.75 | 300.22 | 312.55 | - | 336.96 | - |
| 2014 | 189.22 | 2,429.69 | 247.60 | 26,677.71 | 587.93 | 598.08 | - | 275.09 | - |
| 2015 | 84.96 | 2,630.73 | 1,388.33 | 25,909.70 | 936.71 | 89.03 | - | 248.99 | - |
| 2016 | 91.03 | 3,175.07 | 1,809.37 | 6,927.27 | 572.80 | 111.14 | - | 271.37 | - |
| 2017 | 174.77 | - | 436.66 | - | 471.95 | 28.05 | 28.00 | - | 448.64 |
| 2018 | 60.54 | - | 313.91 | - | 343.63 | 28.00 | 28.00 | - | 279.95 |
| 2019 | 60.08 | - | 680.86 | - | 224.02 | 1,317.71 | - | 248.75 | - |
| Ave. Annual Growth Rates %) | | | 7.3 | | | 573.5 | | | |

*Sources of basic data: UCAP and PCA*

# ANALYSIS OF THE COCONUT INDUSTRY

## Value Chain Map of Coconut Industry Clusters

The Value Chain (VC) map consists of the different segments and functions performed by different players in the value chain. The value chain maps for different coconut industry clusters i.e., coconut oil, desiccated coconut, activated carbon, virgin coconut oil, coconut water, coconut sap sugar, and coco coir) shown in Figures 1 - 7 are made up of the following three inter-linked components: (1) the different players (i.e., input suppliers, inbound and outbound logistics service providers, coconut farmers, traders, and processors and the functions that they perform; (2) the business enabling environment (e.g., laws, regulations, and policies) that may facilitate or hinder the performance of the value chain; and (3) support service providers (i.e., financial and non-financial service providers) that support the operation of the value chain.

The functions of the key players in each coconut commodity value chain which cover input provision, inbound logistics, production, marketing, processing, and outbound logistics/distribution are described and discussed briefly below.

# Inputs

Farm inputs in coconut production include coconut seedlings, fertilizers, pesticides, and farm tools and equipment. The coconut farmers' sources of coconut seedlings are the PCA, traders, and their own farms. Under its Coconut Seedlings Dispersal Project, the PCA distributes good quality coconut seedlings to coconut farmers or groups of coconut farmers for planting or replanting. Moreover, qualified farmer- participants are given by PCA Php 40.00 for every good seedling produced, transplanted, and stabilized in their own farms under the agency's Participatory Coconut Planting Project. In addition, the Agrikulturang Pantawid Pamilyang Pilipino Program (A4Ps) Coconut Planting Program, which is a collaborative undertaking among DA, DSWD, and the PCA, is also being implemented in some provinces in the country. In this program, PCA provides coconut seedlings sourced from the nursery established solely for this purpose to the farmer-participants previously identified by the DSWD field offices. The DSWD pays the farmers Php 225.00 per day for a maximum of 11 days covering the period spent for land preparation, holing, staking, transplanting, and initial care and maintenance activities (PRDP 2013).

Currently, there are seven (7) coconut seedling traders operating in the country. Moreover, the coconut farmers use coconut seedlings from their own farm for planting in their expansion areas or for replanting to replace senile trees. They leave some of their harvested mature nuts to grow into coconut seedlings to be used as their planting material. The PCA also distributes agricultural grade salt fertilizer and coir-based organic fertilizer to coconut farmers. Inorganic fertilizers and other farm chemicals such as insecticides are sourced from agricultural input supply/general merchandise stores in their municipality. Few coconut farmers apply inorganic fertilizers, and the latter are generally applied on the intercrops planted under coconut. Insecticides are only applied whenever there is pest infestation. Simple farm tools are sourced from the public market and input stores.

# Inbound Logistics

Inbound logistics service providers render services such as sourcing or buying, transporting, and delivery of coconut seedlings, material inputs, farm tools and equipment from sources of these farm inputs to the coconut farm. The use of a tricycle is the most common mode of transport of coconut farmers in procuring fertilizers, other farm chemicals and simple farm tools and equipment. Trucks and/or big vans/jeepneys are usually used by the PCA and private traders in transporting and delivering many coconut seedlings to the coconut farms. In island municipalities, coconut seedlings are transported via water mode of transport (e.g., by boat or ship) for distribution to coconut farmers.

# Production

The players in coconut production are coconut farmers. PCA defines a coconut farmer as:

Farm owner: owns and tills the farm by himself and/or with assistance of farm laborers and/or tenants.

Farm tenant: tills, harvests, and processes the coconut product and is compensated in the form of the produce which he sells as his/her own. Under leasehold tenancy, the cost of rental land is 25% of gross sales of copra.

Farm worker: works in the coconut farm for wages or in-kind compensation. For example, a hired laborer applying and hauling fertilizer is paid based on a daily wage while for some farm operations, the "pakyaw" method of payment is practiced wherein a hired laborer performing other tasks such as nut picking, piling of nuts, dehusking and copra making is paid for every 1,000 nuts. Coconuts are harvested by hired workers either by climbing the tree themselves or by using a long bamboo pole with a knife sickle or iron hook attached to its end to pluck the coconuts from the tree top.

In the coconut sugar value chain cluster, the tappers are paid per liter of the collected sap. Coconut sap collection is labor intensive and requires climbing the tree every 4-5 hours interval depending on the height of the trees entailing higher cost (Manohar 2021). A hired cook (i.e., usually the wife of the sap tapper) who processes coconut sap into syrup is paid by the farm owner on per liter of the cooked syrup. Coconut sap sugar processors are paid on a daily wage per kg of coconut sap sugar processed as workers in the processing plant.

Coconut farmers produce copra for oil mills and/or sell husked mature nuts to processors of desiccated coconut and virgin coconut oil as well as young nuts to processors of pasteurized coconut water and to traders of consolidators of the coconut processing companies. Some of these farmers sell coconut sap instead of nuts to coconut processors. Farmers also sell coconut by-products such as husks and coconut shells/charcoal for coco coir and activated carbon processing, respectively, to augment their household income.

# Marketing and Trading

In the coconut oil value chain cluster, large assemblers/consolidators are contracted by oil mills to consolidate the supply of copra through a network of traders/market intermediaries to whom they give money for cash advances. Oil mills and the oil mills' buying stations generally give price premium prices to large assemblers/consolidators who have access to high volume of copra with good quality (Idrovo, et al. 2006). Usually, the large assemblers/consolidators have short-lived contracts (i.e., 30 days) with municipal/city copra traders. They usually set the price of copra for both the traders and the farmers. The municipal/city traders, in turn, buy copra from village traders and do further drying of copra purchased from the latter. Village traders buy low-grade copra from the farmers which they subject to further drying. They adopt the "pasa" system of copra buying where a discount on the copra price is based on moisture. A discounted price is given to copra with 20-25% moisture content. The village traders determine the moisture content visually or by cracking or splitting the copra by hand and feeling due to lack of moisture meters. The farmers either deliver copra to a nearby warehouse near the farm or sell copra on picked up method.

As regards the desiccated coconut value chain cluster, large desiccated coconut processing plants have several strategically located trading or buying stations where farmers and independent traders can directly deliver the husked nuts. Most of the desiccated coconut processing plants use a network of consolidators, traders, and farmers in husk nut procurement (Costales 2019). The desiccated coconut processing companies give financial advances to preferred consolidators so they can provide credit (interest free and collateral free) to their trader-agents and farmer suppliers to ensure cornering future deliveries. Moreover, the desiccated coconut processing plants only procure what is needed for a particular day of operation because any delay in delivery will cause a shrinkage loss of 3.5% of the weight of the nut per day and deterioration of coconut water.

In the coco shell charcoal-based activated carbon value chain cluster, coco charcoal traders act as supply consolidators of coco charcoal. Their buying system is on per-kilogram basis and on-the-spot cash transactions (Idrovo, et al. 2006). Big charcoal traders maintain a network of smaller charcoal buyers from whom they source charcoal for bulk trading. Big traders who supply charcoal to an activated processing plant impose quality specifications and apply discount factors for the presence of moisture, ash, and debris. Since activated carbon plants prefer charcoal with 80% or higher carbon content, the traders' buying price is dependent on their estimated recoverable carbon content of the charcoal that they will purchase. Some traders use a rough system of classifying charcoal: Class A for charcoal produced using the drum method or concrete pit, Class B for charcoal produced from the traditional pit dug in the ground, and Class C for charcoal produced using the open fire method. There are also some big charcoal traders who provide the equipment such as drums or dehusking tools to its farmer-suppliers to maintain stable volume supply and buy charcoal on a per kilo basis. The trader retrieves these equipment if the farmer stops producing charcoal. Meanwhile, the coco shell charcoal-based activated plants source their charcoal requirements directly from farmer-charocal processots and charcoal traders.

The existing marketing system of husked mature nuts in the virgin coconut oil value chain cluster is the same as that of the desiccated coconut value chain cluster considering that the virgin coconut oil processors and the desiccated coconut processing plants have the same suppliers of husked mature nuts. Aside from traders, the virgin coconut oil processors directly buy husked mature nuts from farmers or procure nuts from their own or leased farms, or purchase fermented virgin coconut oil from village intermendiate processors as raw materials for further processing.

In the coconut sap sugar value chain cluster, there are no traders nor consolidators of coconut sap as raw materials because of the small volume of production, inherent perishability of coconut sap, and the difficulty of coordinating sap harvesting and processing (Costales 2019). Coconut sap cannot be traded because of the technical requirement of maintaining a certain pH not lower than pH 5 (Manohar 2021). If the required pH level is not met, coconut sap cannot not be processed into coconut sap sugar since it will become acidic due to fermentation.

A big wholesaler with a network of small assemblers/traders from different provinces is the major supplier of young nuts of the pasteurized coconut water processing company. Marketing of mature nuts as a source of coconut water beverage has been previously discussed under the desiccated value chain cluster.

As regards marketing/trading of raw materials (coconut husks) in the coco coir value chain cluster, consolidators/integrators and traders are the sources of coconut husks of few coir processors. The husk consolidators are the buying agents of a coir processing plant. Most of the coir processing plants source out coconut husks primarily from individual farmers. There are few coir processing plants which have its own coconut farms to supply coconut husks.

## Processing

***Oil Mills and Refineries.*** The major players in the coconut oil processing sector are oil mills and refineries with different production capacities. There are 32 small oil mills that have capacities ranging from 30 MT to 130 MT of copra per day and sell their outputs (i.e., crude coconut oil and copra cake) to the domestic market (Costales 2019). They procure their copra supply directly from small traders (e.g., village and municipal traders) who buy directly from farmers (Ildrovo, et al. 2006). Large oil mills have capacities of more than 130 MT of copra per day. These oil mills export crude coconut oil and/or supply the crude coconut oil requirements of oil refineries, oleochemical plants, and CME companies (Costales 2019). Some of the big oil mills are vertically forward integrated into refining and oleochemical and biodiesel processing.

***Desiccated Coconut Companies.*** Desiccated processing companies in the Philippines have become integrated producing multi-products from a whole nut such as low-fat desiccated coconut, coconut flour, coconut cream/milk, coconut water, paring cakes, paring oil, and virgin coconut oil (Costales 2019). Some desiccated coconut processing companies produce charcoal and activated carbon from coconut shells which they also use as fuel for their boilers. Bulk of their desiccated coconut outputs are shipped to the export market.

***Coconut Shell Charcoal Processors and Activated Carbon Manufacturing Companies.*** Coco shell charcoal processors operating in the country are composed of: (1) coconut farmer-charcoal processors; (2) micro-scale charcoal processors; (3) cooperative charcoal processors; and (4) small-to-large scale charcoal plants. Coconut farmer-charcoal processors employ either the open pit or drum method to process coco shells into charcoal which they sell to rural traders, transporters, and households in the locality. Some farmers also sell charcoal directly to retailers in public markets, activated carbon plants, and oil mills (Idrovo, et al. 2006). An example of a cooperative charcoal processor is the Baybay Cooperative in Leyte which buys coco shells from its members and processes the coco shells into charcoal in its concrete charcoal pits using improved procedures. The cooperative also acts as buyer of coco shell charcoal from its members and non-members. The coco shell charcoal that the cooperative produce and the coco shell charcoal it purchases are sold to a local trader who is, in turn, a supplier of coco shell charcoal to an activated carbon plant. Micro- scale charcoal processors are household charcoal processors that typically employ the drum method in producing charcoal and sell their charcoal output to public market outlets (Ildrovo, et al. 2006). Meanwhile, small-to large-scale charcoal processing plants have production capacity ranging from 120 MT to 252,974 MT per year. As mentioned earlier, eight of the coconut shell charcoal processing plants are vertically integrated and supply their coco shell charcoal outputs to their activated carbon processing plants. Seven of the 15 coco shell charcoal processing plants export their products abroad mostly to China and Japan. Three of the 14 activated charcoal plants operating in the country are either fully or partially owned by Japanese companies. The conventional method of activated carbon production is energy intensive and requires large amount of capital including operating costs (Idrovo, et al. 2006). The outputs of the coco shell charcoal- based activated carbon plants are mainly geared towards the export market.

***Virgin Coconut Oil.*** Virgin coconut oil processors operating in the country are comprised of: (1) village or micro-scale level intermediaries: (2) SME VCO processors; (3) cooperative/association VCO processors; and (4) integrated DCN-VCO processing companies. Village level intermediaries produce and sell raw fermented VCO to some small- and medium-scale VCO processors who improve and standardize product quality using the centrifuge technology to meet the high-quality standards of the export market (Costales 2019). The small- to medium-scale enterprises who export their VCO products practice backward linkaging to have an assured supply of raw VCO from village-level or micro-scale VCO processors to comply with the volume requirements of foreign buyers. The VCO products of the small- to medium-scale VCO processor- exporters are certified organic and they operate their processing plants with food safety and traceability certifications. As regards VCO produced by a cooperative/association, the members participate in processing the product as a group. Currently, two of the six cooperative/association-VCO processors operating in the country are exporting VCO abroad. The integrated DCN-VCO processing companies have larger capacities for mass production of good quality VCO using the wet-dry method and have product certifications such as organic, non-GMO, and fair-trade. All the types of VCO processors also cater to the domestic market.

***Coconut Water Processing Companies.*** Coconut water processors are composed of integrated desiccated coconut companies that process coconut water beverage and coconut water concentrate using mature nuts and companies that produce pasteurized coconut water using young coconuts.

***Coconut Sugar Processors.*** Coconut sugar processors include integrated coconut processing companies, cooperative/association-based coconut sugar processors, independent MSME-processors, and LGU-led coconut sugar processors' association. Some MSMEs lease farms and source coco sap from their own farms to have control of sap supply and get organic certification (Costales 2019).

There are two levels of processors, the sap to syrup processor and the syrup-to sap sugar processor (Manohar 2021). The syrup is utilized for coco nectar and production of aminos in some areas in Northern Mindanao and Davao del Sur or serves as the primary raw material for coconut sap sugar production which is a common practice in Southern Luzon. Processors directly process the sap into coco sugar and/or procure coco syrup from village level processors which is then processed into coco sugar (Costales 2021). The village level processors are micro- and small-scale entrepreneurs and farmers who get their sap from their own farm, other farmers and/or sap collectors and forward integrate by producing coconut syrup. They supply coconut syrup to a processor-exporter for coconut sap sugar production. There are also processors who backward integrate by operating their own farm and leased lands from absentee landlords and farmers and hiring tappers to collect sap from both farms. Currently, there are six cooperative-coconut sap sugar processors in the country which are operating in Davao Oriental and South Cotabato, one of which is already exporting coconut sap sugar abroad. An example of an LGU-led coconut sugar processors' association is the Kaanib Association in Alabat Island wherein coconut sap sugar products of individual members are consolidated by the association for packing and labeling, and marketing is done with the help of the municipal LGU.

***Coco Coir Processors.*** For basic coir processing, the major players are decorticators/ baled fiber producers. Regarding secondary coir processing, these include the following: (1) twines and coconut nets/coco fascines producers; (2) twines and coconut nets producers; (3) stitched mats producers; (4) rubberized mats producers; (3) Gifts, Decors and Houseware (GDH) producers (coir pots, door mats, and tuffed mats); and (4) coco peat producers (peat blocks, loose form grow bags and input to organic fertilizer). Medium-sized coco coir processors in the country mainly process coconut husks into coco coir and coco peat (Costales 2019). Most of the coir processing companies pass on the processing of coir fiber into twine, geotextile nets, geo logs, and mats to micro-enterprises or village level enterprises. Some of these companies, however, have in-plant twine making and weaving.

## Outbound Logistics/Distribution and End Markets

Outbound logistics service providers render transportation, storage, and delivery services to bring the coconut products of processors to their customers in the domestic and or export market. These are companies that specialize in offering storage, warehousing packing, land transport, and shipping services, among other outbound logistics services that will facilitate product delivery to final customers. Usually, processor-exporters incur additional costs such as trucking, handling, storage, and shipping costs as well port charges.

Most of the oil mills, refineries, and desiccated coconut processing companies directly export their coconut products. Some of them rely on trader-exporters and broker-exporters to distribute and export their products abroad. Broker-exporters are responsible for connecting the processors to and moving their products to export markets (Costales 2019). Trader-exporters buy from processors to consolidate deliveries to importers. Regarding activated carbon processing companies, they generally take charge of exporting their products abroad because their product is classified as a dangerous good by shipping companies. In the domestic market, local distributors distribute RBD oil as cooking oil to institutional buyers (i.e., supermarkets). Crude coconut oil is sold to oleochemical/CME companies to produce more value-added products.

For VCO produced by MSMEs for the domestic market, local distributorship is common. Their VCO products are sold in retail stores, drug stores, and "pasalubong" (souvenir) centers in the local market. The DCN-VCO processors also directly export and at the same time rely on trader-exporters and broker-exporters to distribute their products for export. The trader-exporters usually buy raw VCO which are packed in bulk (Costales 2019). The broker-exporters, on the other hand, link with preferred processors who produce VCO in private label and in bulk. In the private label export, the broker-exporter relays to the VCO processor the quality specifications, packaging/ packing, certifications, volume, and schedule of deliveries required by the buyer. Most small- to medium-scale enterprises directly export their VCO products because their small processing capacity limits their ability to transact with more buyers (Costales 2019).

Like the VCO processors, the coconut water processors directly export and/or indirectly export their coconut water and/or coco water concentrate products. In the latter, they tap broker-exporters who act as agents of importers (Costales 2019).

As regards the coconut sap value chain cluster, only a small proportion of the country's coconut sap sugar production is sold in the local market. Retailers serve as distributors in the local market (Manohar 2021). Local brands of coconut sap sugar are available in supermarkets, but its retail price is higher than that of muscovado sugar. Some retailers buy unbranded coconut sap sugar, and they provide their own branding and labels.

Coco sap sugar produced by members of a cooperative or KAANIB association is consolidated by the association or the municipal LGU before marketing. Traders buy the consolidated coco sap sugar products of the cooperatives/associations and the coco sap sugar products from individual small-scale coconut sap sugar producers for consolidation to comply with the exporters' quality and volume requirements (Manohar 2021). Coconut sap sugar is exported in retail packs with private label and seldom in bulk packed in plastic or steel drums (Costales 2019). Most coconut sap sugar processors export their own products because broker-exporters are discouraged to include coconut sap sugar in their product portfolio due to the smallness of the size of the market. The trader-exporters buy from coconut sugar processors to consolidate supply for large volumes. Meanwhile, the broker-exporters act on behalf of importers and usually buy private label coconut sap sugar. Bulk purchase of coconut sap sugar is not common.

As regards coir products, these products are traded locally and internationally. The domestic market outlets in the domestic market are the Department of Public Works and Highways (DPWH), the National Irrigation Administration (NIA), and mining companies which make use of geotextile nets, rolls, mats, and geo logs as protective cover for soils and slopes to prevent soil erosion; households for tufted mats, rubberized mats, and door mats; and local farms, commercial gardens, and nurseries for coco peat products and coco pots as growing medium for landscape plants and grasses. Sale of coir products intended for the domestic market is done through local distributors who provide transport and warehousing logistics services. For coco coir products (e.g., coco coir/peat products) that are geared towards the export market, distribution is done by trader-exporters and traders/consolidators/broker-exporters who act as agents in distributing the products to importing countries. Some coir processors directly export their products to importing countries.

The business-enabling environment covers relevant government legislations and government policies that have either facilitated or hindered the development of the coconut industry. These government policies are discussed in detail in Chapter 10. From the private sector, the different member associations of the United Coconut Association of the Philippines promote policy advocacy related to important issues and problems that need to be addressed by the government concerning their value chain commodity cluster. These associations are the Philippine Coconut Oil Producers Association, Inc.

(PCOPA), Coconut Oil Refiners Association (CORA), Association of Philippine Desiccators (APCD), Virgin Coconut Oil Producers and Traders Association of the Philippines (VCOP), Philippine Activated Carbon Manufacturers Association, Inc. (PACMA), and Philippine Oleochemical Manufacturers Association (POMA).

Support services enable the different functions or vertical linkages in a value chain (e.g., financing, research, development and extension, marketing, financing, and other support services). Support services are provided by the national and regional government agencies, credit and research institutions, LGUs, SUCs and NGOs, among others aimed at assisting value chain stakeholders to achieve their specific enterprise objectives and goals.

The following are the main agencies providing support services to the coconut sector:

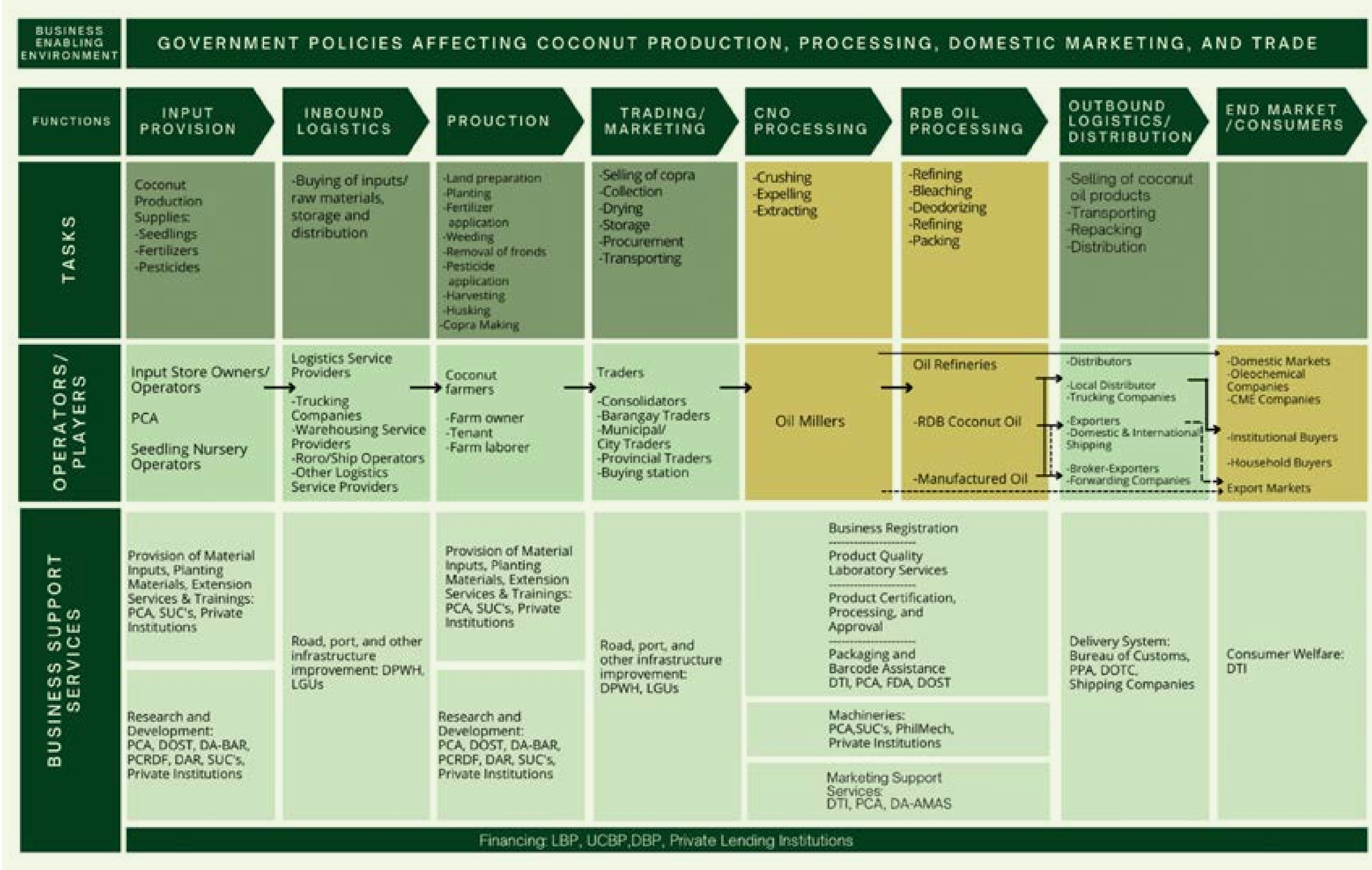
| Agency | Functions/Services |
|---|---|
| Philippine Coconut Authority (PCA) | Sole government agency tasked to develop the industry to its full potential in line with the new vision of a united, globally competitive, and efficient coconut industry.<br><br>The PCA mandate is operationalized through programs and projects conducted nationwide. These programs and projects are grouped into three strategic thrusts or key areas:<br><br>• Poverty reduction and empowerment of the poor and vulnerable through the KAANIB Enterprise Development Projects (Coconut Intercropping and Community/Household-level Coconut Processing)<br>• Rapid inclusive and sustained economic growth (KAANIB Coconut Hub, Investment and Market Promotion, Research and Development, and Farm-to-Market Road Development Project)<br>• Integrity of the environment and climate change mitigation and adaptation (Accelerated Coconut Planting and Replanting, Maintenance of Coconut Seed Farm, and Regulatory Services)<br>PCA provides chemical and microbiological analyses of coconut products and by-products and is responsible for the issuance of export and commodity clearance and certificates of registration to processors, traders, and exporters. |
| Department of Science and Technology (DOST) | • There are three institutes under the DOST which conduct research on coconut, namely, FPRDI, ITDI, and FNRI. FPRDI conducts research on utilization of coconut wood, shell, and coir. ITDI conducts various studies on coconut processing for food and industrial uses. FNRI works on |

| Agency | Functions/Services |
| --- | --- |
| | nutrition-related issues concerning coconut consumption.<br>• DOST-SETUP for MSMEs: 1) seed fund for technology acquisition, (2) needed equipment and equipment upgrading, (3) technical trainings and consultancy services, (4) packaging and label design, (5) database information systems, and (6) support for establishment of product standards, including testing, and calibration of equipment. |
| Department of Trade and Industry (DTI) | • Product and market development<br>• Packaging and barcoding assistance<br>• Investment promotion<br>• Establishment of Negosyo Centers for business registration, advisory and information assistance<br>• Lead agency – One Town One Product program<br>• Shared Facilities Program – provides MSMEs with machinery, equipment, tools, systems, skills and knowledge under a shared system<br>• DTI Financing Programs for SMEs<br>• Conduct of Trade Fairs<br>• Consumer Protection |
| Department of Agrarian Reform (DAR) | • Tenurial issues and distribution of lands under the Comprehensive Agrarian Reform Program (CARP)<br>• Provision of production and other support services to CARP beneficiaries |
| Department of Agriculture (DA) | • Management and implementation of donor-funded coconut programs (special projects)<br>ATI – conducts farm business school trainings, and season-long<br>trainings for coconut farmers<br>AMAS – provides market linkaging assistance and other market<br>support services (trade fairs, etc.)<br>• DA has been supporting the certification of coconut farms as organic and GAP compliant through the FDA and DOST by subsidizing the cost for three years. |
| PHilMech, DA | • Developed coconut water extractor and pasteurizing machine |
| State Universities and Colleges (SUCs)<br>- University of the Philippines Los Baños (UPLB) | • R and D on coconut; some extension services. |
| - Leyte State University (LSU) | • The National Coconut Research Center (NCRC) for the Visayas located at LSU spearheads coconut R&D efforts in the Visayas. It is mandated to generate and disseminate appropriate technologies that will augment the coconut |

| Agency | Functions/Services |
| --- | --- |
| | farmers' income and uplift their general well-being. The Center has four major research thrusts, namely:<br>1. crop improvement<br>2. cultural management and multiple cropping,<br>3. processing and utilization, and<br>4. socioeconomics and extension |
| - University of Southern Mindanao (USM)<br>- Others | |
| **Private Sector** | |
| - Philippine Coconut R and D Foundation, Inc. (PCRDF) | • PCRDF was established to spearhead coconut R&D through research, human resources training, and technology transfer. It provides funds for both basic and applied research in coconut production and utilization, and socio-economic and policy studies on the coconut industry. |
| - United Coconut Planters Bank-Coconut Industry Investment Fund (UCPB-CIIF) | • UCPB-CIIF: source of research funding from the private sector; has livelihood projects and scholarship grant for children of coconut farmers. May also be tapped to provide possible credit or loans to coconut farmers and associations who will venture in coco husks value-adding activities. |
| - United Coconut Association of the Philippines (UCAP) | • UCAP: conducts research on coconut. It also regularly publishes the *Coconut Statistics* yearly, *Coconuts Today*, and the *UCAP Weekly Bulletin*. These publications contain research outputs, information about the world coconut production and market situation, current statistics on international and domestic prices, and the volume of export of various coconut products. |
| Financial Institutions | • Microfinance services |
| - Land Bank of the Philippines (LBP) | • Currently implementing its financing window, the Agricultural Credit Support Project, which offers agricultural production loans; rediscounting line; short-term and medium loans. Developing new lending approaches and methodologies that suit the requirements and characteristics of small farmers, cooperatives, and micro, small and medium enterprises for production, working capital, and acquisition of fixed assets as well as micro-lending. |
| - Development Bank of the Philippines (DBP) | • Its Agribusiness Development Program applies to all agricultural loans including production, post-harvest, agri-processing, marketing under retail lending or relending under its wholesale facilities. Its retail lending for micro |

| Agency | Functions/Services |
|---|---|
| | and small enterprises covers both start-up and existing enterprises with loan requirements of at least PHP 300,000 but not over PHP 10 million. |
| Local Government Unit (LGUs) | • Provides soft loans to community-based enterprises in the amount of PHP 100,000<br>• Extends extension services thru LGU-hired agricultural technicians<br>• Responsible for local or rural road construction and maintenance |
| Philippine Ports Authority (PPA) | • Simplifies business transactions in the ports<br>• Concerned with the planning and development of the country's seaports |
| Department of Public Works and Highways (DPWH) | Undertakes: (a) the planning of infrastructure, such as national roads and bridges, flood control, water resources projects and other public works, and (b) the design, construction, and maintenance of national roads and bridges, and major flood control systems. |

FIGURE 4.1. VALUE CHAIN MAP OF THE COCONUT OIL VALUE CHAIN CLUSTER



## FIGURE 4.2. VALUE CHAIN MAP OF THE DESICCATED VALUE CHAIN CLUSTER

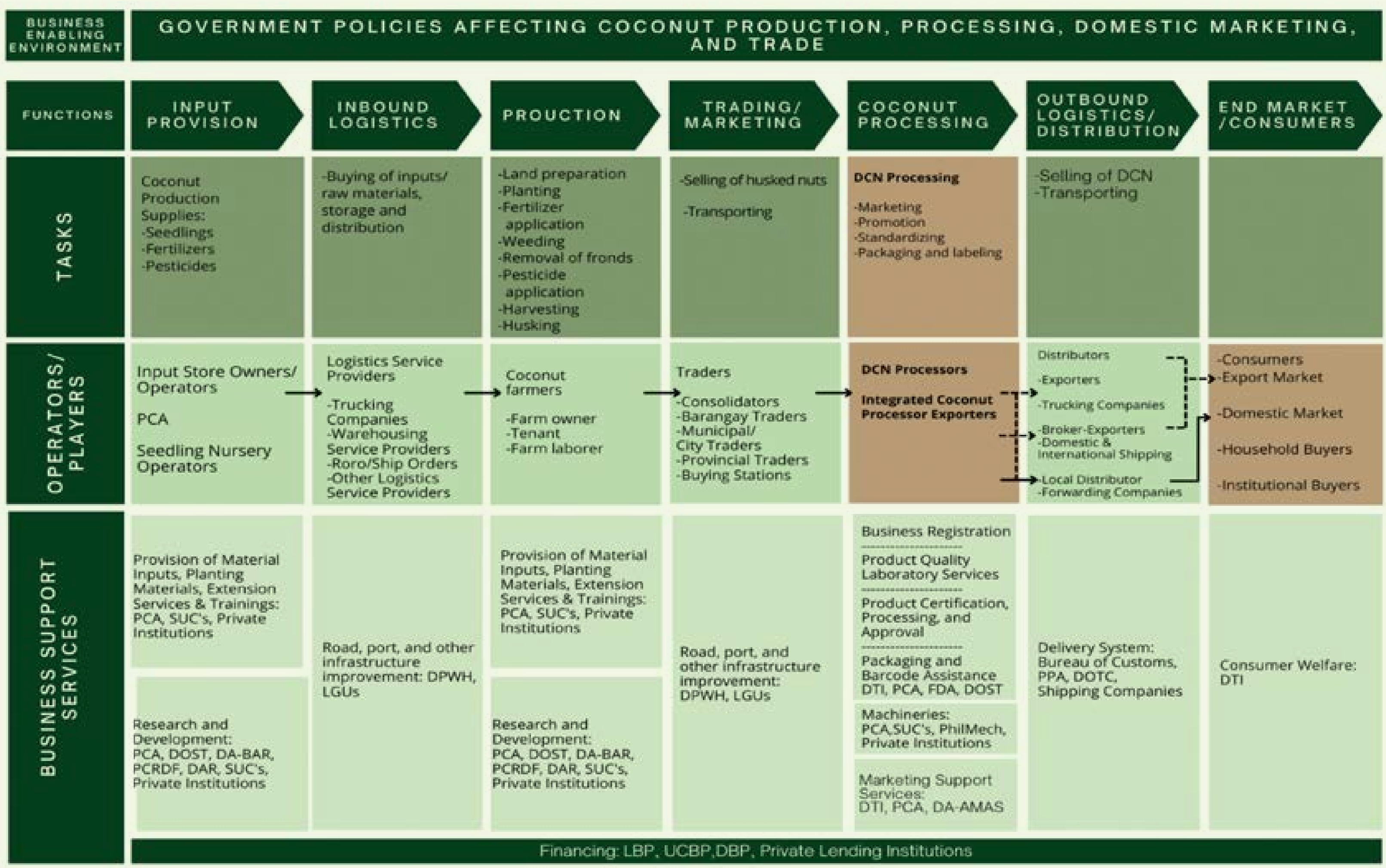
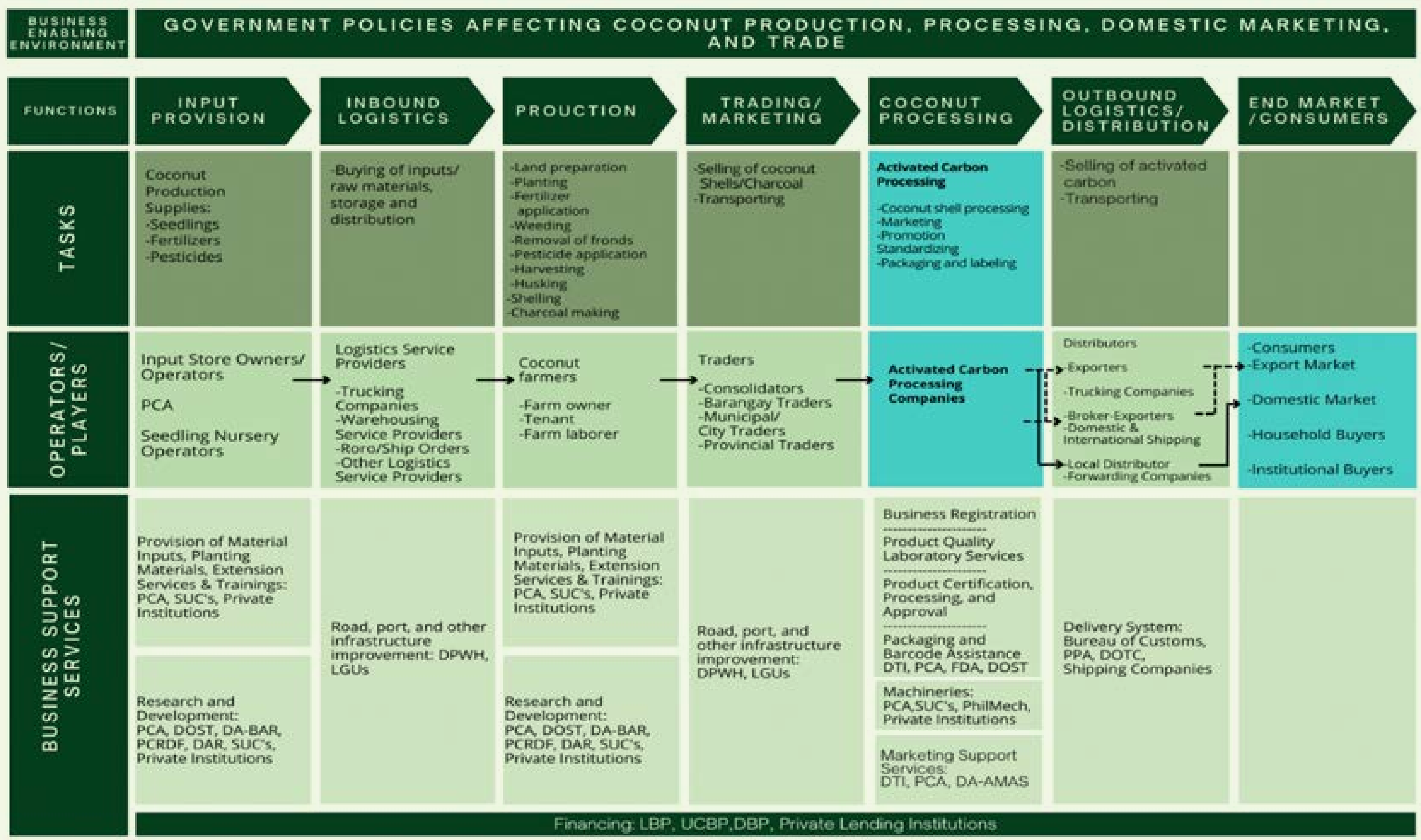


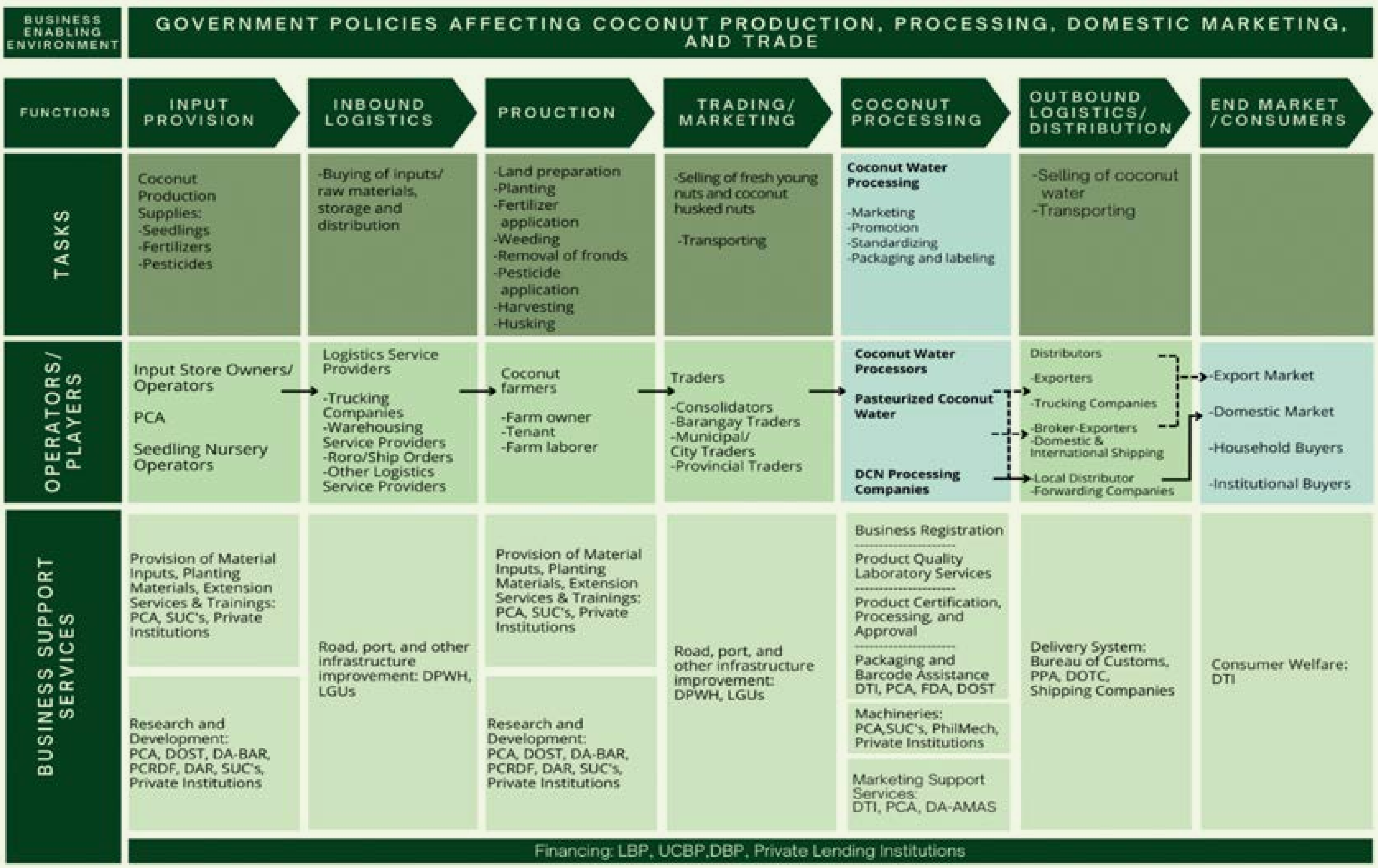
FIGURE 4.3. VALUE CHAIN MAP OF THE COCONUT CHARCOAL/ACTIVATED CARBON VALUE CHAIN CLUSTER



## FIGURE 4.4. VALUE CHAIN MAP OF THE VIRGIN COCONUT OIL VALUE CHAIN CLUSTER

| BUSINESS ENABLING ENVIRONMENT | GOVERNMENT POLICIES AFFECTING COCONUT PRODUCTION, PROCESSING, DOMESTIC MARKETING, AND TRADE | | | | | | |
|---|---|---|---|---|---|---|---|
| FUNCTIONS | INPUT PROVISION | INBOUND LOGISTICS | PROUCTION | TRADING/ MARKETING | COCONUT PROCESSING | OUTBOUND LOGISTICS/ DISTRIBUTION | END MARKET /CONSUMERS |
| TASKS | Coconut Production Supplies:<br>-Seedlings<br>-Fertilizers<br>-Pesticides | -Buying of inputs/ raw materials, storage and distribution | -Land preparation<br>-Planting<br>-Fertilizer application<br>-Weeding<br>-Removal of fronds<br>-Pesticide application<br>-Harvesting<br>-Husking | -Selling of husked nuts<br>-Transporting | VCO Processing<br>-Marketing<br>-Promotion<br>-Standardizing<br>-Packaging and labeling | -Selling of VCO<br>-Transportation | |
| OPERATORS/ PLAYERS | Input Store Owners/ Operators<br>PCA<br>Seedling Nursery Operators | Logistics Service Providers<br>-Trucking Companies<br>-Warehousing Service Providers<br>-Roro/Ship Orders<br>-Other Logistics Service Providers | Coconut farmers<br>-Farm owner<br>-Tenant<br>-Farm laborer | Traders<br>-Consolidators<br>-Barangay Traders<br>-Municipal/ City Traders<br>-Provincial Traders<br>-Buying stations | VCO Processors<br>-Integrated coconut processor Exporter<br>-Cooperative / Associate Processors<br>-MSME Processors<br>Village Intermediate Processors | Distributors<br>-Exporters<br>-Trucking Companies<br>-Broker-Exporters<br>-Domestic & International Shipping<br>-Local Distributor<br>-Forwarding Companies | -Consumers<br>-Export Market<br>-Domestic Market<br>-Household Buyers<br>-Institutional Buyers |
| BUSINESS SUPPORT SERVICES | Provision of Material Inputs, Planting Materials, Extension Services & Trainings: PCA, SUC's, Private Institutions<br>Research and Development: PCA, DOST, DA-BAR, PCRDF, DAR, SUC's, Private Institutions | Road, port, and other infrastructure improvement: DPWH, LGUs | Provision of Material Inputs, Planting Materials, Extension Services & Trainings: PCA, SUC's, Private Institutions<br>Research and Development: PCA, DOST, DA-BAR, PCRDF, DAR, SUC's, Private Institutions | Road, port, and other infrastructure improvement: DPWH, LGUs | Business Registration<br>Product Quality Laboratory Services<br>Product Certification, Processing, and Approval<br>Packaging and Barcode Assistance DTI, PCA, FDA, DOST<br>Machineries: PCA,SUC's, PhilMech, Private Institutions<br>Marketing Support Services: DTI, PCA, DA-AMAS | Delivery System: Bureau of Customs, PPA, DOTC, Shipping Companies | Consumer Welfare: DTI |
| | Financing: LBP, UCBP,DBP, Private Lending Institutions | | | | | | |

## FIGURE 4.5. VALUE CHAIN MAP OF THE COCONUT WATER VALUE CHAIN CUSTER



## FIGURE 4.6. VALUE CHAIN MAP OF THE COCONUT COIR VALUE CHAIN CLUSTER

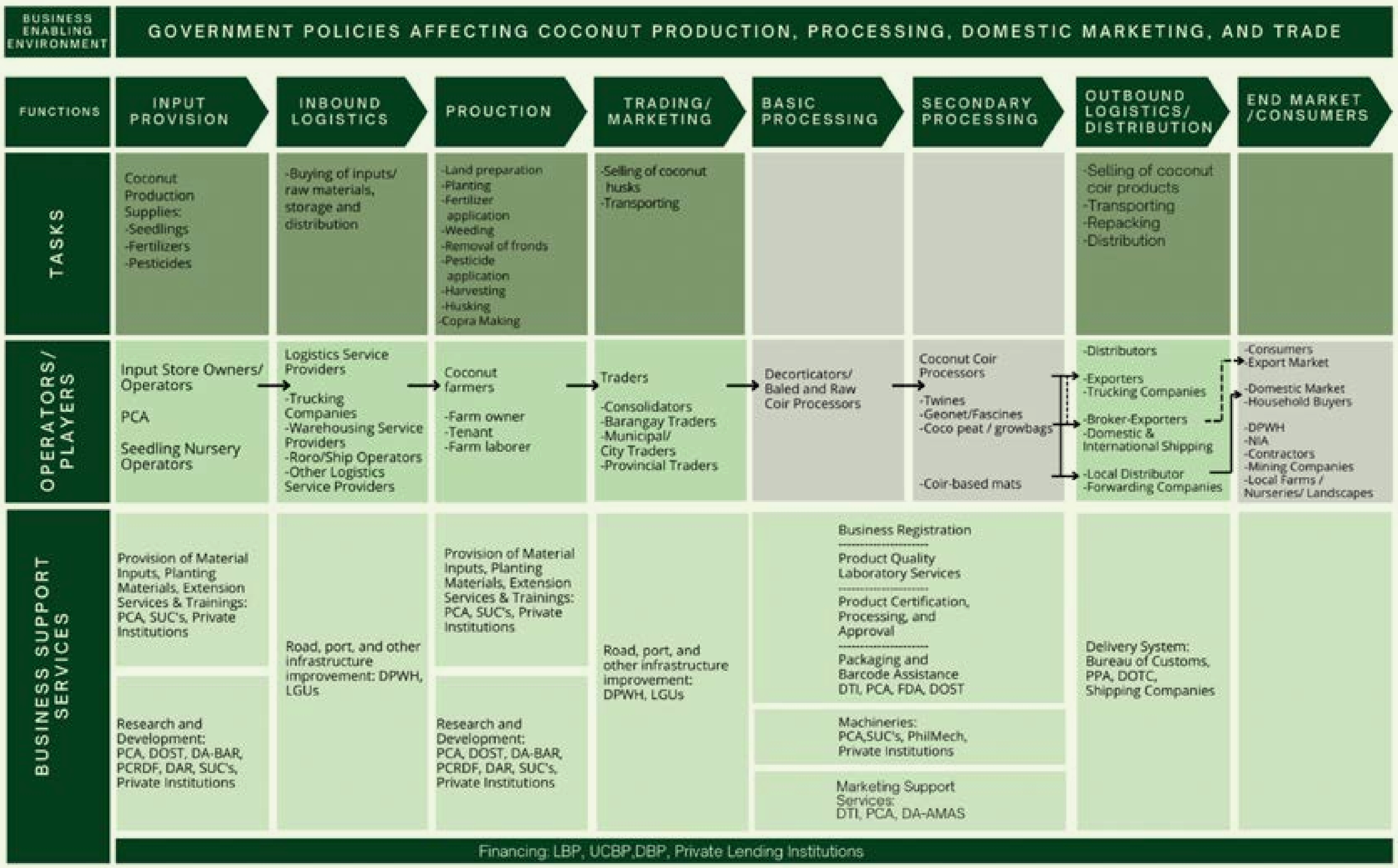
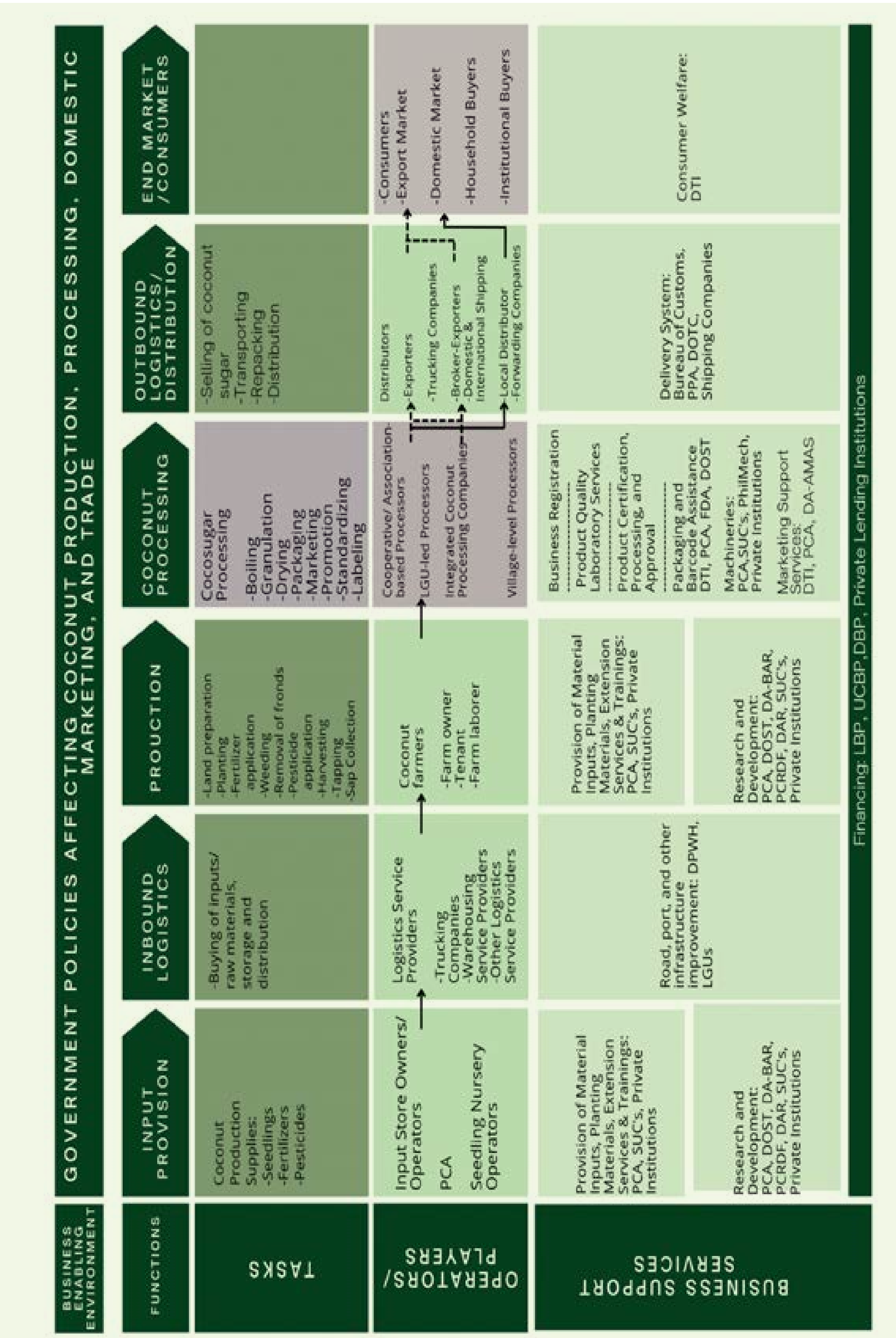


FIGURE 4.7. VALUE CHAIN MAP OF THE COCO SAP SUGAR SWEETENER VALUE CHAIN CLUSTER



## FIGURE 4.8. SWOT MATRIX OF COCONUT OIL VALUE CHAIN

### SWOT MATRIX OF COCONUT OIL VALUE CHAIN

**STRENGTHS (S)**

- 80% of the country's coconut production pass through the copra stage
- Large volume of copra traded as raw material for coconut oil mills by 2,379 copra traders nationwide
- There are 60 operational coconut oil mills 10 regions with combined crushing capacity of 3,420,554 MT per year in 2019
- There are 38 coconut oil refineries in the country with total annual refining capacity of 1,993,400 MT per year in 2019
- The Philippines produced an average of 1.338 MMT (volume – commodity term) of coconut oil per year (2009 – 2019)
- The Philippines is the top world exporter of coconut oil supplying approximately 45% of the total world export volume of coconut oil from 2009 to 2018
- Coconut oil had the biggest contribution (59%) in the coconut export earnings between 2015-2019

**WEAKNESSES (W)**

- Poor quality of copra produced by traditional *tapahan* (aflatoxin contamination and high PAH)
- Multi-layered marketing system causes high price at the oil mill and low price of copra received by farmers
- Poor quality of copra produced and traded
- Low-capacity utilization of oil mills (ranging from 38.4% to 69.1%) between 2009-2019
- Oil extraction from poor copra requires drastic refining and deodorizing that leads to increasing cost
- Low domestic consumption of coconut oil as cooking oil as raw material in oleochemical production
- CNO is more expensive than palm oil and with wide fluctuations in supply

**OPPORTUNITIES (O)**

- Copra quality upgrading assistance provided by PCA and some oil mills (e.g., Visayan Oil Mills & New Leyte Edible Oil Mill)
- Establishment of copra buying stations with re-dryer and white copra centrals under the CFIDP
- Coconut farmers can engage in direct copra marketing
- Demand for high volume of good quality copra may be a catalyst for CFOs to undertake consolidated marketing and supply contract arrangements as a business venture.
- Traders pay higher prices if farmer groups deliver significant volume of good quality copra
- Increase in coconut/copra supply due to PCA's planned replanting program with hybrids and fertilization program
- Production of white copra through the establishment of White Copra Central
- Reduce refining and deodorizing costs for coconut oil refineries
- Skin and beauty treatment industry at the forefront of global market growth of RBD coconut oil
- Increasing the CME blend from 2% (B2) to 5% (B5) in biodiesel production will expand local demand for coconut oil as raw material in CME production.
- Proposed reimplementation of EO 259 will increase the demand for coconut oil to be used in producing fatty alcohol for the local detergent industry
- Consumers and brands in the United States and Europe to switch to alternatives like coconut oil
- Growing global coconut oil market; it is expected to reach US $ 5,538 million by the end of 2026, growing at a compound annual growth rate (CAGR) of 4.3% during the period 2021-2026

**THREATS (T)**

- Influx of imported low-priced palm oil and other vegetable oils
- Coconut oil is a small player in the world's fats and oils market
- Expiration of the preferential US Generalized System of Preferences (GSP) on 31 December 2020 and the expected expiration of the EU-Generalized Scheme of Preferences Plus Program at the end of 2023 providing for duty-free entry of Philippine export products

**S-O**

- Partnership of 60 operational coconut oil mills with farmers through the CFOs to implement a transformative change in copra processing through the establishment of white copra centrals which will reduce processing costs and increase farmers' income
- With the 38 coconut oil refineries in the country, a collaborative arrangement with a clustered white copra central can be established
- Support the increase in CME blend from 2% to 5%
- Promote use of RBD for skin and beauty treatment as well as the reimplementation of EO 269, a rise in demand is foreseeable which even more will strengthen coconut oil production

**S-T**

- Establishment of farmer-owned copra buying stations with re-dryers in strategic location for consolidating copra re-dried to 6% MC
- Incentivize farmers who practice good agricultural practices (GAP) and provide support in organic certification
- Establishment of white copra centrals owned by farmers' organizations in strategic agribusiness corridors to achieve price and quality competitiveness with the world market

**W-O**

- Recalibration of planting/replanting strategy to target significant increase in production to raise the capacity utilization of oil mills
- Support product development of CNO and downstream products
- Implementation of increase in CME blend and greater recognition of RDB use for beauty products will heighten domestic consumption of coconut oil while the reimplementation of EO 259 will increase the utilization of coconut oil as raw material in oleochemical production
- Stimulate demand by aggressive and continuing promotion of the beneficial uses of coconut oil

**W-T**

- Regulation of imported low-priced palm oil and other vegetable oils shall encourage domestic oil consumption
- Government renewal of US and EU

## FIGURE 4.9. SWOT MATRIX OF DESICCATED COCONUT (DCN) VALUE CHAIN

| SWOT MATRIX OF DESICCATED COCONUT (DCN) VALUE CHAIN | OPPORTUNITIES (O) | THREATS (T) |
|---|---|---|
| | • PCA's Replanting Program with hybrids and fertilization Program<br>• Government's policy on organization and strengthening of cooperatives that can consolidate nuts from members and venture into bulk nut trading as supply sources of traders and DCN processors<br>• EU the largest importer of DCN, accounting for more than 30% of global imports.<br>• Imports of DCN dependent on the development of the confectionery and bakery (both showing positive development)<br>• Provision of information on reliable suppliers of husked nuts from PCA | • Competition with other husked nut traders selling to VCO processors for husked nut supply<br>• Competition from Indonesia, Sri Lanka, and India<br>• Multinational DCN factories also operate in other countries<br>• Low and declining coconut production in the Philippines |
| **STRENGTHS (S)**<br>• Philippines is the world's top producer and exporter of DCN (31% market share during 2009-2019; highest export earnings in 2018, US$FOB 218 M)<br>• 21 DCN processing plants operated by 19 companies with an aggregate annual production capacity of 0.45 M MT<br>• 706 traders of husked/mature nuts operating nationwide<br>• DCN has most diverse market among coconut export products penetrating about 109 countries<br>• High price in international market due to premium quality | **S-O**<br>• Compliance to requirements and standards of various certifications supported by the Government<br>• Credit window with low interest to modernize facilities<br>• Market linkage and participation of SMEs in international trade fairs and exhibits. | **S-T**<br>• Planting and replanting program for competing uses of raw materials<br>• Establishment of coconut water concentrates stations in white copra centrals owned by farmers' organizations<br>• Adopt good farm management practices (towards GAP or organic certification) to improve yield and nut quality |
| **WEAKNESSES (W)**<br>• Logistics problem in procuring husked nuts from small, fragmented coconut farms<br>• Poor quality of nuts bought from traders (nuts with poor quality; including rotten or sprouted) mixed with good quality nuts upon delivery<br>• Smaller size nuts than the required standard<br>• Immature nuts less than the required harvest schedule resulting in low coconut meat recovery<br>• Irregular supply of husked nuts | **W-O**<br>• Provide processors access to information on directory of reliable suppliers of husked nuts.<br>• Establishment of MIS would provide enough information for any decision making; it would aid in smooth facilitation of communication and transaction between processors and suppliers | **W-T**<br>• Employ proposed professionalized coconut service crew for harvesting of nuts at right maturity (to lessen rejects)<br>• Create a service unit or employ proposed professionalized coconut service crew to support adoption of sustainable farm management of nut suppliers toward GAP or organic certification<br>• Establish CFO-owned buying stations for dehusked nuts |

## FIGURE 4.10. SWOT MATRIX OF COCO SHELL CHARCOAL-BASED ACTIVATED CARBON VALUE CHAIN

### SWOT MATRIX OF COCO SHELL CHARCOAL-BASED ACTIVATED CARBON VALUE CHAIN

### OPPORTUNITIES (O)

- National Road Rehabilitation and Widening Projects as well as Port and Birthing Projects of the Government
- Activated carbon plants willing to go into subcontracting program with farmer-cooperatives including upgrading of production facilities
- Policy Advocacy of PACMA for regulation of coco shell charcoal exportation
- Customs to check the misdeclaration of coco shell charcoal cargos
- Growth of global trade in activated carbon at a CAGR of 8.21% per year
- Regulatory agencies in different countries recommend coconut shell-based activated carbon as the best material in air purification, mercury absorption, and water treatment applications
- Growing demand for activated carbon in pharmaceutical and medical applications
- Growing demand for coco shell charcoal-based activated carbon in the processed foods and beverage sector for the removal of contaminants or impurities
- Demand for activated carbon used with cyanide in extracting gold dust in mining operations in various countries

### THREATS (T)

- Limited availability of coconut shells traded for charcoal making and activated carbon manufacturing due to use of coconut shells as fuel by DCN manufacturers and oil millers
- Competition between export of coco shell charcoal to be processed into activated carbon and local activated carbon processors
- Major competition with India in the global coconut shell-based activated carbon market due to lower freight rate, production cost, and export price (i.e., US$ FOB 2,000/ton compared to the Philippines' US$ FOB 2,100/ton)

### STRENGTHS (S)

- The Philippines' export of coconut shell charcoal-based activated carbon volume and value increased, on the average, by 17.6% and 20.8% per year (2009-2019), respectively
- Coco shell-based activated carbon charcoal exported to 100 countries
- Coco shell charcoal volume and value increased by 20.3% and 24.1% per year, respectively during the period 2009-2019
- 325 coconut charcoal traders operating nationwide
- Coco shell charcoal is green and renewable

### S-O

- Policy to regulate coco charcoal exports and protect local activated charcoal producers as initiated by PACMA
- Increasing demand on use of activated carbon for air purification, mercury absorption, water treatment applications, for pharmaceutical and medical applications, food and beverage by removing contaminants or impurities, and mining sector in extracting gold dust
- Financial assistance to modernize facilities, certifications, Linkage to markets, and participation of SMEs in international trade fairs and exhibits
- The establishment of central buying station in strategic places will enable exporters to be price and quality competitive

### S-T

- Establish central buying station to integrate and consolidate supply and lessen the competition among various users
- Regulation and support in every node of the value chain to lower down the production cost of coco shell charcoal and improve quality to keep in pace with the product's export trend and compete with the emerging entrant in the international market

### WEAKNESSES (W)

- Logistics/consolidation problem in procuring coconut shells and shell charcoal
- Pole-vaulting of coconut farmer suppliers to traders who pay in cash
- Lack of government regulation on coconut shell charcoal exportation which results to the decreasing supply of coco shell charcoal as raw material for local activated carbon manufacturing
- Few shipping companies load activated carbon because of the false notion that it is combustible. This is brought about by misdeclaration of charcoal shipments, the raw material as activated carbon, charcoal being self-combustible
- High freight cost charged by few shipping lines willing to load activated carbon (i.e., US$ 300/ton for dangerous goods)

### W-O

- Construction of secondary and rural roads traversing coconut farms and farm-to-market roads to lower logistics costs of farmers and traders in consolidating and procuring coconut shells/charcoal
- Contracting of CFOs activated carbon plants
- Educate shipping lines that activated carbon is safe to transport

### W-T

- Establishment of charcoal granulating facility and activated carbon plants to be competitive in the world market
- Establish more activated carbon plants in strategic locations

## FIGURE 4.11. SWOT MATRIX OF OLEOCHEMICAL VALUE CHAIN

### SWOT MATRIX OF OLEOCHEMICAL VALUE CHAIN

### OPPORTUNITIES (O)

- Increasing global demand for environmentally sustainable and non-toxic products
- Favorable export market prospects
- Efforts are underway to align chemical regulation in the Philippines with global best practices
- Oleochemical companies prefer coconut oil as feedstock for oleochemical manufacturing
- Proposed reimplementation of EO 259 allowing the use of fatty alcohol to produce surfactants for the detergent industry
- PCA proposal to increase CME blend from 2% (B2) to 5% (B5) in biodiesel production

### THREATS (T)

- Competition from palm oil companies in Indonesia and Malaysia which serve mainstream markets
- competition with palm oil processing companies in Indonesia and Malaysia in production of Palm kernel oil fatty acids which use cheaper feedstock, have economies of scale and backward integration production..
- Indonesia and Malaysia increased CME blend to 30%.
- Competition with larger world class, multi-national companies operating in different counties, which also use coconut oil as feedstock, can invest in R&D to create new products, green alternatives to petroleum, and new markets.

### STRENGTHS (S)

- Export earnings increased from US$ 12.7 M in 2009 to US$ 37.0 M in 2019, 22.3% per year growth rate.
- Exports volume increased from 1,743 MT in 2009 to 23,956 MT in 2019
- 15 oleochemical companies have an aggregate production capacity of 1,573,030 MT/year (2018)
- 12 coco methyl ester companies have an aggregate production capacity of 885,550 MT/year (2020)
- World class oleochemical companies with huge R&D investments create new products; 2 companies vertically integrated producing coconut oil and branded consumer products

### S-O

- Strict enforcement of trade policies and regulations
- Exploit favorable coconut export market prospects for environmentally sustainable and non-toxic products
- Establishment of white copra centrals in strategic corridors to make CNO-based exporters price and quality competitive
- Premium prices for white copra in order to reduce processing cost

### S-T

- Improved copra quality will reduce refining and processing cost imploring export competitiveness
- Improved copra processing and trading through establishment of copra buying stations and white copra centrals
- Expansion and utilization of chemicals derived from CNO

### WEAKNESSES (W)

- High transaction cost in procuring raw materials due to inter-island shipments
- Presence of unscrupulous traders selling sub-standard oleochemical products
- Coconut oil is a more expensive feedstock than palm oil
- Lack of national standards for chemicals and harmonization with international standards
- Oleochemical production is capital intensive
- Shutting down of 3 out of 4 oleochemical companies manufacturing fatty alcohol after implementation of EO 259 was stopped
- Lack of liquidity of majority of local oleochemical companies to invest in chemical storage facilities that pass global standards, machinery upgrades and R&D

### W-O

- Construct secondary roads and establish FCBS to minimize transaction cost in the procurement and consolidation of raw materials.
- Implementation of PD No. 1644 granting additional powers to PCA to monitor substandard oleochemical products and illegal trading practices
- Expansion and upgrade of storage and port facilities
- Proposed reimplementation of EO 259 would revive production of local fatty acid for stearic acid and fatty alcohol.
- Implementation of CME blend from 2% to 5% in biodiesel production will increase domestic demand.

### W-T

- Develop new products and research to expand uses of chemicals derived from CNO
- Develop more efficient and cost effective processing technologies

## FIGURE 4.12. SWOT MATRIX OF VIRGIN COCONUT OIL (VCO) VALUE CHAIN

### SWOT MATRIX OF VIRGIN COCONUT OIL (VCO) VALUE CHAIN

### OPPORTUNITIES (O)

- Potential further increase in demand with promising clinical study on effectivity of VCO against COVID-19 and promising study on its use against and African Swine Fever
- Base product of many high-end products beauty and health products
- Available simple, low-cost VCO processing technologies suitable for small/household based business enterprise
- Review and updating of PNS /BAFPS 22:2507) for VCO
- Licensing, monitoring, and regular inspection of VCO producers/plants for GMP and HACCP compliance to ensure quality and safe products for human consumption
- Gaining popularity in local and international market particularly for organically certified products can cater for demands in Europe
- Accreditation of government and private laboratories in various locations for VCO quality analysis

### THREATS (T)

- Price and supply competition for whole nuts between DCN-VCO processors and MSMEs with the former offering a higher price; and with other traditional products processors.
- Expeller-derived VCO companies that produce large volume at a low price render smaller firms uncompetitive without market classification based on process.
- Increasing number of VCO producers due to its potential as a profitable enterprise
- Lack of unity in the quality standard and processing method might serve as a threat to the growth of the local VCO industry
- Other VCO producing countries, Thailand, and Indonesia, are fast moving in product development
- Availability of substitute oils that have similar uses
- Lingering effect of negative campaign that coconut oil is an unhealthy oil

### STRENGTHS (S)

- Philippine VCO price and quality competitive meeting PNS and global standards
- Highly priced commodity among the lines of coconut products.
- Established niche market as a functional food for its various health and nutritional benefits
- 42 VCO processing plants in 9 regions while 21 DCN processing plants are also flexible to produce VCO
- Increasing number of VCO producers
- Philippines as the top VCO producer and exporter in the world; total volume and value of exports increased at 45% and 55% annual growth rate from 2009-2019, respectively

### S-O

- Price regulation and development of effective trading system according to process
- Support to research on VCO technologies, processing, and health concerns, tapping on VCO as base for other high-end use
- Broadening the base by promoting other uses than food i.e. industrial application; introducing new products such as MCT from VCO
- Promotion and advertising of the beneficial effects of VCO such as its effectiveness against COVID-19
- More market matching and B2B interactions through international exhibition events and e-marketing platforms
- Improvement of the overall climate for export development such as removing unnecessary impediments, raising productivity and competitiveness; exploit trading opportunities from trading arrangements.

### S-T

- Mapping and regulation on the location and number of new processors to minimize competition; seminar on benefits of exporting or international trading for trader-exporters, broker-exporters, processors and MSMEs.
- The VCOP and UCAP support the relaxing of the of rules of origin (ROOs) compliance and administration. Adopt the proposed changes towards electronic Certificates of Origin (COOs) and self-certification, and linkage to the national single window (NSW) which will improve timelines and ease the entry of MSMEs.
- Increasing promotion and research on the potential of VCO against other oil and to counter negative information on VCO such as the AHA advisory

### WEAKNESSES (W)

- MSMEs cannot compete with large-scale companies that use expeller in VCO mass production; hence, large companies can lower the price due to economies of scale.
- MSMEs' limitations in terms of capacity to meet the demand for VCO
- Competition for the supply of nuts as raw materials because most new plants have emerged in locations where oil mills and DC plants are already existing
- Difference in organoleptic characteristics identified by sensory evaluation due to different VCO processing methods not considered in market pricing and classification
- Prohibitive cost of organic certification (PHP 0.5M for 100 hectares) renewable yearly.
- Lack of product quality testing laboratories in coconut supply grid areas in Visayas and Mindanao

### W-O

- Standardization and certification that distinguish between organic and non-organic and grade quality of VCO to provide bases for product differentiation and price setting
- Establishment of integrated processing center to consolidate, further process, and standardize raw VCO using high-capacity centrifuge process to create economies of scale in production
- Protection of VCO quality by PCA's strict implementation and monitoring of the PNS compliance
- Accreditation of government and available private laboratories in various locations for VCO quality analysis.
- FDA licensing, monitoring, and regular inspection of licensed VCO plants for GMP and HACCP compliance

### W-T

- Accelerate Planting and replanting program to increase and stabilize supply of whole nuts of right maturity
- Collaboration of VCOP and UCAP with government on improving the fermentation process via research for greater recovery rate and better quality.
- Partnership of local academe with international research groups to work on this technology and other technical concerns.
- Accelerate planting of high yielding varieties suitable for VCO production

## FIGURE 4.13. SWOT MATRIX OF COCO COIR PRODUCTS VALUE CHAIN

### SWOT MATRIX OF COCO COIR PRODUCTS VALUE CHAIN

### STRENGTHS (S)

- Presence of abundant raw materials scattered all over the Philippines
- Organized coconut growers who supply husks to coir/peat processors
- Coconut famers, rural community families, and workers earn additional income from selling husks
- Increasing domestic sales and export earnings from US$ 661 thousand in 2009 to US$ 3.9 M in 2019
- Coir and coir value-added products have great market prospects especially in the international market as green renewable products
- 43 suppliers of coco coir and peat products in the Philippines
- Coco coir can be used as raw material to produce many secondary processed products/value-added products
- Compared to the VCO and coco sugar, not much certification requirements in coco coir/peat processing are required except for GMP

### WEAKNESSES (W)

- Only 2% of coconut husks in the country utilized nationwide
- Variability in the quality of husks
- Difficulty in consolidating husks from small, fragmented and sometimes difficult to access coconut farms; high inbound logistics cost
- High inter-island transport cost
- Low domestic market utilization of coco husk fibers/peat
- Lack of market research on more value-added coir products
- The Philippines is a minor player in the global trade of coco coir/peat products
- Decrease in the volume of exports of geonets
- Philippine coco coir/peat products are less quality competitive in the export market compared to India and Sri Lanka
- Stringent requirements in importing countries
- Small capacity of coir processing plants; hence, production of coir products is not sufficient to meet large orders
- Common standard for processing line equipment since customized processing line is the current practice
- Lack of information dissemination on PNS of coco coir and peat products
- Lack/Inefficient decorticating equipment/ machine
- High processing cost (i.e., electricity and labor cost) compared with India

### OPPORTUNITIES (O)

- Increasing use of geotextile nets by DPWH, NIA, mining industries and DENR
- Increasing global demand particularly in the Middle East and local demand for coco peat as soil conditioner and growing medium in agriculture
- RA 10068 Organic Agriculture Act recommends the utilization of cocopeat
- Sustaining the advocacy on "*May Pera sa Bunot*" & availability of de-husking equipment
- PPA projects for port improvement
- Domestic market promotion program for use of other coir products
- Market Research on the market trends and uses of other coco coir fiber and peat products
- Extensive market promotion program including participation in international fairs & exhibits
- Commercialization of existing and efficient technology on value-adding of coco fiber and coco peat
- DTI SSF and DOST Step-Up Program can be tapped to expand capacities and improve machineries of coir processing plants
- Development of technology protocols for use of peat in crops
- Strict implementation of PNS for coco coir fiber and peat products acceptable in the global market
- Upgrading the efficiency of available machines (decorticating machine, drying, and twining equipment)
- Standardization of small decorticating machines and economic-sized business model
- Available Financing Window for the Coco Coir Industry

### THREATS (T)

- Occurrence of typhoons and heavy rains which makes it difficult for farmers to dry coconut husks
- India and Sri Lanka are the world's leading producers and exporters of coir products
- China's decreasing imports of geotextile from the Philippines
- The younger generation may not be enticed to engage in coco coir twining
- India and Sri Lanka far ahead in price and quality competitiveness
- High logistics cost in consolidating and transport of raw materials, high electricity and high labor costs

### S-O

- Institutionalization of the Utilization of Coco Peat in Fertilization and Food Security Programs
- Increase domestic utilization of coco net or geotextile in road construction, slope erosion, riverbank erosion control projects, and protection of stream banks, river, mangrove, and mined-out areas.
- Market facilitation, linkage, and matching to increase market access and promotion (domestic and export) within the value chain; should focus on direct trading of farmers organizations/cooperatives to coconut processing companies and institutional buyers; capacity building on market negotiation, and participation of SMEs in international trade fairs and exhibits
- Support zero farm waste program and cocopeat based organic fertilizer production as an enterprise

### S-T

- Establishment of husk consolidation centers (clustering) at the barangay and municipal levels
- Research to improve processing efficiency

### W-O

- Full utilization of coconut husk/peat towards zero farm waste coconut production
- Establish community-based integrated coconut husk processing and coco-peat based bio-organic fertilizer production as agri-business enterprises
- Continuous market research by PCA, DTI-BETP on the market trends and uses of new products from coco coir, fiber, products, and peat as well as on the potential markets for coir
- Commercialization of existing and efficient technology on value-adding of coco fiber and coco peat
- Tap DTI's shared facilities and financing programs and DOST's set-up program to expand capacities and improve machineries of coir processing plants
- Special Financing Window/Credit Program for CFOs/cooperatives to provide production, processing, trading, and microfinancing loans at low interest rates

### W-T

- Develop programs and strategies to improve price competitiveness of Philippine coir
- Promotion and advertising on digital and traditional platforms to create interest and increase demand for the coconut industry's economic advantage

## FIGURE 4.14. SWOT MATRIX OF COCO SUGAR VALUE CHAIN

### SWOT MATRIX OF COCO SUGAR VALUE CHAIN

#### OPPORTUNITIES (O)

- PCA's Strategic Planting/Replanting Program
- Available Skills Training on Coconut Sap Tapping by ATI
- Research to develop mechanized sap collection
- Available models of CFOs and cooperatives direct links with markets and distribution channels in Metro Manila and/or abroad
- Promising market outlook due to growing interest in the health benefits coco sap sugar consumption
- DTI Shared Facilities Assistance, DOST Set-Up Program and PCA's KAANIB Enterprise Development Program which extend assistance in terms of processing facilities and equipment.
- Available technical assistance or training on GMP-compliance, and financing support for SMEs from PCA, DTI, and DOST

#### THREATS (T)

- Insufficient supply of coconut seedlings of high-yielding dwarf varieties
- Climatic changes (i.e., typhoons and drought)
- Indonesia is price and cost competitive compared to the Philippines because of the former's lower labor cost
- Thailand's coco sugar is more advantageous in terms of quality in the international market
- Adulteration by a few local processors may affect the good image of Philippine coco sugar
- MSMEs cannot compete with existing brands in terms of pricing, packaging, promotion and distribution
- Increasing concerns on food safety leads to stringent entry requirements enforces by Institutional buyers

#### STRENGTHS (S)

- The Philippines is the world's top producer of coconut sap sugar
- Philippine coconut sugar is quality competitive in the global market
- 33 coconut sugar processing plants
- PCA's active support for technology transfer and provision of processing facilities
- Successful business model on Convergence of support services from Local government and other government agencies i.e. Alabat model
- Coco sugar has a low glycemic index and is a healthy option to other sugar sources

#### S-O

- Strategic planting/replanting of outstanding dwarf varieties
- Market facilitation, linkage, and matching to increase market access and promotion (domestic and export)
- Support direct trading of farmers organizations/cooperatives to coconut processing companies and institutional buyers
- Capacity building on market negotiation, and participation of SMEs in international trade fairs and exhibits
- Promoting village level intermediate processing of coconut sugar that is linked to a common facility
- Diversify products to widen the base of NTCPs niche market to other geographical and domestic markets

#### S-T

- Enforcement of PD. 1644 which grants additional powers to PCA related to trade on quality standards
- Establish standards for product quality testing
- Sanctions to those practicing illegal/prohibited marketing practices
- Research on technology improvement particularly in tapping, processing and product development for new uses and applications of coco sugar

#### WEAKNESSES (W)

- Limited supply of planting materials for dwarf varieties suited for coco sugar processing
- Lack of skilled coconut sap tappers and mechanical technology for sap collection
- Prices are dictated by traders and consolidators due to limited access to market
- Low domestic demand; higher price and lack of market promotions on health benefits
- High labor costs in the country making coco sugar less price competitive in global market
- Few processors, low volume of production and lack of export quality assurance
- Lack of processing and packaging facilities due to limited capital
- Many existing micro sugar sap processors have no permits, licenses and certifications
- Most of the home-based processors cannot comply with the food and business requirements of FDA (e.g. GMP)
- Most MSMEs lack awareness on Hazard Analyses and Critical Control Points (HACCP) or organic certification and those who are aware still cannot afford certification fees

#### W-O

- Train professionalized service crew including *'mangangarets'*
- Adoption of improved farm productivity and quality enhancing technologies
- Formation of coco sugar processors association to develop product standards and code of conduct
- Extensive market promotion program through digital and traditional platforms to promote domestic and global demand
- Provide low-interest loans for MSMEs in the coconut processing sector
- Construction of secondary and rural roads traversing coconut farms to lower logistics cost and improve farmers' access to market
- Diversify products and uses to widen the base of the NTCPs niche market to other geographical and domestic markets
- Provide technical assistance and training on GMP-compliance and financing support for SMEs' process/product certification

#### W-T

- Develop strategies on price and quality competitiveness of Philippine Coconut Sugar
- Establish Coconut-Based Agribusiness Enterprises, which are market driven, seamlessly linked from primary production, product processing and marketing
- Setting up of a market information system that generates, monitor, and disseminate information which could also link industry key players to markets, research institutions, and other VC support service provider
- Special Financing Window/Credit Program for Coconut Farmers' Organization/Cooperatives to provide production, processing, trading, and microfinancing loans at low interest rate

## FIGURE 4.15. SWOT MATRIX OF COCONUT WATER VALUE CHAIN

### SWOT MATRIX OF COCONUT WATER VALUE CHAIN

#### OPPORTUNITIES (O)

- Creation of Filipino branded coconut water
- Philippines is a major supplier of popular brands in the world market
- Increasing demand in the international market as an energy drink
- Large market potential especially in Western Europe consuming about 60-70 M L/year and increasing at 10% annually
- UHT processing produces pasteurized coconut water with a longer shelf life of 12 months
- Available business model of Village-level coconut water processing system developed by PhilMech using water from mature nuts
- Untapped potential of green coconuts (for water and meat) waste product (green husks) as bio-fertilizer

#### THREATS (T)

- Competition from other coconut water-producing countries
- Thai coconut water is highly priced in the international market since it is produced from the high-Brix, fragrant Nam Hom variety.

#### STRENGTHS (S)

- Second leading non-traditional coconut export product
- Volume of exports increased from 593 MT worth USD 0.4 M in 2009 to 51, 839 MT valued at USD 57.1 M in 2019
- 14 coconut water processing plants spread in 6 regions

#### S-O

- Accelerate planting/replanting program using only NSIC/PCA certified planting materials
- Active and extensive market promotion program of the multiple uses and benefits of coconut to promote domestic consumption
- Newly or existing coconut water processing plants can expand
- Explore the potential of producing pasteurized coconut water using UHT processing method or the coconut water from matured nuts
- Crafting of PNS for coconut water

#### S-T

- Facilitate market linkage and matching to increase market access
- Accelerate planting of varieties suitable for green coconut (*Buko*) production

#### WEAKNESSES (W)

- Difficulty of transport to processing centers before it spoils since most coconut farms are located in hilly areas with poor road conditions
- Short shelf life especially when exposed to air
- Need for promotional campaign due to low local consumption of processed coconut
- Lack of community-based coconut water extraction technology
- High electricity cost which increases the cost of pasteurized coconut water using the UHT process
- Variability in coconut water product quality needing PNS for coco water
- Smaller or immature nuts than the required standard delivered by suppliers

#### W-O

- Research on biochemistry of coco water to develop new downstream products, uses/application
- Development of market strategies for new and existing coconut products
- Establish well-equipped consolidators' facilities
- Financial assistance to MSMEs to acquire organic certifications and conduct of technical assistance to enable them to comply to the protocols of the standards
- Establish product quality testing laboratories in strategic locations (within SUCs) or private sectors
- Utilization of green husks as bio-fertilizer

#### W-T

- Establishment of Farmers-owned Coconut Water Concentrate Stations (FCWCS) at the Farmers-owned White Copra Centrals (FWCC) that will produce huge volume of coconut water for processing
- Partnership between CFOs and DCN processor in coconut water concentrate enterprise from copra processing.

# Costs and Returns Analysis and Relative Position of Different Value Chain Players

Net income was used as a measure of profit and was computed by subtracting total cost from gross income. The profit-cost ratio indicates the profit obtained from one peso spent in producing/trading/processing one kilogram (kg) of a given coconut product. It was derived by dividing the net income per kilogram of a given coconut product by the total cost incurred in producing/trading/processing one kilogram of that coconut product.

Using buying and selling prices and production/trading/processing costs incurred in each segment of the value chain, the progression of product value through the chain and value shares (i.e., share in unit cost, share in added unit cost, share in unit profit, and share in marketing margin) of the various market participants or players were determined for each value chain cluster. Value shares reflect the participants' contributions (including the farmers') in making the coconut product available to consumers as indicated by their costs and profits for the activities they perform. Analysis of the relative financial position of the key players in each coconut value chain cluster was done separately.

# Coconut Oil Value Chain Cluster

## Costs and Returns Analysis of Different Players

On average, the copra processors are all farm owners who operate an average of 3.16 hectares planted to coconut. Their annual volume of production was 20,940 nuts in 2019. They harvested three times per year. Each husked nut weighs 800 grams, on average. Hence, the volume of nuts processed into copra was 16,752 kg per year. From one kg of husked nuts, the copra processors produced 0.239 kg of copra. The total volume of copra processed was 4,005 kg/year from the 3.16-ha farm. On a per hectare basis, the average volume of copra production was 1,267 kg/ha.

The sample provincial trader buys copra directly from coconut farmers and small traders operating at the municipal and barangay levels either on a picked-up or delivered basis. The annual volume of copra handled by the big trader in 2019 was 600,000 kg.

The buying price of the big trader on a picked-up basis from the copra processors was PHP 20.00/kg and the selling price was PHP 22/kg to the sample oil mill based on the delivered basis of sale. The oil mill has an annual copra crushing capacity of 180,000 MT/ year and the volume of copra that the company crushes per day is 400 MT. Of the total daily volume of copra crushed, the coconut oil yield is 246 MT (62%) and the copra cake yield as a by-product is 128 MT (33%). The company's estimated copra crushing cost was PHP 2.60/kg per day in 2019.

Coconut Farmers. Three sample coconut farmers earned, on average, PHP 25,332.49 per hectare from coconut production and copra processing (Table 4.1). The mean volume of copra sold to the provincial trader was 1,267 kg per hectare at PHP 20/kg in 2019. The coconut farmers' major cash cost items were transportation cost (21.03%), and hired labor cost (14.07%), The imputed value of own land was the biggest non-cash cost item, contributing 55.49% to the sample coconut farmers' average total coconut production and copra processing cost (PHP 18,001.19/ha or PHP 14.21/kg). On average, the net income earned from coconut farming and processing was PHP only 7,331.32/ha or PHP 23,166.97 per farm (or PHP 5.79/kg). The estimated profit-cost ratio is 0.41. This means that the sample coconut farmers, on average, obtained PHP 0.41/kg of net profit from one peso spent in coconut farming and copra processing.

### TABLE 4.1. COSTS AND RETURNS ANALYSIS OF COPRA PROCESSING, 3 SAMPLE COCONUT FARMERS, PHILIPPINES, 2019

| Item | Annual per Hectare | | Per Kilogram | |
|---|---|---|---|---|
| | Amount (PHP) | Percent | Amount (PHP) | Percent |
| **INCOME** | | | | |
| **Cash Income** | | | | |
| Copra Sold | 25,332.49 | 100.00 | 20.00 | 100.00 |
| **Total Income** | **25,332.49** | **100.00** | **20.00** | **100.00** |
| **COSTS** | | | | |
| **Cash Costs** | | | | |
| Hired labor | 2,533.25 | 14.07 | 2.00 | 14.07 |
| Land tax | 1,598.32 | 8.88 | 1.26 | 8.88 |
| Transportation cost | 3,785.49 | 21.03 | 2.99 | 21.03 |
| **Total Cash Cost** | **7,917.06** | **43.98** | **6.25** | **43.98** |
| **Non-Cash Costs** | | | | |
| Depreciation | 94.64 | 0.53 | 0.07 | 0.53 |
| Imputed rental value of own land | 9,989.49 | 55.49 | 7.89 | 55.49 |
| **Total Non-Cash Costs** | **10,084.13** | **56.02** | **7.96** | **56.02** |
| **Total Cost** | **18,001.19** | **100.00** | **14.21** | **100.00** |
| **Net Cash Income** | **17,415.44** | | **13.75** | |
| **Net Income** | **7,331.32** | | **5.79** | |
| **Profit-Cost Ratio** | **0.41** | | **0.41** | |

***Copra Trader.*** The purchase cost of copra accounted for 94.41% of the copra trader's total marketing cost (PHP 12.71 M) in 2019 (Table 4.2). Other marketing cost items incurred by the big copra trader were business permit fees, hired labor cost, and transportation cost. Since the copra trader procured copra from different municipalities/barangays, he had to procure a permit from each municipality/barangay where he sourced copra. The copra trader obtained an annual gross income amounting to PHP 13.20 M from trading 600 MT of copra in the same year. Copra trading was profitable considering the large annual net income reaped by the big copra trader/consolidator amounting to PHP 489,000, or PHP 0.82/kg. However, the copra trader's profit-cost ratio was very low at 0.04, which indicates that the copra trader received only PHP 0.04 of net profit from one peso spent in copra trading.

#### TABLE 4.2. COSTS AND RETURNS ANALYSIS OF COPRA TRADING, 1 SAMPLE COPRA TRADER, PHILIPPINES, 2019

| Item | Annual | | Per Kilogram | |
|---|---|---|---|---|
| | Amount (PHP) | Percent | Amount (PHP) | Percent |
| **INCOME** | | | | |
| **Cash Income** | | | | |
| Copra sold | 13,200,000.00 | 100.00 | 22.00 | 100.00 |
| **Total Income** | **13,200,000.00** | **100.00** | **22.00** | **100.00** |
| **COSTS** | | | | |
| **Cash Costs** | | | | |
| Copra bought | 12,000,000.00 | 94.41 | 20.00 | 94.41 |
| Business permits | 81,000.00 | 0.64 | 0.14 | 0.64 |
| Hired labor | 420,000.00 | 3.30 | 0.70 | 3.30 |
| Transportation | 120,000.00 | 0.94 | 0.20 | 0.94 |
| **Total Cash Cost** | **12,621,000.00** | **99.29** | **21.04** | **99.29** |
| **Non-Cash Cost** | | | | |
| Depreciation | 90,000.00 | 0.71 | 0.15 | 0.71 |
| **Total Non-cash Cost** | **90,000.00** | **0.71** | **0.15** | **0.71** |
| **Total Cost** | **12,711,000.00** | **100.00** | **21.19** | **100.00** |
| **Nest Cash Income** | **579,000.00** | | **0.97** | |
| **Net Income** | **489,000.00** | | **0.82** | |
| **Profit-Cost Ratio** | **0.04** | | **0.04** | |

***Coconut Oil Processor.*** In 2019, the oil mill's annual gross income obtained from copra sales was PHP 4.67 B and PHP 490.56 M from copra cake sales (Table 4.3). The annual processing and marketing cost totaled PHP 3.59 B. The purchase cost of copra accounted for the biggest portion (89.43%) of the oil mill's total cost. The oil mill's net income was approximately PHP 1.59 B. The oil mill's profit-cost ratio was 0.44, which suggests that the oil mill received only PHP 0.44 of net profit from one peso spent in coconut oil processing.

**TABLE 4.3. COSTS AND RETURNS ANALYSIS OF CRUDE COCONUT OIL PROCESSING EXPRESSED IN COPRA TERMS, 1 SAMPLE COCONUT OIL MILL, PHILIPPINES, 2019**

| Item | Annual | | Per kg of Copra Processed | |
|---|---|---|---|---|
| | Amount | Percent | Amount | Percent |
| **INCOME** | | | | |
| **Cash Income** | | | | |
| CNO sold | 4,669,080,000.00 | 90.49 | 31.98 | 90.49 |
| Copra cake sold | 490,560,000.00 | 9.51 | 3.36 | 9.51 |
| **Total Income** | **5,159,640,000.00** | **100.00** | **35.34** | **100.00** |
| **COSTS** | | | | |
| Copra bought | 3,212,000,000.00 | 89.43 | 22.00 | 89.43 |
| Variable cost | 160,600,000.00 | 4.47 | 1.10 | 4.47 |
| Marketing cost | 87,600,000.00 | 2.44 | 0.60 | 2.44 |
| Fixed cost | 131,400,000.00 | 3.66 | 0.90 | 3.66 |
| **Total Cost** | **3,591,600,000.00** | **100.00** | **24.60** | **100.00** |
| **Net Income** | **1,568,040,000.00** | | **10.74** | |
| **Profit-Cost Ratio** | **0.44** | | **0.44** | |

Conversion: 1 MT of copra = 0.62 MT of coconut oil and 0.33 MT of copra cake

## Relative Financial Position of Different Players

Among the three market players in the coconut oil value chain, the oil mill exhibited the highest unit profit share (52.79%) of the value chain's total unit profit amounting to PHP 18.98/kg of copra, followed by the copra processors with a unit profit share of 41.72% (Table 4.4). The copra trader had the lowest unit profit share at 5.79%. As expected, the sample coconut farmers had the lowest unit cost share (23.68%) of the value chain's total unit cost amounting to PHP 60.00/kg. Conversely, the oil mill incurred the highest unit added cost share (41.0%), followed by the copra trader (35.32%).

Although the sample copra processors have a higher unit profit share than the copra traders, it does not mean that they are financially better off than the copra trader. As discussed earlier, the copra trader's total profit amounting to PHP 489,000/year is relatively higher than that of an individual copra processor (PHP 23,166.97 per farm) considering that the copra trader traded a larger volume of copra (600,000 kg/year)

while the average volume of copra sold by each sample coconut farmer was much lower (1,267 kg/ha or 4,005 kg from the 3.16-ha coconut farm). Among the value chain players, the oil mill was the most financially better because of its high volume of production of crude coconut oil (89,790 MT per year) using 146 M kg of copra.

**TABLE 4.4. RELATIVE FINANCIAL POSITION OF VALUE CHAIN PLAYERS PER KILOGRAM OF COPRA TO PRODUCE CRUDE COCONUT OIL, FARMERS AS THE SOURCE OF COPRA TO THE WHOLESALER AND FINALLY TO THE COCONUT OIL MILL, PHILIPPINES, 2019**

| Market Player | Unit Cost | | Added Unit Cost | | Selling Price | Unit Profit | | Unit Margin | |
|---|---|---|---|---|---|---|---|---|---|
| | PHP | % | PHP | % | PHP | PHP | % | PHP | % |
| Farmer | 14.21 | 23.68 | 14.21 | 78.94 | 20.00 | 5.79 | 41.72 | 20.00 | 62.54 |
| Nut trader | 21.19 | 35.32 | 1.19 | 6.61 | 22.00 | 0.81 | 5.79 | 2.00 | 6.25 |
| Processor | 24.60 | 41.00 | 2.60 | 14.44 | 31.98 | 7.38 | 52.79 | 9.98 | 31.21 |
| **Total** | **60.00** | **100.00** | **18.00** | **100.00** | | **13.98** | **100.00** | **31.98** | **100.00** |

Conversion: 1 MT of copra = 0.62 MT of coconut oil and 0.33 MT of copra cake

## Desiccated Coconut Value Chain Cluster

### Costs and Returns Analysis of Different Players

The eight sample coconut farmers are all owner-operators. They operate, on average, 1.7 hectares and hire laborers to undertake fertilizer application, harvesting, collecting, piling, husking, and handling operations. The hired laborers bring their own farm tools. In 2019, the coconut farmers' average volume of production of husked nuts was 7,375 per hectare. The sample coconut farmers delivered 5,900 kg of husked nuts per hectare for sale to the nut trader's buying station. The coconut farmers' selling price was PHP 8.00/kg. The nut trader, in turn, traded 200,000 kg of husked nuts in the same year. The desiccated coconut processing plant utilized 46,475,457 kg of husked nuts as raw materials that were delivered by the nut trader at a selling price of PHP 9.70/kg. The company's desiccated coconut production (718,332 kg per year) is all geared toward the export market.

***Coconut Farmers.*** Considering all the eight sample coconut farmers, the mean annual gross income that they received from coconut farming amounted to PHP 47,198.53 per hectare or PHP 8.00/kg (Table 4.5). The imputed cost of own farmland accounted for the biggest proportion (42.09%) of the mean annual total cost (PHP 23,494.12 per hectare or PHP 3.98/kg), followed by hired labor cost (29.48%), transportation cost (10.80%, and fertilizer cost (9.95%). The sample coconut farmers earned a positive mean annual net income (PHP 23,704.41 per hectare or PHP 4.02/kg) and profit-cost ratio (1.009) from coconut farming, indicating that coconut production is profitable business enterprise (Table 4.5). If cash costs are only considered in the analysis, the mean annual net cash income is PHP 33,594.12 per hectare or PHP 5.69/kg. Although positive, their profit-cost ratio is only 1.009. This figure means that the sample farmers earned a mean profit of only PHP 1.009 per kilogram of husked nut for every peso spent in coconut farming.

### TABLE 4.5. COSTS AND RETURNS ANALYSIS OF COCONUT PRODUCTION, 8 HUSKED NUT FARMERS, PHILIPPINES, 2019

| Item | Annual Per ha. Amount (PHP) | Annual Per ha. Percent | Per kg. Amount (PHP) | Per kg. Percent |
|---|---|---|---|---|
| **INCOME** | | | | |
| **Cash Income** | | | | |
| Nuts sold | 47,198.53 | 100.00 | 8.00 | 100.00 |
| **Total Income** | **47,198.53** | **100.00** | **8.00** | **100.00** |
| **COSTS** | | | | |
| **Cash Costs** | | | | |
| Fertilizer | 2,338.24 | 9.95 | 0.40 | 9.95 |
| Other material inputs | 220.59 | 0.94 | 0.04 | 0.94 |
| Hired labor | 6,926.47 | 29.48 | 1.17 | 29.48 |
| Land tax | 1,582.35 | 6.74 | 0.27 | 6.74 |
| Transportation cost | 2,536.76 | 10.80 | 0.43 | 10.80 |
| **Total Cash Cost** | **13,604.41** | **57.91** | **2.31** | **57.91** |
| **Non-Cash Costs** | | | | |
| Imputed value of own land | 9,889.71 | 42.09 | 1.68 | 42.09 |
| **Total Non-Cash Costs** | **9,889.71** | **42.09** | **1.68** | **42.09** |
| **Total Cost** | **23,494.12** | **100.00** | **3.98** | **100.00** |
| **Net Cash Income** | **33,594.12** | | **5.69** | |
| **Net Income** | **23,704.41** | | **4.02** | |
| **Profit-Cost Ratio** | **1.009** | | **1.009** | |

***Husked Nut Trader.*** The major cost item in husked nut trading was the cost of nuts purchased accounting for 86.35% of the trader's total marketing cost (PHP 1,853,000 per year of PHP 9.27/kg) (Table 4.6). This item is followed by hired labor cost (9.71%). The nut trader did not incur transportation costs in procuring nuts from the farmers because the coconut farmers delivered the husked nuts to the nut trader's buying station. Transportation cost was only incurred in delivering husked nuts to the desiccated coconut processing plant. Since the trader's gross income (PHP 1,940,000 per year or PHP 9.70/kg) in nut husk trading exceeded his total cost (PHP 1,853,000 per year or PHP 9.27/kg), the nut trader obtained a net income of PHP 87,000 per year or PHP 0.43/kg. The nut trader's profit-cost ratio is positive but very low (0.04). This figure means that the nut trader earned a profit of only PHP 0.04 per kilogram of husked nut traded for every peso spent in trading this product.

### TABLE 4.6. COSTS AND RETURNS ANALYSIS OF NUT TRADING, 1 SAMPLE TRADER, PHILIPPINES, 2019

| ITEM | ANNUAL | | PER KILOGRAM | |
|---|---|---|---|---|
| | AMOUNT (PHP) | PERCENT | AMOUNT (PHP) | PERCENT |
| **INCOME** | | | | |
| **Cash Income** | | | | |
| Husked nuts sold | 1,940,000.00 | 100.00 | 9.70 | 100.00 |
| **Total Income** | **1,940,000.00** | **100.00** | **9.70** | **100.00** |
| **COSTS** | | | | |
| **Cash Costs** | | | | |
| Husked nuts bought | 1,600,000.00 | 86.35 | 8.00 | 86.35 |
| Hired labor | 180,000.00 | 9.71 | 0.90 | 9.71 |
| Transportation cost | 60,000.00 | 3.24 | 0.30 | 3.24 |
| Business permits | 5,000.00 | 0.27 | 0.03 | 0.32 |
| Other cash costs | 3,000.00 | 0.16 | 0.01 | 0.11 |
| **Total Cash Costs** | **1,848,000.00** | **99.73** | **9.24** | **99.73** |
| **Non-cash Costs** | | | | |
| Depreciation | 5,000.00 | 0.27 | 0.03 | 0.27 |
| **Total Non-cash Costs** | **5,000.00** | **0.27** | **0.03** | **0.27** |
| **Total Cost** | **1,853,000.00** | **100.00** | **9.27** | **100.00** |
| **Total Cash Income** | **92,000.00** | | **0.46** | |
| **Net Income** | **87,000.00** | | **0.43** | |
| **Profit-Cost Ratio** | **0.04** | | **0.04** | |

***Desiccated Coconut Processor.*** In 2019, the total cost of producing one kilogram of desiccated coconut was PHP 105.68 (Table 4.7). Husked nuts used as one of the raw materials in producing desiccated coconut accounted for 61.22% of the total processing cost (approximately PHP 75.92 M/year), followed by hired labor (23.71%). Other cost items were bunker fuel (4.74%), packaging materials (3.95%), and utilities (3.16%). Given a gross income of PHP 125.29 per kilogram (or PHP 90 M/year), the net income earned from desiccated coconut processing was PHP 19.61/kg (or PHP 14.08 M/year). This amount indicates that desiccated coconut processing is a very profitable business enterprise. The profit-cost ratio of 0.19 means that a net profit of PHP 0.19 per kilogram was obtained by the desiccated coconut processor from one peso spent in processing desiccated coconut.

### TABLE 4.7. COSTS AND RETURNS ANALYSIS OF DESICCATED COCONUT PROCESSING, 1 SAMPLE DESICCATED COCONUT PROCESSOR, PHILIPPINES, 2019

| Item | Annual | | Per kg of DCN | |
|---|---|---|---|---|
| | Amount (PHP) | Percent | Amount (PHP) | Percent |
| **INCOME** | | | | |
| **Cash Income** | | | | |
| Sales of desiccated coconut | 90,000,000.00 | 100.00 | 125.29 | 100.00 |
| **Total Income** | **90,000,000.00** | **100.00** | **125.29** | **100.00** |
| **COSTS** | | | | |
| **Cash Costs** | | | | |
| Husked nuts bought | 46,475,456.94 | 61.22 | 64.70 | 61.22 |
| Boiler suppliers | 720,000.00 | 0.95 | 1.00 | 0.95 |
| Packaging materials and labels | 3,000,000.00 | 3.95 | 4.18 | 3.95 |
| Hired labor | 18,000,000.00 | 23.71 | 25.06 | 23.71 |
| Utilities (water and electricity) | 2,400,000.00 | 3.16 | 3.34 | 3.16 |
| Bunker fuel | 3,600,000.00 | 4.74 | 5.01 | 4.74 |
| Marketing cost | 600,000.00 | 0.79 | 0.84 | 0.79 |
| Other cash costs | 120,000.00 | 0.16 | 0.17 | 0.16 |
| **Total Cash Cost** | 74,915,456.94.00 | 98.68 | **104.29** | 98.69 |
| **Non-Cash Cost** | | | | |
| Depreciation of buildings, equipment, and machinery | 1,000,000.00 | 1.32 | 1.39 | 1.32 |
| **Total Non-Cash Cost** | **1,000,000.00** | **1.32** | **1.39** | **1.32** |
| **Total Cost** | **75,915,456.94** | **100.00** | 105.68 | **100.00** |
| **Net Cash Income** | **15,084,543.06** | | **21.00** | |
| **Net Income** | **14,084,543.06** | | **19.61** | |
| **Profit Cost Ratio** | **0.19** | | **0.19** | |

Conversion: 6.67 kg of husked nuts = 1 kg of DCN

## Relative Financial Position of Different Players

The sample coconut farmers generated the highest unit profit share (54.40%) of the value chain's total unit profit amounting to PHP 7.39/kg among the three market players in the desiccated coconut value chain cluster (Table 4.8). The desiccated coconut processor ranked second, exhibiting a unit profit share of 39.78% The nut trader's unit profit share was the lowest (only 5.82%). The nut trader received the lowest unit profit share. In terms of unit cost share, the sample coconut farmers had the lowest unit share (13.68%) of the total unit cost-share amounting to PHP 29.09/kg among the value chain players, followed by the nut trader (31.87%). On the other hand, the desiccated coconut processor exhibited the highest unit added cost share (15.84%).

The foregoing analysis does not mean that the sample coconut farmers are financially better off than the nut trader. The total profit of the nut trader is expected to be higher than that of an individual coconut farmer because the nut trader handled a higher volume of husked nuts (200,000 kg/year) while the average volume of husked nuts sold by each sample coconut farmer was much lower (5,990 kg/ha or 8,850 kg from 1.7-ha coconut farm). Among the value chain players, the desiccated coconut processing company was the most financially better because of its high volume of production of desiccated coconut, a high value-added product (718,332 kg per year), using 46,475,457 kg of husked nuts.

**TABLE 4.8. RELATIVE FINANCIAL POSITION OF VALUE CHAIN PLAYERS PER KILOGRAM OF HUSKED NUT TO PRODUCE DESICCATED COCONUT, FARMERS AS THE SOURCE OF HUSKED NUTS TO THE NUT TRADER AND FINALLY TO THE DESICCATED COCONUT PROCESSOR, PHILIPPINES, 2019**

| Market Player | Unit Cost | | Added Unit Cost | | Selling Price | Unit Profit | | Unit Margin | |
|---|---|---|---|---|---|---|---|---|---|
| | PHP | % | PHP | % | PHP | PHP | % | PHP | % |
| Farmer | 3.98 | 13.68 | 3.98 | 26.62 | 8.00 | 4.02 | 54.40 | 8.00 | 42.60 |
| Nut trader | 9.27 | 31.87 | 1.27 | 8.50 | 9.70 | 0.43 | 5.82 | 1.70 | 9.05 |
| Processor | 15.84 | 54.45 | 9.70 | 64.88 | 18.78 | 2.94 | 39.78 | 9.08 | 48.35 |
| **Total** | **29.09** | **100.00** | **14.95** | **100.00** | | **7.39** | **100.00** | **18.78** | **100.00** |

Conversion: 6.67 kg of husked nuts = 1 kg of DCN or 1 kg of husked nuts = 0.15 kg of desiccated coconut

## Coco Shell Charcoal-Based Activated Carbon Value Chain Cluster

### Costs and Returns Analysis of Different Players

The sample coconut farmer is a copra processor who utilized coconut shells in his farm to process charcoal using the pit method. The charcoal that he produced (only 37.8 kilograms per year) is picked up by a big charcoal consolidator/trader who granulated the coco shell charcoal prior to delivery to the sample activated carbon processing plant in Davao City. The trader's buying system was on a per-kilogram basis and on-the-spot cash transactions.

The big charcoal trader buys directly from small charcoal producers and smaller charcoal traders for bulk charcoal trading. In 2019, the big charcoal consolidator/trader bought a total of 650,000 kg of coco shell charcoal at PHP 19.00/kg and sold the same quantity of granulated coco shell charcoal to the activated carbon processing company at PHP 21.00/kg. The activated carbon processing company used 1,500 MT per month or 18,000 MT per year of coco shell charcoal to produce 600 MT per month or 7,200 MT per year of activated carbon. Of its total volume of production, the activated processing company sold 3% in the domestic market and 97% were exported. The domestic selling price in 2019 was PHP 90.00/kg and the export price was US $1,600/kg or PHP 79.17/kg. The weighted average selling price of activated carbon used in the costs and returns analysis is PHP 76.80/kg.

***Coconut Farmer-Charcoal Maker.*** Hired labor was the only cash expense incurred by the coconut farmer in making charcoal amounting to PHP 200.00/year (Table 4.9). Coconut shells are the by-product in copra processing. At a selling price of coco shell charcoal of PHP 19.00/kg, the coconut farmer's gross income from coco shell charcoal making was very meager at PHP 718.20/year. Net income earned by the coconut farmer from charcoal making was PHP 518.20/kg, which helped to supplement the coconut farmer's income from coconut farming. The coconut farmer's profit-cost ratio is high at 2.59 due to low processing cost involved in his charcoal-making activity. This figure implies that the coconut farmer earned PHP 2.59/kg of net profit for one peso that he spent in charcoal making.

**TABLE 4.9. COSTS AND RETURNS ANALYSIS OF COCO SHELL CHARCOAL MAKING, 1 SAMPLE COCONUT FARMER-CHARCOAL**

| ITEM | ANNUAL AMOUNT (PHP) | ANNUAL PERCENT | PER KILOGRAM AMOUNT (PHP) | PER KILOGRAM PERCENT |
|---|---|---|---|---|
| **INCOME** | | | | |
| **Cash Income** | | | | |
| Coco shell charcoal sold | 718.20 | 100.00 | 19.00 | 100.00 |
| **Total Income** | **718.20** | **100.00** | **19.00** | **100.00** |
| **COSTS** | | | | |
| **Cash Costs** | | | | |
| Hired labor | 200.00 | 100.00 | 5.29 | 100.00 |
| **Total Cash Cost** | **200.00** | **200.00** | **5.29** | **100.00** |
| **Total Cost** | **200.00** | **100.00** | **5.29** | **100.00** |
| **Net Income** | **518.20** | | **37.80** | |
| **Profit-Cost Ratio** | **2.59** | | **2.59** | |

***Coconut Shell Charcoal Trader.*** Due to the large volume of coco shell charcoal handled by the big charcoal consolidator/ trader, he obtained an annual gross income amounting to PHP 13.65 M (Table 4.10). The bulk of the trader's total cost was comprised of coco shell charcoal (95.43%). Coco shell charcoal trading was profitable since the trader's annual gross income was higher than his annual total cost (PHP 12.94 M). The coco shell charcoal trader reaped an annual net income of PHP 708,500 or PHP 1.09/kg. Due to his high production cost, the coco shell charcoal trader's profit-cost ratio was meager. The profit-cost ratio of 0.05 means that the coco shell trader received only PHP 0.05 of profit for one peso spent in coco shell trading.

### TABLE 4.10. COSTS AND RETURNS ANALYSIS OF COCO SHELL CHARCOAL TRADING, 1 SAMPLE COCO SHELL CHARCOAL TRADER, PHILIPPINES, 2019

| ITEM | ANNUAL | | PER KILOGRAM | |
|---|---|---|---|---|
| | AMOUNT | PHP | AMOUNT | PHP |
| **INCOME** | | | | |
| **Cash Income** | | | | |
| Granulated coco shell charcoal sold | 13,650,000.00 | 100.00 | 21.00 | 100.00 |
| **Total Income** | **13,650,000.00** | **100.00** | **21.00** | **100.00** |
| **COSTS** | | | | |
| **Cash Costs** | | | | |
| Coco shell charcoal bought | 12,350,000.00 | 95.43 | 19.00 | 95.43 |
| Hired labor | 162,500.00 | 1.26 | 0.25 | 1.26 |
| Utilities | 180,000.00 | 1.39 | 0.28 | 1.39 |
| Fuel cost for granulating machine | 84,000.00 | 0.65 | 0.13 | 0.65 |
| Business permits | 10,000.00 | 0.08 | 0.02 | 0.08 |
| Marketing cost | 120,000.00 | 0.93 | 0.18 | 0.93 |
| **Total cash costs** | **12,906,500.00** | **99.73** | **19.86** | **99.73** |
| **Non-cash cost** | | | | |
| Depreciation of storage area and machine | 35,000.00 | 0.27 | 0.05 | 0.27 |
| **Total Non-cash Costs** | **35,000.00** | **0.27** | **0.05** | **0.27** |
| **Total Cost** | **12,941,500.00** | **100.00** | **19.91** | **100.00** |
| **Net Cash Income** | **743,500.00** | | **1.14** | |
| **Net Income** | **708,500.00** | | **1.09** | |
| **Profit-Cost Ratio** | **0.05** | | **0.05** | |

***Coco Shell Charcoal-based Activated Coconut Manufacturer.*** As expected, coco shell charcoal was the major cost item in activated carbon processing, contributing 86.81% to the total manufacturing cost (approximately PHP 435.43 M per year or PHP 60.48/kg) (Table 4.11). Activated carbon processing is capital intensive. Depreciation cost of fixed capital items accounted for 4.55% of the total cost, followed by utilities (3.31%), cost of packaging materials and labels (2.38%), and marketing cost (2.20%). Other costs incurred by the company were hired labor cost and the cost of product certification. The activated carbon manufacturing company obtained an annual gross income and net income amounting to PHP 552.96 M/year (or PHP 76.80/kg) and PHP 117.53 M/year (PHP 16.33/kg), respectively. Although the company obtained very high net profit because of its large volume of production, the company's profit-cost ratio is very low at 0.27, which indicates that only PHP 0.27/kg of net profit was derived from one peso spent in activated carbon manufacturing.

**TABLE 4.11. COSTS AND RETURNS ANALYSIS OF ACTIVATED CARBON MANUFACTURING, 1 SAMPLE ACTIVATED CARBON PROCESSING COMPANY, PHILIPPINES, 2019**

| ITEM | ANNUAL | | PER KILOGRAM OF ACTIVATED CARBON | |
|---|---|---|---|---|
| | AMOUNT | PERCENT | AMOUNT | PERCENT |
| **INCOME** | | | | |
| **Cash Income** | | | | |
| Activated carbon sales | 552,960,000.00 | 100.00 | 76.80 | 100.00 |
| **Non-cash Income** | | | | |
| Unsold activated carbon | | | | |
| **Total Income** | **552,960,000.00** | **100.00** | **76.80** | **100.00** |
| **COSTS** | | | | |
| **Cash costs** | | | | |
| Coconut shell charcoal | 378,000,000.00 | 86.81 | 52.50 | 86.81 |
| Packaging materials and labels | 10,368,000.00 | 2.38 | 1.45 | 2.38 |
| Hired labor | 2,760,000.00 | 0.63 | 0.38 | 0.63 |
| Utilities (water and electricity) | 14,400,000.00 | 3.31 | 2.00 | 3.31 |
| Marketing cost | 9,600,000.00 | 2.20 | 1.33 | 2.20 |
| Product certification | 500,000.00 | 0.11 | 0.08 | 0.11 |
| **Total cash cost** | **415,628,000.00** | **95.45** | **57.73** | **95.45** |
| **Non-cash cost** | | | | |
| Depreciation of buildings, equipment, transport vehicle, and machineries | 19,800,000.00 | 4.55 | 2.75 | 4.55 |
| **Total Non-cash Cost** | **19,800,000.00** | **4.55** | **2.75** | **4.55** |
| **Total Cost** | **435,428,000.00** | **100.00** | **60.48** | **100.00** |
| **Net Cash Income** | **137,332,000.00** | | **19.08** | |
| **Net Income** | **117,532,000.00** | | **16.33** | |
| **Profit-Cost Ratio** | **0.27** | | **0.27** | |

Conversion: 2.5 kg coconut shell charcoal = 1kg activated carbon

## Relative Financial Position of Different Players

The activated carbon manufacturing company exhibited the highest unit cost share of the value chain's total unit cost amounting to PHP 49.39/kg (Table 4.12). Conversely, the sample coconut farmer had the lowest unit cost share (10.71%), followed by the coco shell charcoal trader (40.31%). In terms of unit profit share, the sample coconut farmers generated the highest percentage share (64.28%) of the value chain's total profit of PHP 21.33/kg among the three market players in the activated carbon value chain. The activated carbon processing company ranked second, exhibiting a unit profit share of 30.61%. The coco shell charcoal trader's unit profit share was the lowest (only 5.11%) among the value chain players.

The foregoing analysis of the relative financial position of the different players in the coco shell charcoal-based activated carbon value chain cluster does not imply that the sample coconut farmers are financially better off than the coco shell charcoal trader and the activated carbon processing company. As shown in Tables 4.9 and 4.10, the total profit of the coco shell charcoal trader is higher than that of the coconut farmer-charcoal maker because the coco shell charcoal trader handled a higher volume of charcoal (650,000 kg/year) while the average volume of coco shell charcoal produced by the sample coconut farmer was only 37.8 kg per year. Among the value chain players, the activated carbon manufacturing company was the most financially better because of its high volume of production of activated carbon (7,200 kg/year) using 18,000 MT of granulated coco shell charcoal. From the analysis of the relative financial position of the value chain players, it can also be inferred that if a farmers' cooperative will venture into coco shell charcoal trading and engage in direct marketing to the activated carbon processing company, the association can earn a net profit of PHP 1.09/kg.

**TABLE 4.12. RELATIVE FINANCIAL POSITION OF VALUE CHAIN PLAYERS PER KILOGRAM OF COCO SHELL CHARCOAL TO PRODUCE ACTIVATED CARBON, FARMER AS THE SOURCE OF COCO SHELL CHARCOAL TO THE BIG CHARCOAL TRADER AND FINALLY TO THE ACTIVATED CARBON MANUFACTURING COMPANY, PHILIPPINES, 2019**

| Market Player | Unit Cost | | Added Unit Cost | | Selling Price | Unit Profit | | Unit Margin | |
|---|---|---|---|---|---|---|---|---|---|
| | PHP | % | PHP | % | PHP | PHP | % | PHP | % |
| Farmer | 5.29 | 10.71 | 5.29 | 56.34 | 19.00 | 13.71 | 64.28 | 19.00 | 61.85 |
| Trader | 19.91 | 40.31 | 0.91 | 9.69 | 21.00 | 1.09 | 5.11 | 2.00 | 6.51 |
| Processor | 24.19 | 48.98 | 3.19 | 33.97 | 30.72 | 6.53 | 30.61 | 9.72 | 31.64 |
| **Total** | **49.39** | **100.00** | **9.39** | **100.00** | | **21.33** | **100.00** | | **100.00** |

Conversion: 2.5 kg of coco shell charcoal = 1 kg of activated carbon or 1 kg of coco shell charcoal = 0.40 kg of activated carbon

## Virgin Coconut Oil Value Chain Cluster

### Costs and Returns Analysis of Different Players

The sample coconut farmer, a farm owner, operates a 2-ha coconut farm. He directly hires workers to do short-term jobs such as applying organic fertilizer, harvesting, gathering, husking, and handling of nuts. The hired farm workers are paid per day for organic fertilizer application and per nut harvested and husked. In 2019, the coconut farmer's volume of production was 7,875 nuts per hectare or 15,750 nuts per farm. The virgin coconut oil processor picked up the husked nuts from the coconut farmer's farm since the processor wants to coordinate the procurement of nuts with her processing operation. The sample virgin coconut oil processor has an integrated processing and marketing company. She operates her own and leased organically certified coconut farms and at the same time buys husked nuts from contracted farmers. Her processing company pioneered virgin coconut oil in 2002 using the fermentation process. In 2016, to resolve the issue of low moisture content and sediments present using the fermentation process, the processing company used centrifuge to filter the virgin coconut oil and increase the moisture content from 0.10 to 0.50-0.60. About 10% of the company's total production of virgin coconut oil is exported and the main bulk (90%) is sold in the domestic market. The company supplies virgin coconut oil to 200 branches or outlets of Mercury Drug store nationwide.

***Coconut Farmer.*** In 2019, the sample coconut farmer obtained a gross income of PHP 53,550 from selling 6,300 kg of husked nuts per hectare at PHP 8.50/nut (Table 4.13). The imputed cost of his own land (21%) and hired labor (18%) were the coconut farmer's major cost items. Other production cost items were the cost of material inputs like organic fertilizer (3.83%) and land tax (7.71%). On a per hectare basis, the coconut farmer's annual gross income far outweighed his annual total cost (PHP 20,759.09/year or PHP 3.30/kg), resulting in an annual net income of PHP 32,790.90 (or PHP 5.20/kg). The coconut farmer's profit- cost ratio of 1.58 implies that the coconut farmer earns PHP 1.58 of profit for every peso spent in producing one kilogram of husked nut.

### TABLE 4.13. ANNUAL COSTS AND RETURNS IN COCONUT PRODUCTION, 1 SAMPLE COCONUT FARMER, PHILIPPINES, 2019

| ITEM | ANNUAL PER HECTARE | | PER KILOGRAM | |
|---|---|---|---|---|
| | AMOUNT (PHP) | PERCENT | AMOUNT (PHP) | PERCENT |
| **INCOME** | | | | |
| **Cash Income** | | | | |
| Nuts sold | 53,550.00 | 100.00 | 8.50 | 100.00 |
| **Total Income** | **53,550.00** | **100.00** | **8.50** | **100.00** |
| **COSTS** | | | | |
| **Cash Costs** | | | | |
| Material inputs | 795.45 | 3.83 | 0.13 | 3.83 |
| Hired labor | 3,818.18 | 18.39 | 0.61 | 18.39 |
| Land tax | 1,600.00 | 7.71 | 0.25 | 7.71 |
| **Total Cash Cost** | **6,213.64** | **29.93** | 0.99 | 29.93 |
| **Non-Cash Costs** | | | | |
| Depreciation | 4,545.45 | 21.90 | 0.72 | 21.9 |
| Imputed rental value of own land | 10,000.00 | 48.17 | 1.59 | 48.17 |
| **Total Non-Cash Costs** | **14,545.45** | **70.07** | **2.31** | **70.07** |
| **Total Cost** | **20,759.09** | **100.00** | **3.30** | **100.00** |
| **Net Cash Income** | **47,336.36** | | **7.51** | |
| **Net Income** | **32,790.91** | | **5.20** | |
| **Profit- Cost Ratio** | **1.58** | | **1.58** | |

***Virgin Coconut Oil Processor.*** The sample coconut processor produced 10,000 liters/month or 120,000 liters/year of virgin coconut oil. Of the company's total production, 68% was sold in the domestic market and 32% was for export. The domestic selling price was PHP 150/250-ml bottle or PHP 1,000/liter- bottle while the export selling price was PHP 200/liter. Hence, the average weighted price of virgin coconut oil was PHP 448/liter. In 2019, the virgin coconut oil processor earned an annual gross income amounting to PHP 53.76 M (PHP 448/liter of virgin coconut oil). Table 4.14 shows that the major cost items were packaging and labelling (43.86%), marketing (25.22%), and husked nuts (23.30%). The virgin coconut oil producer used five (5) kilograms of husked nuts to produce one (1) liter of virgin coconut oil. The total cost incurred in virgin coconut oil processing was PHP 21,890,000 per year or PHP 182.42/liter. The annual net income earned was PHP 31,870,000 or PHP 265.58/liter. The virgin coconut oil processor's profit-cost ratio was 1.46, indicating that PHP1.46 per liter of virgin coconut oil was obtained from one peso spent in processing this product.

## TABLE 4.14. ANNUAL COSTS AND RETURNS IN VIRGIN COCONUT OIL PROCESSING, PHILIPPINES, 2019

| ITEM | ANNUAL | | PER LITER OF VCO | |
|---|---|---|---|---|
| | AMOUNT (PHP) | PERCENT | AMOUNT (PHP) | PERCENT |
| **INCOME** | | | | |
| **Cash Income** | | | | |
| Sales of virgin coconut oil | 53,760,000 | 100.00 | 448.00 | 100.00 |
| **Total Cash Income** | **53,760,000** | **100.00** | **448.00** | **100.00** |
| **Costs:** | | | | |
| **Cash Costs** | | | | |
| Husked nuts | 5,100,000 | 23.30 | 42.50 | 23.30 |
| Packaging materials and Labels | 9,600,000 | 43.86 | 80.00 | 43.86 |
| Hired labor | 1,008,000 | 4.60 | 8.40 | 4.60 |
| Water | 18,000 | 0.08 | 0.15 | 0.08 |
| Electricity | 84,000 | 0.38 | 0.70 | 0.38 |
| Marketing cost | 5,520,000 | 25.22 | 46.00 | 25.22 |
| Other cash costs (organic certification) | 500,000 | 2.28 | 4.17 | 2.28 |
| **Total Cash costs** | **21,830,000** | **99.73** | **181.92** | **99.73** |
| **Non-Cash Costs** | | | | |
| Depreciation of buildings, equipment, and machinery | 60,000 | 0.27 | 0.50 | 0.50 |
| **Total non-cash costs** | **60,000** | **0.27** | **0.50** | **0.50** |
| **Total Cost** | **21,890,000** | **100.00** | **182.42** | **100.00** |
| **Total Cash Income** | **31,930,000** | | **266.08** | |
| **Net Income** | **31,870,000** | | **265.58** | |
| **Profit-Cost Ratio** | **1.46** | | **1.46** | |

## Relative Financial Position of Different Players

Table 4.15 shows that the virgin coconut oil processor is financially better off than the coconut farmer in the VCO value chain cluster. The virgin coconut oil processor's share of the value chain's total unit profit of PHP 58.32 is very high at 91.08% compared to the coconut farmer's unit profit share of only 8.92%. As expected, the virgin coconut oil processor's unit cost share (91.70%) is much higher than the coconut farmer's unit cost share of 8.30% of the total value chain's unit cost share of PHP 39.78/kg.

**TABLE 4.15. RELATIVE FINANCIAL POSITION OF THE VALUE CHAIN PLAYERS PER KILOGRAM OF HUSKED NUTS TO PRODUCE VIRGIN COCONUT OIL, FARMER AS THE SOURCE OF HUSKED NUT AND FINALLY TO THE VIRGIN COCONUT OIL PROCESSOR, PHILIPPINES, 2019**

| Market Player | Unit Cost | | Added Unit Cost | | Selling Price | Unit Profit | | Unit Margin | |
|---|---|---|---|---|---|---|---|---|---|
| | PHP | % | PHP | % | PHP | PHP | % | PHP | % |
| Farmer | 3.30 | 8.30 | 3.30 | 10.55 | 8.50 | 5.20 | 8.92 | 8.50 | 9.49 |
| Processor | 36.48 | 91.70 | 27.98 | 89.45 | 89.60 | 53.12 | 91.08 | 81.10 | 90.51 |
| **Total** | **39.78** | **100.00** | **31.28** | **100.00** | | **58.32** | **100.00** | **89.60** | **100.00** |

Conversion: 1 kg of husked nut = 200 ml of VCO or 1 liter of VCO = 5 kg of husked nuts

## Coconut Water Value Chain Cluster

### Costs and Returns Analysis of Different Players

The sample coconut farmers are farm owners operating an average of 2.38 hectares. Their mean annual volume of production in 2019 was 7,540 kg of young nuts per farm (or 3,168 kg of young nuts per hectare) which were sold to a nut wholesaler/big nut trader on picked-up basis at PHP 9.00/kg. The wholesaler handled a total of 100,000 kg of young nuts in the same year. The wholesaler buys nuts from assemblers and directly from coconut farmers in neighboring provinces that he delivers to the coconut water processing company. The processing company produces pasteurized coconut water using young nuts (7–8 months old) for the export market and frozen coconut meat for the domestic market. For the first six months, the company produces 100,000 liters of pasteurized coconut water per month using 222,222 young nuts as raw materials. For the second half of the year, the company produces 500,000 liters of pasteurized coconut water per month utilizing 1,111,111 young nuts. In 2019, the coconut water processing company produced 3.6 M liters of coconut water using 7,999,998 or approximately 8 M nuts. The export price of the pasteurized coconut water was US$ 1.00/liter (FOB Manila).

Coconut Farmer. The sample coconut farmers earned PHP 28,512.60 per hectare of mean annual gross income from selling 3,168 kg of young nuts at PHP 9.00/kg based on picked-up mode of sale (Table 4.16). The imputed rental value of own land (50.02%) and hired labor (37.42%) were the major production cost items incurred by the sample coconut farmers. Since the sample coconut farmers' mean annual gross income per hectare exceeded their mean annual production cost per hectare (PHP 9,946.13), they reaped a meager mean net profit amounting to PHP 18,566.47 per year. The estimated profit cost-ratio is 1.47, which implies that PHP 1.47 of mean profit was earned by the sample coconut farmers from one peso spent in coconut farming.

### TABLE 4.16. COSTS AND RETURNS ANALYSIS OF COCONUT PRODUCTION, 5 SAMPLE COCONUT FARMERS SELLING YOUNG NUTS TO A WHOLESALER AS MARKET OUTLET, PHILIPPINES, 2019

| ITEM | ANNUAL PER HECTARE | | PER KILOGRAM | |
|---|---|---|---|---|
| | AMOUNT | PERCENT | AMOUNT | PERCENT |
| **INCOME** | | | | |
| **Cash Income** | | | | |
| Nuts sold | 28,512.60 | 100.00 | 9.00 | 100.00 |
| **Total Income** | 28,512.60 | 100.00 | 9.00 | 100.00 |
| **COSTS** | | | | |
| **Cash Costs** | | | | |
| Fertilizer | 35.30 | 0.35 | 0.01 | 0.35 |
| Other material inputs | 65.12 | 0.66 | 0.02 | 0.66 |
| Hired labor | 3,722.01 | 37.42 | 1.17 | 37.42 |
| Land tax | 795.97 | 8.00 | 0.25 | 8.00 |
| Transportation cost | 352.94 | 3.55 | 0.11 | 3.55 |
| **Total Cash Cost** | 4,971.34 | 49.98 | 1.57 | 49.98 |
| **Non-Cash Costs** | | | | |
| Imputed rental value of own land | 4,974.79 | 50.02 | 1.57 | 50.02 |
| **Total Non-Cash Costs** | 4,974.79 | 50.02 | 1.57 | 50.02 |
| **Total Cost** | 9,946.13 | 100.00 | 3.14 | 100.00 |
| **Net Cash Income** | 23,541.26 | | 7.43 | |
| **Net Income** | 18,566.47 | | 5.86 | |
| **Profit-Cost Ratio** | 1.87 | | 1.87 | |

Assumption: 1 nut = 800 kg

***Young Nut Traders.*** The wholesaler or big young nut trader earned PHP 1.35 M of gross income in 2019 from selling 100,000 kg of young nuts at PHP 13.50/kg. The purchase cost of young nuts accounted for the largest proportion (73.41%) of the wholesaler's total marketing cost (approximately PHP 1.23 M/year or PHP 12.26/kg), followed by hired labor (16.31%), and transportation cost (PHP 4.89%). Owing to the large marketing cost incurred by the wholesaler, the net income that he received from his trading business was only PHP 124,000 per year (or PHP 1.24/kg). The estimated profit-cost ratio of 0.10 is much lower than that calculated for the sample coconut farmers. The estimated profit cost-ratio of 0.10 means that only PHP 0.10 of profit was earned by the sample wholesaler of young nuts from one peso spent in nut trading.

### TABLE 4.17. COSTS AND RETURNS ANALYSIS OF YOUNG NUT TRADING, 1 SAMPLE WHOLESALER, PHILIPPINES, 2019

| ITEM | ANNUAL | | PER KILOGRAM | |
|---|---|---|---|---|
| | AMOUNT (PHP) | PERCENT | AMOUNT (PHP) | PERCENT |
| **INCOME** | | | | |
| **Cash Income** | | | | |
| Young nuts | 1,350,000.00 | 100.00 | 13.50 | 100.00 |
| **Total Income** | **1,350,000.00** | **100.00** | **13.50** | **100.00** |
| **COSTS** | | | | |
| Young nuts bought | 900,000.00 | 73.41 | 9.00 | 73.41 |
| Hired labor | 200,000.00 | 16.31 | 2.00 | 16.31 |
| Meals | 12,000.00 | 0.98 | 0.12 | 0.98 |
| Maintenance | 24,000.00 | 1.96 | 0.24 | 1.96 |
| Transportation cost | 60,000.00 | 4.89 | 0.60 | 4.89 |
| Business permit | 10,000.00 | 0.82 | 0.10 | 0.82 |
| **Total Cash Costs** | **1,206,000.00** | **98.37** | **12.06** | **98.37** |
| **Non-Cash Costs** | | | | |
| Depreciation | 20,000.00 | 1.63 | 0.20 | 1.63 |
| **Total Non-Cash Costs** | **20,000.00** | **1.63** | **0.20** | **1.63** |
| **Total Cost** | **1,226,000.00** | **100.00** | **12.26** | **100.00** |
| **Net Cash Income** | **144,000.00** | | **1.44** | |
| **Net Income** | **124,000.00** | | **1.24** | |
| **Profit-Cost Ratio** | **0.10** | | **0.10** | |

***Coconut Water Processing Company.*** The sample processing company obtained PHP 180 M of annual gross income in 2019 from producing and exporting 3.6 M liters of pasteurized coconut water (Table 4.18). The purchase cost of young nuts accounted for 92.75% of the company's total processing and marketing cost (approximately PHP 116.47 M/year). Hired labor was the second major cost item, contributing only 3.84% to total processing and marketing cost. The company's annual net income from processing pasteurized coconut water amounted to PHP 63.56 M. The company's profit-cost ratio of 0.55 indicates that PHP 0.55 of net profit was obtained by the company from one peso spent in processing and exporting pasteurized coconut water.

**TABLE 4.18. COSTS AND RETURNS ANALYSIS OF PASTEURIZED COCONUT WATER PROCESSING, 1 SAMPLE COCONUT WATER PROCESSOR, PHILIPPINES, 2019**

| ITEM | ANNUAL | | PER LITER | |
|---|---|---|---|---|
| | AMOUNT (PHP) | PERCENT | AMOUNT (PHP) | PERCENT |
| **INCOME** | | | | |
| **Cash Income** | | | | |
| Sales of pasteurized coconut water | 180,000,000.00 | 100.00 | 50.00 | 100.00 |
| **Total Income** | **180,000,000.00** | **100.00** | **50.00** | **100.00** |
| **COSTS** | | | | |
| Young nuts | 107,999,973.00 | 92.75 | 29.97 | 92.75 |
| Packaging materials and Labels | 810,000.00 | 0.70 | 0.22 | 0.70 |
| Hired labor | 4,465,500.00 | 3.84 | 1.24 | 3.84 |
| Utilities | 360,000.00 | 0.31 | 0.10 | 0.31 |
| Business permit | 2,000.00 | 0 | | 0 |
| Marketing cost | 1,500,000.00 | 1.29 | 0.42 | 1.29 |
| **Total Cash Costs** | **115,137,473.00** | **98.88** | **31.95** | **98.88** |
| **Non-Cash Costs** | | | | |
| Depreciation | 1,300,000.00 | 1.12 | 0.36 | 1.12 |
| **Total Non-Cash Costs** | **1,300,000.00** | **1.12** | **0.36** | **1.12** |
| **Total Cost** | **116,473,473.00** | **100.00** | **32.31** | **100.00** |
| **Net Cash Income** | **64,862,527.00** | | **18.05** | |
| **Net Income** | **63,562,527.00** | | **17.69** | |
| **Profit-Cost Ratio** | **0.55** | | **0.55** | |

Conversion: 1 young nut = 450 ml of coconut water

## Relative Financial Position of Different Players

Among the three value chain players, the sample coconut farmers had the lowest unit cost share (10.49%) of the value chain's total unit cost amounting to PHP 29.94/kg (Table 4.19). The coconut water processing company exhibited the highest unit cost share (48.56%), followed by the young nut wholesaler (40.95%). In terms of unit profit share, the coconut water processing company had the highest percentage share (53.14%) of the value chain's total profit of PHP 15.15/kg. The sample coconut farmers ranked second, exhibiting a unit profit share of 38.68%. The young nut wholesaler's unit profit share was the lowest (only 8.18%) among the value chain players.

Again, the foregoing analysis does not indicate that the sample coconut farmers are financially better off than the big wholesaler. It can be gleaned from Tables 4.16 and 4.17 that the total profit of the big wholesaler (PHP 124,000/year) is relatively much higher than the average total farm profit obtained by the coconut farmers (PHP 28,512.60) because the wholesaler traded 100,000 kg of young nuts per year while the sample coconut farmers sold only an average of 3,168 kg of young nuts per year. Among the value chain players, the coconut water processing company was the most financially better because of its high volume of production of pasteurized coconut water (3 M liters/year) using approximately 8 M young coconuts. From the analysis of the relative financial position of the value chain players, it can also be inferred that if a farmers' cooperative will venture into young nut trading and engage in direct marketing to the coconut water processing company, the association can earn a net profit of PHP 1.24/kg.

**TABLE 4.19. RELATIVE FINANCIAL POSITION OF VALUE CHAIN PLAYERS PER KILOGRAM OF FRESH YOUNG NUT TO PRODUCE PASTEURIZED COCONUT WATER, FROM THE FARMERS AS THE SOURCE OF YOUNG NUTS TO THE WHOLESALER AND FINALLY TO THE COCONUT WATER PROCESSING COMPANY, PHILIPPINES, 2019**

| Market Player | Unit Cost | | Added Unit Cost | | Selling Price | Unit Profit | | Unit Margin | |
|---|---|---|---|---|---|---|---|---|---|
| | PHP | % | PHP | % | PHP | PHP | % | PHP | % |
| Farmer | 3.14 | 10.49 | 3.14 | 42.20 | 9.00 | 5.86 | 38.68 | 9.00 | 40.00 |
| Wholesaler | 12.26 | 40.95 | 3.26 | 43.82 | 13.50 | 1.24 | 8.18 | 4.50 | 20.00 |
| Processor | 14.54 | 48.56 | 1.04 | 13.98 | 22.50 | 8.05 | 53.14 | 9.00 | 40.00 |
| **Total** | **29.94** | **100.00** | **7.44** | **100.00** | | **15.15** | **100.00** | **22.50** | **100.00** |

## Coco Coir Value Chain Cluster

### Costs and Returns Analysis of Different Players

The coconut farmer, an owner-operator, owns 5.0 hectares of coconut farm. His annual coconut production in 2019 was 5,619 kg of whole nuts per hectare or 28,095 kg of whole nuts per farm. He sold 1,854 kg/hectare of coconut husks (or 9,270 kg per farm) to the coconut husk trader on picked-up method of sale at PHP 1.30/kg.

The coconut husk trader is a wholesaler-consolidator who purchases coconut husks from assemblers and directly from coconut farmers on picked-up or delivered mode of procurement. In 2019, the coconut husk trader handled 156,000 kg of coconut husks in his trading business. His selling price to the coir processing company was PHP 2.00/kg.

The coco coir processing company used to export coco fiber and coco peat but stopped producing these coir products because of the high export cost. The company decided to focus instead on coco geonet processing for the domestic market. In 2019, the coco coir processing company bought a total of 2.4 M kg of coconut husks at PHP 2.00/kg which were decorticated in the company's processing plant. After decorticating the coconut husks, 240,000 kg of coco fiber were produced which were used as raw materials in making geotextile nets. The company produced 1 geotextile net per month using 20,000 kg of coir fiber. The size of each geotextile net was 60,000 sq m. The selling price of geotextile net was PHP 4.00/sq m. The company produced a total of 12 geotextile nets in 2019.

***Coconut Farmer.*** The sample coconut farmer obtained PHP 2,410 per year from selling 1,854 kg of coconut husks at PHP 1.30/kg to augment his household income from coconut farming (Table 4.20). Hired labor cost for collecting and assembling husks amounting to PHP 1,709/ha (PHP 0.76/kg of coconut husk) was the only cost item that the sample coconut farmer encountered from selling coconut husks. Hired labor cost for dehusking was already included as a cost item in copra processing. Net income received by the sample coconut farmer from coconut husk sales amounted to PHP 1,001.20/ha per year or PHP 5,006 per farm per year (or PHP 0.54/kg of coconut husk). The profit-cost ratio is 0.71 which means that PHP 0.71/kg of net profit was earned by the sample coconut farmer from one peso spent in selling coconut husks.

**TABLE 4.20. COSTS AND RETURNS ANALYSIS OF COCONUT FARMER FROM SELLING COCONUT HUSK, PHILIPPINES, 2019**

| ITEM | ANNUAL | | PER KILOGRAM | | PER HECTARE | |
|---|---|---|---|---|---|---|
| | AMOUNT | PERCENT | AMOUNT | PERCENT | AMOUNT | PERCENT |
| **INCOME** | | | | | | |
| **Cash Income** | | | | | | |
| Coconut husk sold | 12,051.00 | 100.00 | 1.30 | 100.00 | 2,410.20 | 100.00 |
| **Total Income** | **12,051.00** | **100.00** | **1.30** | **100.00** | **2,410.20** | **100.00** |
| **COSTS** | | | | | | |
| **Cash Cost** | | | | | | |
| Hired labor | 7,045.00 | 100.00 | 0.76 | 100.00 | 1,409.00 | 100.00 |
| Total Cash Cost | **7,045.00** | **100.00** | **0.76** | **100.00** | **1,409.00** | **100.00** |
| **Total Cost** | **7,045.00** | **100.00** | **0.76** | **100.00** | **1,409.00** | **100.00** |
| **Net Cash Income** | **5,006.00** | | **0.54** | | **1,001.20** | |
| **Net Income** | **5,006.00** | | **0.54** | | **1,001.20** | |
| **Profit-Cost Ratio** | **0.71** | | **0.72** | | **0.71** | |

Conversion: 1 kg whole nut = 0.333 kg husk

***Coconut Husk Trader.*** The annual gross income earned by the coconut husk trader from selling 156,000 kg of coconut husks at PHP 2.00/kg was PHP 312,000 in 2019 (Table 4.21). Hired labor was the husk trader's major cost item, contributing 69.64% to the total marketing cost amounting to PHP 291,200 per year, or PHP 1.87/kg of coconut husk, followed by hired labor (11.54%), and depreciation of storage area and vehicle (10.58%). The coconut husk trader reaped PHP 20,800 per year of net income, or PHP 0.13/kg. The profit-cost ratio from coconut husk trading is0.07. This figure indicates that PHP 0.07 of net profit was received by the husk trader for one peso spent in coconut husk trading.

### Table 4.21. Costs and returns analysis of coconut husk trading, 1 sample coconut husk trader, Philippines, 2019

| ITEM | ANNUAL | | PER KILOGRAM OF COCONUT HUSK | |
|---|---|---|---|---|
| | AMOUNT | PERCENT | AMOUNT | PERCENT |
| **INCOME** | | | | |
| **Cash Costs** | | | | |
| Coconut husk sold | 312,000.00 | 100.00 | 2.00 | 100.00 |
| **Total Income** | 312,000.00 | 100.00 | 2.00 | 100.00 |
| **COSTS** | | | | |
| **Cash Costs** | | | | |
| Coconut husk bought | 202,800.00 | 69.64 | 1.30 | 69.64 |
| Hired labor | 33,600.00 | 11.54 | 0.22 | 11.54 |
| Transportation cost | 24,000.00 | 8.24 | 0.15 | 8.24 |
| **Total Cash Cost** | **260,400.00** | **89.42** | **1.67** | **89.42** |
| **Non-Cash Cost** | | | | |
| Depreciation | 30,800.00 | 10.58 | 0.20 | 10.58 |
| **Total Non-Cash Cost** | **30,800.00** | **10.58** | **0.20** | **10.58** |
| **Total Cost** | **291,200.00** | **100.00** | **1.87** | **100.00** |
| **Total Cash Income** | **51,600.00** | | **0.33** | |
| **Net Income** | **20,800.00** | | **0.13** | |
| **Profit Cost Ratio** | **0.07** | | **0.07** | |

***Coco Geotextile Net Processor.*** In 2019, the coco coir processing company earned a very high annual gross income from selling 12 coco geotextile nets amounting to PHP 28.80 M (Table 4.22). The company incurred PHP 7.71 M in geotextile net processing. The major cost items were the husks (62.24%) and hired labor (14.67%). The company reaped PHP 21.16 M as total cash income and PHP 21.08 M as net cash income. A high profit-cost ratio was estimated for the coco geotextile net processing business. The profit-cost ratio of 2.73 means that PHP 2.73 /kg was generated from one peso spent in making geotextile net.

TABLE 4.22. COSTS AND RETURNS ANALYSIS OF COCO GEOTEXTILE NET PROCESSING, 1 SAMPLE COCO COIR PROCESSOR, PHILIPPINES, 2019

| ITEM | ANNUAL | | PER KG OF COIR | | PER KG OF HUSK | |
|---|---|---|---|---|---|---|
| | AMOUNT | PERCENT | AMOUNT | PERCENT | AMOUNT | PERCENT |
| **INCOME** | | | | | | |
| **Cash Income** | | | | | | |
| Geonet Sold | 28,800,000.00 | 100.00 | 120.00 | 100.00 | 12.00 | 100.00 |
| **Total Income** | **28,800,000.00** | **100.00** | **120.00** | **100.00** | **12.00** | **100.00** |
| **COSTS** | | | | | | |
| Coco husk bought | 4,800,000.00 | 62.24 | 20.00 | 62.24 | 2.00 | 62.24 |
| Transportation cost | 240,000.00 | 3.11 | 1.00 | 3.11 | 0.10 | 3.11 |
| Hired labor | 1,131,600.00 | 14.67 | 4.72 | 14.67 | 0.47 | 14.67 |
| Utilities | 12,000.00 | 0.16 | 0.05 | 0.16 | 0.01 | 0.16 |
| Repair and maintenance | 12,000.00 | 0.16 | 0.05 | 0.16 | 0.01 | 0.16 |
| Business permit | 3,000.00 | 0.04 | 0.01 | 0.04 | 0.00 | 0.04 |
| Marketing cost | 240,000.00 | 3.11 | 1.00 | 3.11 | 0.10 | 3.11 |
| Packaging materials | 600,000.00 | 7.78 | 2.50 | 7.78 | 0.25 | 7.78 |
| Other materials used | 600,000.00 | 7.78 | 2.50 | 7.78 | 0.25 | 7.78 |
| **Total Cash Cost** | **7,638,600.00** | **99.05** | **31.83** | **99.05** | **3.18** | **99.05** |
| **Non-Cash Cost** | | | | | | |
| Depreciation | 73,333.33 | 0.95 | 0.31 | 0.95 | 0.03 | 0.95 |
| **Total Non-Cash Cost** | **73,333.33** | **0.95** | **0.31** | **0.95** | 0.03 | 0.95 |
| **Total Cost** | **7,711,933.33** | **100.00** | **32.13** | **100.00** | **3.21** | **100.00** |
| **Total Cash Income** | **21,161,400.00** | | **88.17** | | **8.82** | |
| **Net Income** | **21,088,066.67** | | **87.87** | | **8.79** | |
| **Profit Cost Ratio** | **2.73** | | **2.73** | | **2.73** | |

Conversion: 1MT of husk = 0.10 MT of coir

## Relative Financial Position of Different Players

Among the three value chain players, the sample coconut farmer had the lowest unit cost share (13.01%) of the value chain's total unit cost amounting to PHP 5.84/kg (Table 4.23). The coco coir processing company exhibited the highest unit cost share (47.64), followed by the coco husk wholesaler (32.02%). In terms of unit added cost share, the coco coir processing company exhibited the highest share (47.64%), followed by the coconut farmer with 29.92% unit added cost share. The coco husk wholesaler, on the other hand, had the lowest unit added cost share of 22.44%. As expected, the coco coir processor showed the highest unit profit share (92.92%). The sample coconut farmer ranked second with unit profit share of 5.71%. The coco husk trader's unit profit share (1.37%) was the lowest among the value chain players.

The analysis presented above is in terms of unit cost and unit profit shares. However, if the total volume of business is considered, the coconut farmer is at the bottom of the income ladder having earned the lowest profit as shown in the costs and returns analysis in Table 4.20 The coco coir processing company is at the top of the income ladder having generated the highest business profit as presented in Table 4.23.

**TABLE 4.23. RELATIVE FINANCIAL POSITION OF VALUE CHAIN PLAYERS PER KILOGRAM OF COCO HUSK, FARMER AS THE SOURCE OF COCO HUSK TO THE WHOLESALER AND FINALLY TO THE COIR PROCESSOR, PHILIPPINES, 2019**

| Market Player | Unit Cost | | Added Unit Cost | | Selling Price | Unit Profit | | Unit Margin | |
|---|---|---|---|---|---|---|---|---|---|
| | PHP | % | PHP | % | PHP | PHP | % | PHP | % |
| Farmer | 0.76 | 13.01 | 0.76 | 29.92 | 1.30 | 0.54 | 5.71 | 1.30 | 10.83 |
| Wholesaler | 1.87 | 32.02 | 0.57 | 22.44 | 2.00 | 0.13 | 1.37 | 0.70 | 5.83 |
| Processor | 3.21 | 54.97 | 1.21 | 47.64 | 12.00 | 8.79 | 92.92 | 10.00 | 83.33 |
| **Total** | **5.84** | **100.00** | **2.54** | **100.00** | | **9.46** | **100.00** | **12.00** | **100.00** |

## Coco Sugar Value Chain Cluster

The eleven farmer-processors interviewed are among the major players in the LGU-led Agro-Hub enterprise in Alabat Island in Quezon province and are members of the KAANIB Coco Hub Association in this island. PCA provided a big farmer-based processing center (i.e., building and equipment) that serves as a common shared facility for the farmer-processors of the association. PCA trained the farmer-processors on coconut sugar proc essing which provided them the skills to venture into coconut sugar processing business.

Sap collection is done by hired laborers who are paid in cash at PHP 7.50/liter of coconut sap collected. Coconut sap collection is usually done four to five times daily every 3-6 hours (i.e., 6 am, 9 am, 1 pm, 5 pm, and 11 pm). Coco syrup production is done at the farm level because of the exceedingly short shelf life of the sap. The tapper's wife is hired to cook the coconut sap into coconut syrup and is paid in cash at PHP 15.00/liter of the coconut syrup. Coconut sugar processing activities are undertaken at the common shared facility where the farmer-processors bring their coconut syrup. They hire workers to cook the coconut syrup into coconut sugar. Each hired cook granulates and dries the coconut syrup delivered to the common facility and is paid PHP 20/kg of raw sugar. Processed raw sugar of the farmer-processors is given to the KAANIB Coco Hub Association for packing and labeling. The KAANIB Coco Hub Association serves as the consolidator of the coconut sap sugar processed by the 11 farmer-processors. The association also handles the packaging of the consolidated coconut sugar products at the common facility to ensure that product quality is compliant to PNS for domestic and/or export marketing. The association pays the packers a daily wage as workers in the processing plant. Currently, the municipal LGU takes charge of marketing packed coco sugar products of the association.

## Costs and Returns Analysis of Farmer-Processor Players

Each farmer-processor, on average, can produce 285 kg of coconut sugar per harvest cycle or a total of 3,424.27 kg annually. At a selling price of PHP 165/kg, the average annual gross income received by each farmer-processor in 2019 was PHP 565,004.67. Among the cost items, hired labor accounted for the biggest proportion (58.79% in syrup production and 19.0% in coconut sugar production). Other cash costs incurred by the farmer-processors were fuel cost for cooking, transportation cost, land tax, and payment for organic certification. The total cost of producing one kilogram of coconut sugar was PHP 127.76. Overall, the sample farmer-respondents posted positive profit measures with a net cash income of PHP 44.80/kg and a net income of PHP 37.24/kg of coconut sugar, indicating that coconut sugar processing is very profitable. The estimated profit-cost ratio is 0.29 which means that, on average, for every peso spent on coconut sugar production, a farmer-processor earned PHP 0.29 per kilogram of coconut sugar.

**TABLE 4.24. COSTS AND RETURNS ANALYSIS OF COCONUT SUGAR PROCESSING, 11 FARMER-PROCESSORS, PHILIPPINES, 2019**

| ITEM | ANNUAL | | PER KILOGRAM OF COCO SUGAR | |
|---|---|---|---|---|
| | AMOUNT (PHP) | PERCENT | AMOUNT (PHP) | PERCENT |
| **INCOME** | | | | |
| **Cash Income** | | | | |
| Coconut sugar sales | 565,004.67 | 100.00 | 165.00 | 100.00 |
| **Non-Cash Income** | | | | |
| Unsold coconut sugar | 0.00 | 0.00 | 0.00 | 0.00 |
| **Total Income** | **565,004.67** | **100.00** | **165.00** | **100.00** |
| **COSTS** | | | | |
| **Cash Costs** | | | | |
| **Syrup Production** | | | | |
| Hired labor for syrup production | 257,171.90 | 58.79 | 75.10 | 58.79 |
| Land tax | 3,898.18 | 0.89 | 1.14 | 0.89 |
| Land rent | 11,590.91 | 2.65 | 3.38 | 2.65 |
| Other material inputs | 9,381.15 | 2.14 | 2.74 | 2.14 |
| **Sugar Processing** | | 0.00 | 0.00 | 0.00 |
| Hired labor for sugar processing | 83,136.77 | 19.00 | 24.28 | 19.00 |
| Utilities | 0.00 | 0.00 | 0.00 | 0.00 |
| Fuel for cooking | 7,636.36 | 1.75 | 2.23 | 1.75 |
| Repairs and maintenance | 9,090.91 | 2.08 | 2.65 | 2.08 |

| ITEM | ANNUAL | | PER KILOGRAM OF COCO SUGAR | |
|---|---|---|---|---|
| | AMOUNT (PHP) | PERCENT | AMOUNT (PHP) | PERCENT |
| Transportation cost | 11,104.55 | 2.54 | 3.24 | 2.54 |
| Fuel cost (if vehicle is owned) | 3,863.64 | 0.88 | 1.13 | 0.88 |
| Payment for organic certification | 14,718.70 | 3.36 | 4.30 | 3.36 |
| **Total Cash Cost** | **411,593.06** | **94.08** | **120.20** | **94.08** |
| **Non-Cash Costs** | | | | |
| Depreciation | 4,057.92 | 0.93 | 1.19 | 0.93 |
| Imputed value of own land | 21,824.09 | 4.99 | 6.37 | 4.99 |
| **Total Non-Cash Costs** | **25,882.01** | **5.92** | **7.56** | **5.92** |
| **Total Cost** | **437,475.07** | **100.00** | **127.76** | **100.00** |
| **Net Cash Income** | **153,411.60** | | **44.80** | |
| **Net Income** | **127,529.60** | | **37.24** | |
| **Profit-Cost Ratio** | **0.29** | | **0.29** | |

# Benchmarking (Production Sector)

The Philippines has the largest coconut area in the world at 3.65 M in 2019—about a M ha. more than Indonesia, and 1.5 M ha more than India. Combined, the three countries account for almost 75% of the global coconut production in 2019 (FAOStat). In terms of volume of production, Indonesia is the largest producer at 17.13 MMT nuts, followed by the Philippines (14.77 M MT), and India (14.68 MMT). However, the Philippines' nut productivity per hectare is the lowest among the top 10 coconut-producing countries, in all years from 2015–2019 (Table 4.25), with a negative 0.8% average annual growth rate. Both Indonesia and India have positive average annual growth rates for the same period at 1.46% and 8.27%, respectively. Without short- to long-term interventions, the Philippines stands to lose its 2nd rank as highest nut producer to India in the near future while Indonesia can further increase its lead as the top coconut supplier. Brazil and Vietnam, each with less than 200,000 ha of coconut area, produce 125,000 (12.5MT) and 105,000 nuts hg/ha (10.5 MT), respectively. On the low extreme are Sri Lanka and the Philippines at 49,000 and 40,000 hg/ha nuts, respectively. The other top producing countries have yields between 61,000 and almost 70,000 hg/ha nut yield (Table 4.25).

## TABLE 4.25. NUT PRODUCTIVITY PER HECTARE OF THE TOP TEN COCONUT-PRODUCING COUNTRIES IN THE WORLD

| COUNTRIES | Nut Yield (Hg/ha) 2015 | 2016 | 2017 | 2018 | 2019 | Average growth rate |
|---|---|---|---|---|---|---|
| Indonesia | 57,756 | 60,000 | 60,351 | 61,071 | 61,174 | 1.46 |
| Philippines | 41,888 | 38,779 | 38,892 | 40,589 | 40,431 | -0.79 |
| India | 53,673 | 54,488 | 53,661 | 78,269 | 68,257 | 8.27 |
| Sri Lanka | 52,619 | 54,689 | 43,310 | 46,085 | 49,037 | -1.01 |
| Brazil | 110,596 | 112,613 | 105,543 | 118,064 | 124,683 | 3.25 |
| Vietnam | 98,818 | 100,110 | 101,227 | 101,608 | 105,502 | 1.66 |
| Mexico | 64,554 | 63,917 | 63,643 | 63,368 | 63,094 | -0.57 |
| Papua New Guinea | 56,877 | 58,679 | 60,174 | 61,670 | 63,165 | 2.66 |
| Thailand | 47,201 | 47,584 | 62,951 | 70,783 | 64,807 | 9.28 |
| Malaysia | 69,104 | 67,168 | 69,937 | 66,007 | 69,892 | 0.40 |

Note: 1 Hg=0.0001 MT
*Source: FAOStat, 2019*

Coconut production in the top three producing countries— Indonesia, Philippines and India—are all dominated by smallholder coconut production. About 6.6 M farmers in Indonesia, 2.5 M in the Philippines, and 12 M in India rely on coconut for their main source of income

Coconut in Indonesia is widespread, planted in 3.4 M ha throughout 34 provinces, of which six occupy 47.7% of the totalarea. The provincewiththe largest coconutarea(12.14%) is the Riau in Sumatera Island in North Sulawesi, followed by East Java, Central Java, North Maluku and Central Sulawesi. Coconuts in Riau are concentrated in Indragiri Hilir, which shares 12.12% of the coconut area (Alouw, JC and S Wulandari, 2020).

Similarly, in the Philippines, 3.65 M ha of coconuts are spread nationwide, dominating the agricultural landscape of 69 out of the 82 provinces. The main island of Mindanao supplies 60% of the total nut production in 2019 and has three regions among the top four coconut producers, namely Davao, Northern Mindanao and Zamboanga Peninsula with each region producing more than 1.5 B nuts (data from PSA, 2019).

In India, coconut production is concentrated in the southern peninsular region composed of the four states of Kerala, Tamil Nadu, Karnataka, and Andhra Pradesh. This region accounts for 89% of the coconut area of 2.1 M ha and 91% of the country's production (Deepthi N, 2017).

The benchmark in terms of productivity is Brazil, ranked 6th in the world in terms of area (187,000 ha), 5th in volume of nut production (2.3MT) but run-away first in terms of productivity per hectare at over 12.5 MT/ha (data from FAOStat, 2019). Its modern, technology-based agro-industrial plantations supply coconuts directly to processors. This backward integration is also desired by oil mill processors in the Philippines but the coconut farms are small and fragmented, thus difficult for them to consolidate. There are VCO processors who practice this backward integration to a limited extent, maintaining their own plantations and leasing other farms, but generally, not at a large scale. The leap in tree productivity and production per hectare in Brazil was attributed to planting of suitable dwarf variety and technologically advanced irrigation and fertigation systems (ACA Ltd, 2019). Vietnam is also small-farmer focused but is the benchmark in Asia in terms of tree productivity and production at 10.5 MT, a close second to Brazil (data from FAOStat, 2019). Mekong Delta accounts for over 75% of coconut hectarage, so water is probably not a constraint. Ben Tre, coconut capital of Vietnam, has increased its coconut area by 25,000 ha in less than 10 years (up 68%) and accounted for 45% of coconut in the country with corresponding yield increase (https://coconutvietnam.com.vn/). There is much to learn from how these two countries have achieved such high yields. The Agronomy Capital Advisors Ltd (ACAL, Jan. 2019) is a good reference for comprehensive analysis of the coconut producer sector focused on the operational and sectoral differences between Brazil and the top producing countries, Indonesia, the Philippines, and India.

Reliance of supply in wide areas or concentration in fewer areas both have their advantages and disadvantages, and strategic interventions for sustainable growth of the coconut industry could differ. Calamities, strong typhoon, drought, conflict, disruption in transport system, pest and disease outbreaks in a major supply grid would impact the whole industry, whereas a wider spread of supply can buffer the supply chain under such circumstances while waiting for the affected areas to recover. On the other hand, spreading the supply too widely across the country, particularly in archipelagic Philippines, poses challenges in collection and transport of feedstock to processors. This gave the opportunity for the prevalence of multi-layered marketing system, which marginalized the small growers from participating (and benefiting) in the higher levels of the coconut value chains. Provision of programs and support system (improving farmers' welfare and income, monitoring and enhancing crop health) to geographically dispersed and small farms, could stretch thinly the resources of the government, thus diluting their impacts. Focusing the same amount of resources and support to concentrated areas should make a huge impact on coconut productivity and welfare of farmers.

The national programs of the top three coconut-producing countries have similarities—but different approaches—in addressing similar problems of low productivity, low farmers' income, poor management of coconut farms, pests and diseases, high and increasing senility of trees. These programs include production and distribution of quality planting materials, planting and rejuvenation/rehabilitation of old senile and diseased trees, promoting integrated good agricultural, scientific practices to increase yield and income of farmers. Noteworthy programs include (1) expansion to potential nontraditional coconut areas following specialized schemes with financial and technical support to follow scientific methods, and (2) community- based approach in effectively controlling and managing pests and diseases in India. Indonesia and the Philippines have programs to develop protocols for tissue culture (and embryo culture for Indonesia) and establishment of coconut seed gardens in several major coconut-producing provinces. Plantation Industries Minister Naveen Disanaya said that Sri Lanka will venture in a massive expansion program to establish the second coconut triangle base in the North and East aimed at doubling the coconut production in 10 years, with an allocation of Rs 200 M for the coconut project. The first coconut triangle, which covers 66% of the total coconut hectarage in Sri Lanka, is located in the districts of Kurunegala, Puttlam and Colombo (www.news.lk/news)

The Philippines, because of its geographical location, is recurrently exposed to tropical cyclones that are predicted to be more frequent and intense due to climate change. The Philippines ranked 4th in the long- term climate risk index for 2000–2019 (annual averages), with 317 devastating events, the highest among the top ten countries most impacted by extreme weather events. The experience with super typhoons Bopha in 2012 Haiyan in 2013 and Mangkuk in 2018 brought devastation to the country (Germanwatch, 2021). Major coconut-producing areas were so devastated and are still unable to recover. Disaster risk reduction and management should be factored in the development programs of PCA and building resilience in the coconut production sector is a key strategy. Research on coconut phenology and how the crop responds to changes in the environment need to be prioritized. Similarly, India needs to build climate resilience in the coconut- producing regions. It ranked 5th in 2018 and 7th in 2019 climate risk index due to the severe effects of seasonal monsoons that caused massive flooding, and due to six out of ei gh t intense to very severe cyclones that caused death and $8.1 B in damages. In Ben Tre, Vietnam, the worst drought elevated saltwater levels in rivers (reaching 5,000mg/L) and caused the worst drought in the area that reduced nut size rendering them unmarketable (Hoang Nam, 2020).

# Local Benchmarking

Assurance of steady supply of good quality coconuts, the lifeblood of the various coconut-based value chain industry clusters, is key to sustainable growth of the industry. About 80% of the coconuts produced in the country are processed into copra, the feedstock for coco oil mills. From 2009–2019, the estimated yearly utilization of the oil mills ranged from 38% to 69% of the total crushing capacity of 3.4 M MT/year of 60 oil mills (Tables 3.3, 3.4, 3.5 Chapter 3). Added to this is the increasing demand for other coconut products coming from whole nuts and sap, and the magnitude of supply deficit increases further.

For farmers dependent only on coconut, mostly copra for their source of livelihood, the low yield of coconut in the country at 44 nuts/tree /year is just about 50% of the potential yield of the local talls and less than 30% of the conservative estimate of yield of hybrids. The dependence of price of nut and copra on the fluctuating price of the world oil market results in low income of farmers from coconut. Many studies report on income earned by farmers from coconut farming and all converge on the same conclusion—farmers generally earn low income from coconut farming and coconut farming alone cannot provide a decent income for a typical coconut farmer, no matter what product from coconut he sells. Table 4.26 presents the range of income (from PHP <10,000 to >100,000/year) of coconut farmers' percentage of NCFRS-registered farmers by region. Of the total 1.44 M farmers, only 5.6% earn more than PHP 102,000. A great majority (83%) earn less than PHP 50,001, of which 46% earn PHP 10,000 (0.528 M) or less, the other 37% earn between PHP 10,001– 50,001 (0.425 M) (NCFRS, 2018).

## TABLE 4.26. RANGE OF INCOME OF CORRESPONDING NUMBER OF FARMERS IN DIFFERENT REGIONS OF THE PHILIPPINES, 2018 (N=1.44 M)

| Region/Income Range (PHP) | <10,001 | 10,001–20,001 | 20,001–30,001 | 30,001–50,001 | 50,001 – 60,001 | 60,000–80,001 | 80,001–100,001 | >100,002 |
|---|---|---|---|---|---|---|---|---|
| Region IV-B (MIMAROPA) | 106,070 | 9,039 | 5,647 | 5,828 | 1,782 | 2,118 | 1,351 | 2,552,260 |
| Region IV-A (CALABARZON) | 2,778 | 1,221 | 651 | 656 | 178 | 169 | 124 | 4,184,990 |
| Region V (Bicol Region) | 81,701 | 9,826 | 7,065 | 9,370 | 3,079 | 3,329 | 1,885 | - |
| Region VI (Western Visayas) | 55,696 | 2,837 | 2,175 | 2,902 | 580 | 992 | 293 | - |
| Region VII (Central Visayas) | 29,692 | 15,187 | 11,669 | 11,259 | 10,012 | 10,079 | 9,894 | 10,239 |
| Region VIII (Eastern Visayas) | 69,676 | 24,708 | 13,807 | 10,888 | 2,683 | 2,616 | 1,296 | 1,886 |
| Region IX (Zamboanga Peninsula) | 18,499 | 17,947 | 14,325 | 13,220 | 4,057 | 4,791 | 2,927 | 5,383 |
| Region X (Northern Mindanao) | 15,100 | 15,335 | 9,952 | 11,048 | 3,460 | 4,052 | 2,750 | 11,032 |
| Region XI (Davao Region) | 23,479 | 16,999 | 11,692 | 12,121 | 3,836 | 4,264 | 2,877 | 8,896 |
| Region XII (SOCCSKSARGEN) | 96,222 | 12,805 | 8,905 | 10,257 | 2,827 | 3,084 | 1,701 | 2,920 |
| Region XIII (Caraga) | 15,284 | 13,695 | 8,260 | 8,000 | 2,219 | 2,788 | 1,335 | 2,427 |
| BARMM | 13,914 | 24,222 | 33,717 | 37,510 | 9,359 | 11,763 | 7,248 | 12,929 |
| **Grand Total** | **528,111** | **163,821** | **127,865** | **133,059** | **44,072** | **50,045** | **33,681** | **63,698** |
| **Percent (%) of farmers** | **46.15** | **14.32** | **11.17** | **11.63** | **3.85** | **4.37** | **2.94** | **5a.57** |

*Source: NCFRS, PCA*

The food threshold for a Filipino family of five in 2018 needed no less than PHP 7,337 on the average to meet the family basic food needs for a month, or PHP 88,044/year. To meet both basic food and nonfood needs (poverty threshold), the family needs PHP 10,481/ month or PHP 125,775/ year (PSA, 2019). It is a sad reality that more than 90% of our coconut farmers are food insecure and even less than 6% have incomes above the poverty threshold (Table 4.26).

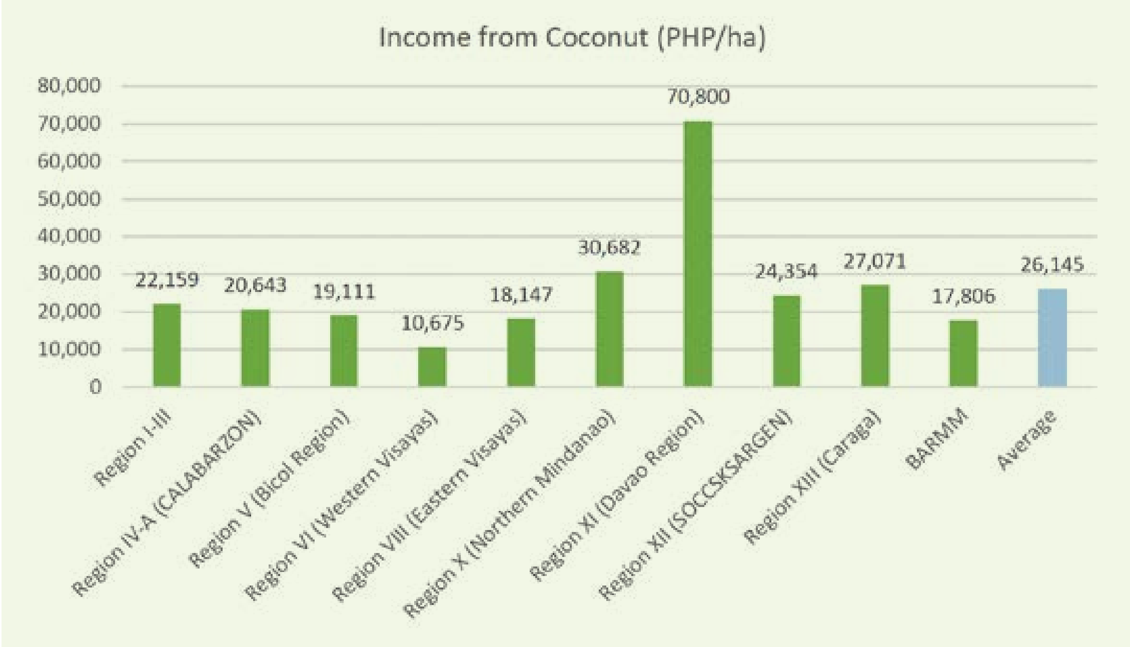
In the conduct of the value chain analysis, when farmers supplying feedstocks to various product streams were interviewed, the average earnings/ha also support the data in the NCFRS survey. But, from the limited survey data, there are farmers who could earn much more than the typical farmer selling the same product, such as farmers selling matured nuts and then performing value-adding to the sap, processing coco syrup/sugar through a common service facility and participating in cooperative marketing system (Alabat agro-hub). Generally, all farmer respondents have poor management of coconut farms - rainfed, no fertilization (except for salt when PCA provides), no pest and disease management, occasional weeding just to facilitate harvesting. While there are farms with higher nut productivity per tree (more nuts/harvest), the income from copra and matured nuts was more price dependent at the time of sale. Matured nut sellers to VCO processors additionally get a price premium, particularly when the farm is certified organic.

TABLE 4.26.1. NET CASH INCOME OF FARMERS SELLING SPECIFIC PRODUCTS FROM COCONUT

| Product | Average (PHP) | Maximum (PHP) | Minimum (PHP) |
|---|---|---|---|
| Matured nuts (n=17) | 38,325.87 | 140,666.67 | 1,828.57 |
| Copra (n=14) | 20,503.35 | 74,880.00 | 2,393.60 |
| Coco syrup (n=11) | 97,701.41 | 214,866.67 | 15,750.00 |
| Young buko (n=6) | 32,517.30 | 58,880.00 | 16,920.00 |

In the 2019 NCFRS early registration, a random sample of 72 farmers from eight regions validated the low income of coconut farmers with an average of PHP 26,145/ha. Income from coconut ranged from PHP 10,675/ha to PHP 70,800/ha (Figure 4.16).

**FIGURE 4.16. INCOME LEVEL OF COCONUT REGISTRANTS TO THE 2019 NCFRS**




Low income from coconut farming offers no incentive for the farmers to improve coconut farm management. The coconut production sector remains an informal sector dominated by small holders, landless tenants, and farm workers who have no social protection or welfare benefits from the industry. Among the players in the numerous coconut value chains, the farmer is the most marginalized and vulnerable, bearing the burden of low and fluctuating prices of copra and even whole nuts that are dependent on the world oil prices. All other players—the traders, consolidators, processors, brokers, exporters—operate on margin; hence, whether the prices are high or low, they all earn profit, unlike the coconut farmers who are paid based on the prevailing coconut oil price with discounts for poor quality but generally without premium for good quality.

## Addressing the Low Coconut Productivity and Declining Production in the Philippines

The causes of low productivity in the Philippines despite having the largest coconut hectarage are many, such as the following: senility of trees; poor management practices, recurrent extreme climate events typhoons and drought; rampant cutting even of productive trees; and coconut land conversion to other uses, among others.

There is much room for improving yield of coconuts in the country using already available technologies. The traditional, still existing, practice of chronic under management of coconuts—generally rainfed, no fertilization, no pest and disease monitoring, unmanaged pests and diseases. Control, is initiated by the government (through PCA) only when the infestation or infection is already serious and widespread such as the invasive pests Brontispa or coconut leaf weevil (Brontispa longissima, Gestro) and coconut scale insect (cocolisap, CSI Aspidiotus rigidus. Clearing of understory is done only during harvest (if at all). This management system needs to change to increase nut productivity per tree which averaged only 44 nuts/tree/year in 2019. However, the farmers have to be willing to replant senile trees with good quality seedlings, adopt and sustain good agricultural practices for new plantings and productive trees, including pest and disease monitoring and management.

Table 4.27 presents the production practices of a typical coconut farmer against the best practices (benchmark). It has been and will remain a challenge to make farmers continue to plant/replant and shift toward good management practices, without an inclusive program that will directly benefit them and their families. Thus, there is a need for farmers to be incentivized and motivated to continue planting and sustainably manage their coconut farms following the recommended good agricultural practices

### TABLE 4.27. BENCHMARK AND TYPICAL PRODUCTION PRACTICES

| PARAMETER | TYPICAL | BENCHMARK | REMARKS |
|---|---|---|---|
| Variety | Local Tall Variety | Hybrids;<br>Selected Talls | • 97% of the palms are tall type, hybrids make up >1%, the rest are dwarfs;<br>• PCA has developed 15 local hybrids that are early bearing and can yield an average of 80-150 nuts/tree/year;<br>• Selected local talls can yield at least 80 nuts/tree/year;<br>• Selected dwarfs and hybrids suitable for sap production |
| Planting Density | Irregular with > 100 trees/ha | Systematically planted with at least 100 trees/ha | • Planting systems can be square, triangular or quincunx or group of 3 with 10 between rows |
| Age of Trees | A third of the coconut population is non-bearing , only half of the palms are more or less in peak productive stage (11-50 years) (NCFRS, 2018) | Replanting of trees above 60 years old or if yield is below 20 nuts/tree/year | • Replanting options;<br>• Cutting down of all senile trees, for replanting or interplanting in between rows of existing trees and cutting down when seedlings are in early bearing stage; staggered replanting – 20% replacement/year |
| Water Management | Rainfed | Supplemental irrigation or mulching during dry season; cover cropping | • 60% of potential production is lost due to moisture deficit (PCA, DRC). On the average, a adult coconut palm requires about 50 L of water a day (range of 10-150L); a seedlings and young palms need 5-10L /day , depending on soil characteristics and weather). |

| PARAMETER | TYPICAL | BENCHMARK | REMARKS |
| --- | --- | --- | --- |
| Water Management | Rainfed | Supplemental irrigation or mulching during dry season; cover cropping | • Supplemental irrigation during the dry period increased nut yield by 30% and copra yield by 54% (CRI, 1991). Irrigation when monthly rainfall is lower than 150mm stabilizes nut production throughout the year (Magat, 1999). |
| Crop Nutrition | Generally, coconuts are unfertilized; PCA's fertilization program from 2009-2019 covered only 4.62% of the total population of bearing trees. | Recommended fertilizer application demonstrated to increase nut and copra yield up to 230 %, and income increased by 180%. | • Recommendations depending on growth stage and location (inland or coastal, upland, flatland) established;<br>• Critical nutrient levels in leaf 1-4 of bearing trees already established to guide fertilization. |
| Weed Management | Occasional clearing just to facilitate harvesting and collection of felled nuts | Regular ring weeding | • Subsoiling every 2-5 years to prevent soil compaction, particularly if animals are allowed to graze or are tethered in the farm |
| Pest Management | Coconut farmers generally do not practice crop protection against pests and diseases. | Regular monitoring of farm for presence of pests and symptoms - | • Except for enterprising farmers, pest management is a relegated function of to the PCA.<br>• This is particularly true when the pest and disease problem is no longer just confined to a farm and spreading. |

| PARAMETER | TYPICAL | BENCHMARK | REMARKS |
|---|---|---|---|
| Pest Management | Presence of few damaged palms is perceived to be normal since coconut , being resilient are able to recover without intervention | - use of SARAI mobile app SPIDTECH for pest identification and advisories for management. | • Unmanaged pests and diseases can cause 10- 100% yield loss.<br>• If undetected and uncontrolled, bud rot, rhinoceros beetle Asiatic palm weevil, CSI, can cause death of palms; coconut spike moth can cause 100% loss of inflorescence; |
| Cropping Systems | 80% Monocropped | Intercropped | • Intercropping intensifies land use, increases farm productivity and income |

# Benchmark Analysis for Processing: Domestic and International

## Coconut Oil

The Philippines is the largest producer and exporter of coconut oil in the world. The benchmark coconut oil companies in the world are Cargill, Inc., Wilmar International Limited, Granexport Manufacturing Corporation, and the Primex Group of Companies based on the size of their coconut processing plants, use of modern machinery and technology in coconut oil manufacturing, and wide distribution network in the domestic and international market. All these companies comply with internationally recognized GMP procedures. Wilmar Edible Oils Philippines, Granexport Manufacturing, and New Davao Oil Mills of the Primex Group of Companies, which all manufacture refined coconut oil, follow food safety standards related to the microbiological levels in food products. The list of companies for all products are listed at the end of the chapter.

## Desiccated Coconut

Philippine desiccated coconut is considered by foreign buyers as having the best quality compared to those produced by the country's closest competitors, namely Indonesia and Sri Lanka. The benchmark desiccated coconut processing company in the Philippines and in the world is Franklin Baker Co. because of its having the largest aggregate desiccated coconut rated capacity, its adoption of best practices, use of modern equipment in desiccated coconut processing, and its worldwide distribution network.

## Coco Shell Charcoal-Based Activated Carbon

The benchmark coco shell charcoal-based activated carbon manufacturing plants in the global market are Haycarb PLC, Jacobi Group, and Kuraray Co. Ltd. because of their state-of-the-art coco shell charcoal-based activated carbon facilities, adoption of strict quality assurance procedures, operation of several coconut-shell based charcoal processing sites worldwide, and wide sales network in different countries. In the

Philippines, the benchmark coco shell activated carbon manufacturing companies are Jacobi Carbons Philippines and Cenapro Chemical Co.

## Oleochemicals

The benchmark oleochemical companies in the Philippines are Chemrez Technologies, Pilipinas Kao Philippines, Sakamoto Orient Chemicals Corporation, and Stephan Philippines Quaternaries, Inc. These companies are currently engaged in new technology and product development, expansion, and long-term contracts to maintain their dominance in the Philippines and/or the global market.

## Virgin Coconut Oil

Considering that the Philippines is the world's top producer and exporter of virgin coconut oil, the benchmark virgin coconut oil-producing companies in the world are therefore operating in the country. These are Franklin Baker Co., Peter Paul Philippines, Prosource International, and SC Global Coco Products, Inc. These companies produce virgin coconut oil using state-of-the-art facilities/equipment and have established excellent distribution network in international and Philippine markets. Another leading virgin coconut oil processing company in the Philippines is Greenlife Coconut Products Philippines, Inc. Virgin coconut oil produced by desiccated coconut manufacturing companies accounts for the biggest portion of exported virgin coconut oil from the Philippines.

## Coco Coir Products

India and Sri Lanka are the dominant players in the global coir market. The world's benchmark coir producing and exporting companies come from these countries. Some of the world's leading coir producer- exporters are Dutch Plantin Coir India Pvt. Ltd. (India), Harish Coconut Products Pvt. Ltd. (India), Sivanthi Joe Coirs Pvt., Ltd. (India), and Hayleys Fiber PLC (Sri Lanka). In the Philippines, Pilipinas Coir Fiber Co. is one of the leading coir producing and exporting companies.

## Coco Sugar

The Philippines and Indonesia are the world's leading producers and exporters of coco sugar. The benchmark coco sugar processing companies in the world are Spythe Global (Philippines), P.T. Coco Sugar (Indonesia), TREELIFE (Philippines), Big Tree Farms (Indonesia), and Leo Integrated Farms because they produce high-quality organic and non-GMO coco sugar and adopt Good Manufacturing Practices (GMP).

## Coconut Water

The world's benchmark coconut water processing companies are Peter Paul Philippines Corporation, Axelum Resources, Inc., Century Pacific Foods, Inc., and Franklin Baker Co. These Philippine companies are among the major suppliers of coconut water drink to All Market, Inc., Pepsi Cola Co., and Costco that commercialize the popular brands of coconut water drink in the international market, namely, Vita Coco, O.N.E. and Kirkland, respectively. Other leading companies producing coconut water on a large scale in the world are Celebes Coconut Corporation (Philippines), Cardinal Agri Products, Inc. (Philippines), the Sambu Group of Companies (Indonesia), Silvermill Group of Companies (Sri Lanka), and Universal PLC (Thailand).

## Price Competitiveness of Coconut Oil as Cooking Oil

***Local.*** Price competitiveness of refined bleached deodorized coconut oil as cooking oil was assessed by comparing its retail price with that of palm oil, canola oil, soybean oil, and corn oil. Coconut oil as cooking oil is not price competitive in the domestic market as evident from its retail price being the highest in local supermarkets (Table 4.28). As expected, palm oil's retail price is the lowest among the different types of cooking oil because the yield of oil palm is higher than that of coconut. Among the oil-producing plants in the world, oil palm produces the highest oil content per hectare per year, averaging between 3 and 7 MT/ha in commercial cultivations (Perera, 2013). According to Magat (n.d.), the yield or productivity advantage of oil palm over the coconut is estimated to be about 2.3 times at best achievable oil yields of the two tropical perennial crops.

### TABLE 4.28. AVERAGE RETAIL PRICES OF DIFFERENT TYPES OF COOKING OIL IN SUPERMARKETS IN LAGUNA, PHILIPPINES AS OF APRIL 2021

| Type of Cooking Oil | Price Per Liter (PHP) |
|---|---|
| Coconut oil | 152.00 |
| Palm oil | 100.50 |
| Soybean oil | 130.65 |
| Canola oil | 114.40 |
| Corn oil | 150.55 |

*Source: COCOFIRM Market Research*

***International.*** The export parity price to domestic wholesale price ratio for coconut oil was calculated to determine its price competitiveness in the export market. The computed ratios are greater than one at 1.03 for coconut oil exported in flexi bag with heat pad and 1.14 for coconut oil in closed steel drum. These calculated ratios indicate that Philippine coconut oil is price competitive in the export market (Table 4.29).

### TABLE 4.29. PRICE COMPETITIVENESS OF PHILIPPINE COCONUT OIL UNDER EXPORT TRADER SCENARIO, PHILIPPINES, MAY2021

| Item | Coconut Oil in Closed Steel Drum | Coconut Oil in Flexi bag with Heat Pad |
|---|---|---|
| Export Price (FOB US$/MT), Manila | 1,929.00 | 1,757.00 |
| X Exchange Rate (PHP/US$) | 47.82 | 47.82 |
| = Export Price (PHP/MT) | 92,244.78 | 84,019.74 |
| - Port, storage, handling, and transport costs (PHP/MT) | 2,410.00 | 2,410.00 |
| =Derived Wholesale Price (or Export Parity Price) | 89,834.78 | 81,609.74 |
| Domestic Wholesale Price, Manila | 78,903.00 | 78,903.00 |
| Price Ratio = Export Parity Price/Domestic Wholesale Price | 1.14 | 1.03 |

Price competitiveness exists if the ratio of the derived wholesale price (or export parity price) to the domestic wholesale price is greater than one.
*Source: COCOFIRM Market Research*

# International/Global Competitiveness of Philippine Coconut Products

This section presents two approaches used to measure global competitiveness of exported coconut products, namely the Domestic Resource Cost Analysis (DRC) using financial prices and the Revealed Comparative Advantage (RCA) approach.

## DRC as a Measure of Competitive Advantage.

The COCOFIRM Market Research Team reviewed past studies that employed the DRC analysis using financial prices and used their data to show the competitive advantage of coconut oil in selected regions of the country. Competitive advantage is a good indicator for intercountry comparison of competitiveness (Aragon, 2003). It indicates which countries could better compete in international markets, under certain assumptions about the existing marketing systems and government interventions.

Aragon (2003) reported that the resource cost ratio (RCR)—calculated by dividing DRC by the prevailing official exchange rate—was 0.99 for the Bicol oil miller-exporters and 0.95 for the oil miller- exporters in Davao Region (Table 4.30). These RCR figures are less than 1.0 or unity and indicate competitive advantage in producing and exporting Philippine crude coconut oil in both the Bicol and Davao regions. However, the Mindanao oil miller–exporters were found to be more competitive in terms of crude coconut oil production than the Bicol oil miller–exporters based on the DRC and RCR estimates in each region. The average DRC (48.80) and RCR (0.96) representing the Philippines also indicate that the country has a competitive advantage in the production and exportation of crude coconut oil. This implies that it is more profitable to produce crude coconut oil in the Philippines and export it to the international market rather than to import it. An RCR less than unity further implies that the country is a foreign exchange earner of crude coconut oil exports under existing sets of trade and exchange rate policies.

**TABLE 4.30. DRC AND RCR ESTIMATES OF COMPETITIVE ADVANTAGE IN PRODUCING AND EXPORTING PHILIPPINE CRUDE COCONUT OIL, PHILIPPINES**

| Source/Measure of Competitiveness | Bicol Region | Davao Region | Region Western Mindanao | Northern Mindanao | Philippines |
|---|---|---|---|---|---|
| Aragon (2003) using 2001 data | | | | | |
| DRC | 50.50 | 48.23 | | | 48.80 |
| RCR | 0.99 | 0.95 | | | 0.96 |
| Dampor (2004) using 2002 data | | | | | |
| DRC | | 50.24 | 49.32 | 48.61 | 49.39 |
| RCR | | 0.97 | 0.96 | 0.94 | 0.96 |

In another study, Dampor (2004) estimated RCRs of 0.96 for Western Mindanao oil miller-exporters, 0.97 for Davao Region oil miller-exporters, and 0.94 for Northern Mindanao oil miller-exporters (Table 4.30). These RCR figures are less than 1.0 or unity, indicating the competitive advantage of the Philippines in producing and exporting crude coconut oil. These figures support Aragon's previous findings. There are no available DRC estimates for crude coconut oil produced by the country's close competitors (i.e., Indonesia

and India) for comparative analysis to determine which country has more competitive advantage in producing and exporting crude coconut oil.

## RCA as a Measure of Global Competitiveness

Two coconut researchers and the COCOFIRM Research Team employed the RCA methodology to measure and compare the global competitiveness of different coconut products between the Philippines and its competitors. In the RCA approach, a positive RCA index indicates that a country has a competitive edge in producing and exporting a given commodity. The larger the RCA index, the higher is the level of competitiveness.

Comparing the global competitiveness of Philippine and Indonesian coconut oil during the period 1995-2000, Aragon (2003) found that the mean RCA index of Philippine coconut oil (124.53) was significantly much higher than the average RCA index of Indonesian coconut oil (26.67). These RCA indices indicate that the level of export competitiveness of Philippine coconut oil was greater than that of Indonesian coconut oil (Table 4.31). The study pointed out that Indonesia posed a threat as evident from the increasing trend (52.92%/year) of the RCA index of Indonesian coconut oil while that of Philippine coconut oil was declining (-8.83%/year).

#### TABLE 4.31. COMPARISON OF THE RCA INDICES OF DIFFERENT COCONUT PRODUCTS AMONG MAJOR COCONUT-PRODUCING COUNTRIES, BASED ON PREVIOUS STUDIES

| Source of Data/ Country | Coconut Products | | | |
|---|---|---|---|---|
| | Coconut Oil | Desiccated Coconut | Activated Carbon | Virgin Coconut Oil |
| Aragon (2003) using 1995-2000 data | | | | |
| Philippines | 124.53 | | | |
| Indonesia | 26.67 | | | |
| Jayasekhar et al. (2016) using 2014 data | | | | |
| Philippines | 22.30 | 29.10 | 28.10 | 38.00 |
| Indonesia | 21.20 | 4.90 | 26.20 | 16.10 |
| India | 2.10 | 1.80 | 6.90 | 1.10 |
| Malaysia | 12.00 | 4.20 | 10.60 | 5.20 |
| Thailand | 1.60 | 5.60 | 12.60 | 8.10 |

Using the RCA methodology, Jayasekhar et al. (2016) analyzed the competitiveness in the export of major coconut value-added products (i.e., coconut oil, desiccated coconut, activated carbon, and virgin coconut oil) traded across the world by the Philippines, India, Indonesia, Malaysia, and Thailand. The study revealed that the Philippines is the dominant player with the highest RCA indices in all the coconut value- added product lines (Table 4.32. Further, the Philippines' comparative advantage for all the aforementioned coconut products is much higher than those of the four other major coconut exporting countries.

For Philippine coconut oil, the COCOFIRM Research Team estimated that the RCA indices in 2017, 2018, and 2019 are 108.80, 120.85, and 107.81, respectively, which are relatively much higher than the RCA indices estimated for crude coconut oil from Indonesia and India (Table 4.32). These RCA estimates support the findings from previous studies that the country has the highest comparative advantage in producing and exporting coconut oil compared with its close competitors, Indonesia and India.

### TABLE 4.32. COMPARISON OF THE RCA INDICES OF DIFFERENT COCONUT PRODUCTS AMONG MAJOR COCONUT-PRODUCING AND EXPORTING COUNTRIES, BASED ON THE COCOFIRM STUDY

| Source of Data/Country | Coconut Products | | | | | | |
|---|---|---|---|---|---|---|---|
| | Coconut Oil | Desiccated Coconut | Activated Carbon | Virgin Coconut Oil | Coco Coir | Coco Water | Coco Sugar |
| COCOFIRM using 2017 data | | | | | | | |
| Philippines | 108.80 | 82.10 | 12.53 | 8.95 | 6.69 | 12.36 | 0.32 |
| Indonesia | 24.45 | 21.55 | 1.47 | | | | |
| India | 0.99 | | 34.25 | | 26.69 | | |
| Sri Lanka | | 18.30 | 8.30 | | 16.42 | | |
| COCOFIRM using 2018 data | | | | | | | |
| Philippines | 104.60 | 110.07 | 19.79 | 6.70 | 6.30 | 7.70 | 0.19 |
| Indonesia | 28.10 | 24.60 | | | | | |
| India | 0.50 | | | | 55.40 | | |
| Sri Lanka | | 20.80 | | | 17.70 | | |
| COCOFIRM using 2019 data | | | | | | | |
| Philippines | 107.81 | 106.30 | 13.90 | 4.57 | 12.74 | 7.47 | 0.10 |
| Indonesia | 23.14 | 19.45 | | | | | |
| India | 0.53 | | | | 54.15 | | |
| Sri Lanka | | 21.55 | | | 23.50 | | |

Sri Lanka and Indonesia are the country's tight competitors in the global desiccated coconut market. Although Sri Lanka is one of the Philippines' closest competitors, high production costs in Sri Lanka became the Philippines' opportunity to have a significant share in the global desiccated coconut market. As shown in Table 4.32, the Philippines' RCA index for desiccated coconut (106.30 in 2019) was higher than that of Sri Lanka (18.55) and Indonesia (19.35). In 2017 and 2018, the Philippines' RCA indices for desiccated coconut were also higher than that of Indonesia and Sri Lanka in the same period. These RCA figures reveal that the Philippines has the highest comparative advantage in producing and exporting desiccated coconut among the three leading desiccated coconut producers and exporters.

Comparison of the RCA of the Philippines, India, Sri Lanka, and Indonesia shows that India has the highest comparative advantage in producing and exporting activated carbon, followed by the Philippines. As mentioned earlier under the trade performance section of this report, India outranked the Philippines as the world's top exporter of activated carbon since 2016. The COCOFIRM Research Team estimated that India's RCA index of 34.25 for activated carbon in 2017 was higher than the Philippines' RCA index of 12.53.

Comparison of the RCA among the aforementioned global competitors in producing and exporting activated carbon for 2018 and 2019 was not done due to lack of information on the export values of the country's competitors in these years.

Based on the COCOFIRM Research Team's RCA estimates for virgin coconut oil and coconut water, which are all greater than 1.0 during the period 2017-2019, the Philippines has a comparative advantage in producing and exporting these non-traditional coconut products (Table 4.32). The RCA indices for coconut water (7.47 to 12.36) are higher compared to the RCA indices for virgin coconut oil (4.57 to 8.95). The high RCA indices for coconut water are attributed to the higher export earnings generated from this product. The companies that produce Vita Coco, O.N.E., and Kirkland (Costco) —the popular brands of coconut water drink in the United States and/or Europe—source their coconut water from the Philippines, among other countries.

In the Philippines, virgin coconut oil is produced on a large scale by desiccated coconut processing companies using the expeller method. Virgin coconut oil produced by these companies constitute a bigger portion of the country's volume of virgin coconut oil exports. Meanwhile, MSMEs produce a smaller volume of virgin coconut oil using the wet process (i.e., fermentation and centrifuge). Moreover, some small- to medium-scale processors also export their virgin coconut oil products to the international market. Price competitiveness varies among virgin coconut oil producers in the country. Since the desiccated coconut– virgin coconut oil processing companies have the capability to mass-produce virgin coconut oil, they have economies of scale which makes their virgin coconut oil products more price competitive compared with those produced by MSMEs (Costales, 2019). Quality competitiveness also varies depending on the virgin coconut oil processing method employed by the processors. Virgin coconut oil produced using the fermentation process is less quality competitive compared with virgin coconut oil produced either by the expeller or the centrifuge method. Costales (2019) reported that the use of manual, non-measuring, and non- automated technology by virgin coconut oil intermediate processors adopting the fermentation process caused product quality variability. There were also more rejects from using the fermentation process. In contrast, centrifuge-processed virgin coconut oil is generally preferred by food manufacturers, especially in the EU market, due to the consistency in the product's quality and properties such as taste and odor (Cristobal, 2019).

The Philippines and Indonesia compete in the global coconut sap sugar market. The RCA indices for coconut sap sugar estimated by the COCOFIRM Research Team range from 0.10 to 0.32 during the period 2017 to 2019. These indices indicate that the Philippines has a very low comparative advantage in producing and exporting coconut sap sugar (Table 4.32). These low RCA indices could be attributed to the low volume of exports of Philippine coconut sap sugar. The RCA indices also exhibit a declining trend from 2017 to 2018. Indonesia's coconut sap sugar export data are not available to facilitate comparative analysis of the competitiveness of coconut sap sugar between the Philippines and Indonesia. Nevertheless, PCA sources reported that Philippine coconut sap sugar is not price- and cost-competitive compared to Indonesia's coconut sap sugar which is being sold at a lower price due to the higher labor cost incurred in tapping coconut sap in the country. Coconut sap is collected four (4) times a day at 4 hours interval in the Philippines while in Indonesia, coconut sap is collected only once a day because their sap collectors use an anti-fermenting agent to retard the fermentation process (Manohar, 2021). The quality of Philippine coconut sap sugar is at par with that of Thailand while Indonesia's coconut sap sugar is not as quality competitive with that of the Philippines and Thailand. Philippine coconut sap sugar is globally recognized to be of good quality because it is organically produced. However, a current threat to the Philippine coconut sap sugar industry is adulteration which brings about trepidations on product authenticity in the global market (Angulo, 2019). Some local coconut sugar processor-exporters practice adulteration by mixing sugarcane with coconut sap sugar and by mixing Philippine coconut sap sugar with low-quality and lower-priced coconut sap sugar imported from Indonesia.

Based on the RCA estimates of the COCOFIRM Research Team, the Philippines has a lower comparative advantage in producing and exporting coco coir products compared to its close competitors, India and Sri Lanka. In 2019, India and Sri Lanka captured 94% of the global coco coir market (FAOStat, 2020). The Philippines' RCA index for coco coir in 2019 was only 12.74 compared to those of India (54.15) and Sri Lanka (23.50). The same pattern could be observed in 2017 and 2018 with India having the highest RCA index, followed by Sri Lanka. The Philippines had the lowest RCA index. There are several reasons why the country's coco coir is outcompeted in the export market. One of the reasons is the small plant capacity of Philippine coir processing plants that constrain the Filipino coir processor-exporters from meeting large orders abroad. Owing to inadequate economies of scale, the country's coir processing cost is higher (Costales, 2019). In contrast, India has larger coir processing plants with economies of scale, and these are fully mechanized. Coir exporters from India and Sri Lanka also incur lower transport cost because of the proximity of these countries to China, the major coco coir importing country. Coir products can be shipped by sea, air, or road from India to China and by road and sea freight from Sri Lanka. Lower electricity cost in India (i.e., PHP 3.50-4.00/kw) compared with the electricity cost in the Philippines (e.g., PHP 11-12/kw in Luzon and PHP 8-9/kw in Davao/Mindanao) is another reason why India has a competitive edge over the Philippines in terms of processing cost and price. Moreover, Philippine varieties have bigger kernels and produce lesser fiber compared with India's and Sri Lanka's coconut varieties (Costales, 2019). According to Mr. Reynaldo Go, the vice-president of the Coir Association of the Philippines, coco coir products from India and Sri Lanka are slightly more quality competitive than Philippine coco coir products because coir processors in these countries practice retting (i.e., dipping the coconut husks in water for at least 3 days) which makes the coir fibers softer and of better quality.

# MARKET TRENDS & PROSPECTS

This chapter presents the key drivers or the major demand factors (demand shifters) that affect the demand for traditional and selected promising non-traditional coconut products to provide a solid foundation in identifying the market prospects of these coconut products in the future. The factors that negatively affected the demand for these products were also tackled in this chapter. Future market trends and prospects (both local and international) are also thoroughly discussed in this chapter to be able to anticipate the country's future coconut production and logistical needs.

## Coconut Oil

### Key Demand Drivers

- The key drivers in the global coconut oil market are as follows (Persistence Market Research, 2018; Market Research Future, 2019; and Industry Probe, 2020):
- Coconut oil market is driven by increasing application as an ingredient in the cosmetic industry. Coconut oil is not only used as a cosmetic and an enhancement in beauty care but also has nutritional and health benefits.
- Rise in demand for coconut oil as an ingredient in hair care and skin care products is leading to the growth in the coconut oil market. Coconut oil acts as a natural moisturizer for the skin and helps hydrate the skin and reduces water loss, especially in dry skin types. Coconut oil not only moisturizes the skin but also helps to condition hair. For women opting for shampoos, hair oils, conditioners, sunscreen, and serum, coconut oil has a solution for all these problems as proven by dermatologists. Coconut oil has anti-microbial, anti-fungal, and anti-bacterial properties that make it ideal for the manufacturing of various cosmetics.

- Easy availability and low cost especially in tropical regions where coconuts are grown are also boosting the demand for coconut oil in the global market.
- Increasing health benefits from coconut oil consumption are also driving the global coconut oil market over the forecast period. It is emerging as a better option for cardiovascular patients because of its saturated medium-chain fatty acid content, which lowers heart attack risk for these patients. Medium- chain fatty acid behaves differently in the body compared to long-chain fatty acids, which would make coconut oil more beneficial than other saturated fats. Moreover, coconut oil also helps to reduce stress, curb appetite, strengthen the immune system, control blood sugar, and increase good cholesterol. These factors are significantly driving the growth of the global coconut oil market.
- Advancements in the field of dermatology have acted as a launchpad for the growth of the global RBD coconut oil market. The ever-maturing skin and beauty treatment industry has remained at the forefront of the market growth of RBD coconut oil. Moreover, the effectiveness of RBD coconut oil in preventing acne, pimples, and red spots on the skin has also given a thrust to market growth. Medical experts recommend the use of RBD coconut oil for the purpose of frying. Experts in the field of chemistry have also given a seal of credibility to the use of RBD coconut oil in cooking.
- The slow rancidification of coconut oil compared to olive and canola oil coupled with its health benefits is likely to spur its market growth over the forecast period. Preference for cooking oil which assists in the breakdown of fats is anticipated to push the coconut oil market volume to reach 6,569.8 kilotons (KT) by 2025.
- The growing trend of using coconut oil as feedstock to produce biodiesel fuel as an alternative to conventional diesel fuel is a recent driving factor in the growth of the global coconut oil market. A flurry of innovations in this regard might act as an elixir boosting the prosperity of the coconut oil market in the foreseeable future.
- The introduction of new innovative products made of coconut oil in the market such as turmeric- infused coconut oil, Nature Wax Coconut 1, and Nature Wax Coconut 2 is diversifying the coconut oil market.

However, health concerns regarding the unsaturated fat content of coconut oil by various international organizations coupled with the downvote for its use will be a major factor that can negatively affect the demand for coconut oil.

## Coconut Oil Domestic and Export Market Prospects

**Domestic Market.** The growth in the domestic consumption of RBD coconut oil as cooking oil is projected to be slow due to the proliferation of lower-priced imported palm oil, canola oil, corn oil, and other vegetable oils in retail stores and supermarkets throughout the country. To increase domestic consumption of RBD coconut oil as cooking oil, it is imperative that the government through the Department of Agriculture-Agribusiness Market Assistance and Support Services (DA-AMAS), the Department of Science and Technology-Food and Nutrition Research Institute (DOST-FNRI), and the Department of Trade and Industry (DTI) should jointly launch intensified market promotion activities using multi-media highlighting the health benefits that can be derived from coconut oil consumption.

With the increase in the country's population, it is projected that the domestic demand for coconut oil as raw material for manufacturing margarine, shortening and other specialty fats; as replacement for milk fat in reconstituted milk; and spray oils for crackers and biscuits will further expand over time.

In the country's non-food sector, coconut oil is used as feedstock in producing coco methyl ester. Coconut biodiesel (coconut methyl ester or CME) has expanded the use of coconut oil in the domestic market (Agustin, 2013). This is supported by Republic Act (RA) 9367 or the Philippine Biofuels Act of 2006 which remains in effect. From an admixture of 1% biodiesel (Bl) in the diesel fuel blend since the law took effect in 2007, this was increased to 2% (B2) in February 2009. Currently, the Philippine Coconut Authority has

submitted a proposal to Congress for approval to increase the CME blend from 2% (B2) to 5% (B5) for the purpose of increasing local biodiesel utilization. If the proposal will be approved by Congress, it is projected that the demand for crude coconut oil as feedstock for CME production will increase from 0.273 M MT at 2% CME blend to 0.683 M MT at 5% CME blend in 2021 and will further expand from 0.350 M MT at 2% CME blend to 0.875 M MT at 5% CME blend in 2025 (PCA, 2021).

Moreover, coconut oil is used as feedstock to locally manufacture other oleochemicals or fatty-acid compounds to produce cosmetics, soaps, detergents, surfactants, paints, varnishes, and lubricants. The local coconut oil market has lucrative potential in the cosmetics and skincare industry. In view of the country's growing female population, it is expected that the demand for cosmetic products will show tremendous growth. The cosmetic industry uses coconut oil for manufacturing numerous products such as bath soaps, lipsticks, shampoos, conditioners, hair masks, and serums, among other beauty and skincare products. Moreover, coconut oil is used as a skin-friendly foundation primer. It is lightly dabbed all over the face prior to applying any foundation to make the makeup last longer.

Currently, the Philippine Oleochemical Manufacturers Association is clamoring for the revival of EO 259 which required all detergent manufacturers to use fatty alcohol in their detergent formulation. The revival of this executive order will also increase domestic demand for coconut oil in the detergent industry tremendously.

It is also projected that after the COVID-19 pandemic, the booming construction industry in the country will continue to grow due to urbanization and this will subsequently increase the demand for coconut oil for the manufacture of oleochemicals to be used in the production of varnishes and paints.

**Export Market.** The global coconut oil market which was valued at US$ 4,110.8 M in 2020 is expected to reach US $ 5,537.9 M by the end of 2026, growing at a compounding annual growth rate (CAGR) of 4.3% during the period 2021-2026 (Global Oil Market Research Report, 2020). Increasing consumers' awareness of the lauric acid content in coconut oil coupled with its application in biofuels and cosmetics is predicted to drive the market growth of coconut oil during the forecast period.

The United States and the Netherlands are the top importers of coconut oil, accounting for 24.1% and 16.7% of the world coconut oil imports in 2019, respectively (FAOSTAT, 2020). These countries were also the country's leading buyers of coconut oil. In 2019, the United States' market share of the country's coconut oil exports was 26.0% while that of the Netherlands was 17.1% (PSA 2020). However, Netherlands exhibited a faster growth in imports of Philippine coconut oil at 20.4% per year than the United States (4.06%/year) during the period 2009-2019.

In the world market, coconut oil faces stiff competition with lower-priced palm oil as cooking oil and palm kernel oil as feedstock in the manufacture of oleochemicals. However, the growing negative advisory against the use of palm oil will likely increase the demand for coconut oil in the European Union (EU) and the United States. The EU initially banned palm kernel oil for use in biofuels out of concern that oil palm cultivation accelerated deforestation, fires, and global warming. There have been claims that forests are burned to clear areas for oil palm cultivation. Oil palm plantations, typically monoculture crops, are therefore

under scrutiny for their effects on the environment, including loss of carbon-sequestering, biodiverse forest land. There is also concern over displacement and disruption of human and animal populations due to oil palm cultivation. By the end of 2014, EU labelling laws changed so that products are now required to state if they contain palm oil. In January 2019, the European Parliament voted to ban the use of palm oil for biodiesel production in the European Union by 2020 with the main objective to stop the deforestation of rainforests in Malaysia and Indonesia (ISCC, 2019). Moreover, the United States indicated that it banned shipments of palm oil from three of the world's biggest producers in Malaysia after finding indicators of forced labor and other human rights abuses in oil palm plantations (Voa News, 2020).

As reported by Coca (2020), the growing awareness about the negative environmental and social impacts of oil palm cultivation on the environment, biodiversity, and local communities has led some consumers and brands in the United States and Europe to switch to alternatives like coconut oil. Hence, palm oil imports for food consumption are dropping in Europe and have stalled in the United States. In view of these recent developments, it is expected that coconut oil's position in the oil and fats trade in these countries will improve.

However, to improve the Philippines' competitive advantage over other coconut oil-exporting countries like Indonesia, Filipino oil processor-exporters should give importance to producing and exporting sustainable, ethical, traceable coconut oil. Companies selling different brands of coconut oil products in Europe such as Lucy Bee are now requiring complete traceability (i.e., from their shops down to coconut farms) in their purchases of coconut oil and are working with Fair Trade Sustainability Alliance (Fair TSA) for certification to ensure that a large portion of their sales from coconut oil will go directly to coconut farmers (Coca, 2020). Fairtrade certification promotes fair prices for farmers, decent working and living conditions for workers, higher income of farmers by bypassing unnecessary middlemen, promotes association of workers, and cooperatives and advances sustainable agriculture. These EU companies do not want to be faced with the same issues as what they experienced with palm oil whenever they import coconut oil.

# Desiccated Coconut

## Key demand drivers

- The development of the baking industry due to changes in lifestyle and food habits of consumers has driven the growth of the desiccated coconut powder market. Desiccated coconut is vastly used as toppings and as an ingredient in food industries such as bakery, confectionery, culinary, and beverage. Most recently, there has been an increase in the interest of consumers in desiccated coconut-based products such as kokosmakronen, breakfast cereals, and many Asian dishes, which has driven the demand for desiccated coconut.
- Desiccated coconut is an important part of functional beverages – an outcome of strong preference shown by the millennial populace that is demanding for variants that have health blended with taste. Since desiccated coconut has health benefits, the demand for this coconut product is exhibiting a rapid upward curve.
- An increase in disposable income coupled with stronger buying power and growth in the e-commerce sector is bringing desiccated coconut to inaccessible locations. Desiccated coconut is easily available in the market through retail stores, online, supermarkets, which has fueled the growth in the global desiccated coconut market. Besides, as technology advances and improves the shelf life of the ingredient, growth in demand is only anticipated to grow further over the forecast period and beyond.
- There has been an increase in the sales and demand for organic desiccated coconut which has a direct impact in driving the market growth of desiccated coconut.
- The new-age consumers are highly conscious of their feeding habits and as desiccated coconut is considered gluten-free, high in dietary fiber, and rich in vitamins, and minerals, it is showing high demand. Besides, this section of the population is also oriented towards convenience and thus opts for the desiccated version due to its ease of use in various dishes.

There are some factors that could negatively affect the demand for desiccated coconut. Availability of several substitutes for desiccated coconut powder in the market such as Brazil nuts and macadamia nuts that offer similar nutty flavor and texture like desiccated coconut powder acts as a key restraint to the desiccated coconut market. Moreover, some European consumers prefer value-added forms of products,

like coconut water and roasted coconut chips rather than desiccated coconut, as the former products are more suitable for busy lifestyles.

## Desiccated Coconut Domestic and Export Market Prospects

**Domestic Market.** In the domestic market, the major buyers of desiccated coconut are institutional users such as hotels and pastry and bakery industries. The increase in the number of hotels and bakeshops in the country due to rapid urbanization is expected to expand further the local demand for desiccated coconut. However, household consumers' demand for desiccated coconut is highly seasonal (i.e., family celebrations during birthdays, Christmas and New Year holidays, weddings, etc.) and will be most likely confined to consumers belonging to middle- and high-income households who can afford to buy desiccated coconut and other baking ingredients for home baking and cooking.

**Export Market.** The European Union is the world's largest importer of desiccated coconut, accounting for more than 30% of global imports (IEG Vu 2019). In Western Europe, Belgium is the major consumer of desiccated coconut followed by Germany, the Netherlands, and the United Kingdom. Desiccated coconut is a key ingredient in traditional bakery of many European countries such as kokosmakronen of the Netherlands and coconut macaroons of the United Kingdom. Desiccated coconut is also widely used as breakfast cereal. Sales of organic desiccated coconuts as well as fair-trade products are also increasing in the Western European markets. Moreover, there is a shift in the European market from traditional desiccated coconut towards value-added forms of the product, such as roasted coconut chips, which consumers eat on the go to fit their busy lifestyles. Desiccated coconuts are also being used in an increasing number of applications such as snack bars, fruit desserts, and bread spreads.

In the Asia-Pacific region India and Singapore are the major consumers of desiccated coconut. It is extensively used in South Asian (i.e., Indian, Burmese, and Indonesian) cuisines. In Asia, it is used as toppings in curries and other savory dishes as a substitute for grated coconut and as an ingredient in cooked cereal and baked food (Globe Newswire, 2020). In the North American region, the United States accounts for most of desiccated coconut imports which are used as a staple ingredient in baking and confectionery industries.

The Philippines, Sri Lanka, and Indonesia dominate the global production of desiccated coconut. The largest share of imports of desiccated coconut to the European Union came from the Philippines (54%), followed by Indonesia (30%) and Sri Lanka (8%) (IEG Vu, 2019). Desiccated coconut from the Philippines, the leading world supplier, usually fetch higher prices compared to desiccated coconut imported from Indonesia and Sri Lanka because most European buyers consider Philippine desiccated coconut of premium quality. Hence, the Philippines has the greatest ability to compete in the global desiccated coconut market compared to its competitors, particularly in the European Union. In 2019, the major export markets of the Philippines for desiccated coconut in the European Union were the Netherlands, Germany, and Great Britain. In North America, the country's export markets for desiccated coconut were the United States and Canada.

In Europe, imports of desiccated coconuts are very dependent on the development of the confectionery and bakery industries. As both industries have positive development forecasts, it is anticipated that imports of desiccated coconut in the European Union will expand tremendously in the long term (IEU

Vu, 2019). Being the largest exporter of premium quality desiccated coconut in Europe, the Philippines will stand to benefit from the considerable growth in market demand for desiccated coconut in the European market. About 35% of imported desiccated coconuts are used by the food processing industry as an ingredient for final products in Europe (EU Vu, 2019). The largest share of desiccated coconuts is used by the confectionery industry as fillers inside chocolate bars, as an ingredient in biscuits, toffees, and chocolates. Larger cuts are used as snacks sometimes sweetened and toasted. In the bakery industry, desiccated coconuts are used as ingredients and for cake decorations.

# Coco Shell Charcoal

## Key Demand Drivers

Coconut shell charcoal may come in its raw or natural form, powdered and in briquettes. The major key demand drivers in the global coco shell charcoal market are as follows (Wiwimex, n.d.; Elvatara, n.d.; Lifegreen, 2019; Market Watch, 2021):

- The multiple uses of coconut shell charcoal serve as a major demand driver for coco shell charcoal. Coconut shell charcoal is used widely as an efficient domestic and industrial fuel. It is also used by foundries and goldsmiths. In the food industry, coconut charcoal is widely used in barbecues as an alternative to wood charcoal due to its fast burning and food-grade properties. The food industry is favoring it due to the pleasant flavor it emits when preparing traditional foods and barbecues. It also has medical uses in devices for filtering blood like dialysis units. Coco shell charcoal is also made into charcoal soap. Charcoal soap has the amazing ability to control facial oil and draw away the impurities that build up in the pores. It is also effective in the removal of dead cells, thus providing clean and flawless skin. It not only aids the removal of toxins but also removes skin impurities thus helping in the treatment of acne.
- The increasing demand for coconut shell-based products such as activated carbon, briquette, and sisha has expanded the demand for coco shell charcoal. Aside from coal and wood, coconut shell charcoal is also used as a raw material for the production of activated carbon.
- The newly found uses of coco shell charcoal in the construction of golf courses and as animal feed are contributing to the growth in global coco shell charcoal market demand. Coconut shell charcoal has been found to be a suitable material in the development of golf courses. In golf courses, a layer of coconut shell charcoal is laid to a certain depth along with sand and other biomass before planting grasses. Coconut shell charcoal is also used as feed for cattle, pigs, and poultry. Some studies have shown that animals fed with coconut charcoal give more milk. Similarly, for pigs and poultry, it is a suitable feed to increase weight and reduce the chances of any disease occurring. Hence, this will lead to greater meat production.

High fluctuating prices of coconut shells due to small and fragmented coconut land holdings may restrict the growth of the market for coco shell charcoal.

## Coco Shell Charcoal Domestic and Export Market Prospects

In the Philippines, coconut shell charcoal is widely used by rural and some urban households as domestic fuel as a substitute to fuelwood and kerosene for cooking food. Chefs in restaurants, small eateries, and hotels as well as urban households prefer to use coco shell charcoal in preparing barbecue and grilling fish. The expansion of oil mills and desiccated companies which utilize coco shell charcoal as fuel and activated carbon processing plants which use coco shell charcoal as raw material in manufacturing activated carbon is a significant factor to the growth of the coco shell charcoal market in the Philippines.

**Export Market.** Coco shell charcoal has a great export market potential especially in Japan and the Peoples Republic of China where Philippine coco charcoal is preferred because of its good quality as raw material for the activated carbon industries in these countries. In Japan, coconut shell charcoal is not only used for making activated carbon, but the use of charcoal briquettes in the preparation of traditional foods such as "sukiyaki" is also becoming more and more popular. In 2019, the Peoples Republic of China was the Philippines' biggest buyer of coco shell charcoal, accounting for 57% of the total volume of coco shell charcoal, followed by Japan with 48% market share. The Peoples Republic of China also registered much faster CAGR of 149%/year compared to Japan's 6.1%/year CAGR during the period 2009-2019.

The demand for coco shell charcoal is also growing due to the booming shisha market all over the world. The biggest market is the Middle East since it is there where shisha consumption started being popular. Charcoal briquettes are commonly used in Middle Eastern countries to burn shisha and fragrances at home. Turkey, a Middle Eastern country started to import charcoal briquette from the Philippines only in 2018 and posted a remarkable CAGR of 245% from 2018 to 2019, thus becoming the country's third largest buyer of coco shell charcoal. Apart from Turkey, India and Sri Lanka were other foreign buyers that used the imported coco shell charcoal from the Philippines for burning shisha.

The Republic of Korea is the country's fourth largest export market for coco shell charcoal. The Republic of Korea used coconut shell charcoal in the construction of golf courses of international standards and for manufacturing activated carbon. From 2009 to 2019, the

Republic of Korea exhibited a CAGR of 15% per year in its volume of imports of coco shell charcoal from the Philippines.

In North America, the United States is the country's export market for coco shell charcoal while in Europe, Germany and Belgium are the main export markets for Philippine coco shell charcoal. In America and Europe, charcoal briquettes are used to heat spas as well as stoves for cooking. The use of coconut shell charcoal briquette for barbecue and grilling purposes and in poultry raising is becoming popular in Europe also.

If the country's major foreign buyers will further expand their utilization of coconut shell charcoal in the next 5-10 years, this will raise their import demand for Philippine coco shell charcoal significantly.

# COCO SHELL CHARCOAL-BASED ACTIVATED CARBON

## Key Demand Drivers

The key trends that will drive the global activated carbon market include the following (Transparency Market Research, 2018; Grandview Market Research, 2019; QYR Research, 2020):

- Increasing demand for water treatment and sewage and human waste treatment applications as well as desulphurization, and purification of factory effluent gases is expected to be a key growth driver. Among all end uses, it is widely used in potable water purification and sewage treatment plants. Coconut activated carbon is extensively used in water and sewage treatment owing to its ability to remove particulate and chlorine as well as dissolve organic impurities in water. Growing environmental concerns, stringent regulations, and standards as well as government initiatives to safeguard the environment are expected to aid the market over the forecast period. As a result, water treatment, air purification, and mercury absorption are a few applications that are expected to witness brisk growth.
- The rising demand for the product in air purification applications from domestic as well as commercial users is expected to offer ample growth opportunities in the

forthcoming years. Activated carbon is used in greenhouses and manufacturing industries for air purification and to remove toxic gases, odors, and harmful dust particles. Consumption of activated carbon into the air conditioners and gas masks has been increasing.

- Rapid urbanization and public and private investments in infrastructural developments in emerging economies such as China, India, and Brazil have also fueled the demand for wastewater management systems. This, in turn, is anticipated to drive the demand for coconut activated carbon during the forecast period.
- Growing demand for processed foods and beverages is a major factor expected to drive the market for activated carbon in the foreseeable future. In the food and beverage sector, activated carbon is consumed in processes such as removal of contaminants or impurities such as color and odor from sweeteners, food liquids, syrups, beverages, glycerin, and amino and organic acids.
- Increasing population, disposable income, and health concerns are expected to propel the demand for activated carbon over the forecast period. Activated carbon is used for the purification of raw material compounds, kidney machine, nursing supplies, and respirators. The demand for activated carbon in pharmaceutical and medical applications is expected to further grow over time.
- Growing applications in automotive industries are projected to aid future market growth of activated carbon. Applications in the automotive industry are expected to witness a brisk growth over the forecast period and are presumed to assist the growth over the next six years.
- One of the factors that could negatively affect the demand for activated carbon is the presence of substitutes such as granulated rubber and coke breeze, but these materials have not been used on a large scale.

## Coco Shell Charcoal-based Activated Carbon Domestic and Export Market Prospects

**Domestic Market.** The domestic market prospect of coco shell charcoal-based activated carbon is bright. In the Philippines, granular activated carbon from coconut shells is heavily used in air treatment and municipal and city water treatment plants, especially in mercury and chlorine removal process. Activated carbon is also mainly used in the food processing industry especially in soft drinks and sugar refining industries, the monosodium glutamate manufacturing industry, and the coconut oil refining industry. Local mining operations are also big users of activated carbon as it is used with cyanide in extracting gold dust (Ordinario et al., 2019). Moreover, demand for food infused with activated carbon has been also steadily growing in the domestic market such as lemonade and frozen yogurts. At the consumer level, activated carbon is locally used for health products such as toothpaste, toothbrush, and skincare products, including facial masks and creams.

**Export Market Prospect.** World demand for activated carbon is expected to strengthen in the next 10 years. The projected trend is based on the positive global activated carbon market growth in the last decade. The global trade in activated carbon in terms of US dollar value has been growing at a CAGR of 8.21%, which is projected to hit a faster pace in the short-term to medium-term due to global environmental laws encouraging the use of activated carbon for industries that cater to water filtration, air purification, mining, and health care, among other uses (Ordinario et al., 2019).

In 2019, the world imports of activated carbon exceeded $1.92 B (TrendEconomy, 2021). USA and Japan are the largest importing countries of activated carbon in the global market with 11.9% ($229 M) and 8.58% ($165 M) market shares, respectively in 2019. Other major importers of activated carbon in the same year were Germany (8.45% share or US$162 M), Peoples Republic of China (8.21% or US$ 157 M), Republic of Korea (6.49% or US$ 124 M), and Belgium (4.86% or $93 M). These seven countries absorbed 48.5% of the activated carbon product from the global market in 2019. The growing demand from major importing countries of activated carbon such as Japan, USA, Germany, China, and Korea have significantly contributed to the global market growth of activated carbon.

The Philippines has favorable market prospects for coco shell charcoal-based activated carbon exports to the world's largest activated carbon importing countries. For the last decade, the Philippines' leading export markets for activated carbon were Japan, USA, Germany, the People's Republic of China, and the Republic of South Korea. Based on

PSA data, these importing countries of coco shell charcoal-based activated carbon from the Philippines exhibited high annual growth rates in terms of export volume from 2009 to 2019. In 2019, Japan was the top buyer of Philippine manufactured coco shell-based activated carbon with 18%

market share, followed by USA with 12.3% market share. Germany slightly trailed behind at 11.9%. The People's Republic of China (7.9%) and the Republic of Korea trailed behind (6.8%). Owing to rapid industrialization, the rising level of air and water pollution have governments in these major importing countries of activated carbon impose strict air and water pollution control and waste treatment norms. Owing to growing environmental concerns, government regulatory agencies have recommended coconut activated carbon as the best available material for use in air purification, mercury absorption, and water treatment applications. The increasing applications of activated carbon in the food and beverages industry and the pharmaceutical sectors have also contributed to demand growth of activated carbon in these countries and are expected to increase further the demand for coco shell-based activated carbon from the Philippines.

The Philippines' close competitor in the global coco shell charcoal-based activated carbon is India. In 2019, India outranked the Philippines in exporting activated carbon because of the spike in the country's exports of raw coco shell charcoal to China and Japan where activated carbon manufacturers in these countries prefer Philippine coconut shell charcoal as raw material for manufacturing activated carbon. Rising volume of exports of raw coco shell charcoal has been depleting the supply of this raw material for Filipino activated carbon manufacturers. In that year, India exported US$ 203 M worth of activated carbon compared to the Philippines' $129 M (TrendEconomy, 2021). Being the second largest coconut producing country in the world where there is abundant supply of coconut shells, there is a great possibility for the Philippines to outrank India as the top world supplier of coconut shell charcoal-based activated carbon provided that the country's policy makers will regulate exports of raw coco shell charcoal by imposing an export ban.

# Oleochemicals

## Key Demand Drivers

The key demand drivers in the global oleochemicals market are as follows (Allied Market Research, 2020 and Factmr, 2021):

- The global market for oleochemicals is driven by high demand coming from consumer markets. The demand for oleochemicals is increasing in the pharmaceutical and personal care industry as consumers are becoming aware of the environmental benefits and cost effectiveness offered by oleochemicals.
- Another key demand driver is easy availability of raw materials, and a growing market for green chemicals. The Asia-Pacific region is estimated to be the fastest growing region because of the easy availability of raw materials and development of newer applications for the product.
- Growing environmental concerns have encouraged the growth of oleochemicals applications across a range of industrial domains including food and beverage, personal care and cosmetics, soaps and detergents, polymers, and pharmaceuticals, among others. Oleochemicals have emerged as an ideal substitute for products derived from petroleum due to its low levels of toxicity. Oleochemicals are viewed as natural, green, organic, safe, renewable, and biodegradable by scientists and consumers, thus considered to be environment friendly.
- The increase in demand for biodegradable products is driving the global market for oleochemicals. Growing demand for bio-degradable products in food and beverage industry is fueling the demand for oleochemicals globally.
- The increase in demand for various cosmetics and personal care products from oleochemicals is projected to boost the demand for the global oleochemicals market.
- Population growth in the Americas, Europe, and Asia-Pacific will drive the demand for oleochemicals across application segments such as personal care and cosmetics, soaps and detergents, lubricants, food, and many others.
- The major factors that negatively affected the demand for oleochemicals using coconut oil as feedstock are the influx of lower-priced palm oil imports and the discontinued implementation of EO 259 which required all detergent manufacturers to use fatty alcohol in their detergent formulation.

## Oleochemicals Domestic and Export Market Prospects

**Domestic Market.** Currently, the domestic market for oleochemicals is limited to coco methyl ester for biodiesel production, but it will be favorable if EO 259 will be revived to create domestic consumption of coconut oil and increase the country's opportunity to locally produce fatty alcohol again. Reviving this law will enable three oleochemical companies manufacturing fatty alcohol to reopen. Pilipinas Kao, the only remaining manufacturer of fatty alcohol, exports its fatty alcohol production for the export market. There are many applications of fatty alcohol such as the production of detergents, shaving creams, shampoos, face and body creams, and surfactants. They are components also of cosmetics, foods, and as industrial solvents. They find use as co-emulsifiers, emollients and thickeners in cosmetics and food industry. Other applications of fatty alcohol include pharmaceutical and petroleum applications. With local production of fatty alcohol, the Philippines can minimize importation of most of the country's shampoo raw materials, fabric softener, cleaning products, bar soaps, detergents, and soap noodles from Malaysia and Indonesia.

At present, the local oleochemical industry is mostly composed of coco methyl ester manufacturing companies. With the present CME blend of 2%, PCA estimated that the CME requirement for biodiesel production is 252.86 M liters. If PCA's proposal to increase the CME blend from 2% to 5% under the Biofuels Act will be implemented, the projected CME requirement will be 632.14 liters in 2021 and will further increase to 809.01 M liters in 2025.

**Export Market.** The global oleochemicals market size is anticipated to reach USD 31.4 B by 2027 registering a CAGR of 5.8% (Research and Markets, 2020). Oleochemicals are replacing many petroleum- based products as their properties help build a product which is better for the environment and which can be manufactured from renewable raw materials. Glycerol is estimated to be the fastest-growing product segment due to increasing demand for technical-grade refined glycerin in the manufacturing of metalworking fluids, adhesives & sealants, polyols, agrochemicals, oilfield chemicals, and solvents. In 2019, Linoleic (C18:2) acid emerged as the largest fatty acid product segment, both in terms of volume and revenue owing to the high product demand in the production of dietary supplements, paints, varnishes, food flavoring agents, and surfactants. Soaps and detergents are projected to be the leading application segment, both in terms of volume and revenue. The personal care and soaps and detergents applications share more than 50.8% of the oleochemicals demand. The growth in this segment can be attributed to increasing product demand from industrial and institutional cleaning and textile sectors.

The Asia-Pacific Region takes the leading position in the global oleochemicals market owing to the strong raw material base and expanding world scale plants. Palm oil, palm kernel oil, and crude coconut oil are the feedstock used as raw materials in oleochemical processing. Malaysia and Indonesia are the major producing and exporting countries of palm oil and palm kernel oil. The Philippines is the largest exporter of crude coconut oil. Palm kernel oil and crude coconut oil have a wide mix of all the fatty acids (Beroe, 2018). This has positioned palm kernel oil and crude coconut oil as the preferred feedstock in the oleochemical industry. However, palm kernel oil is the most traded commodity among the oleochemical feedstock because of its lower price compared to crude coconut oil.

Coconut oil (CNO) competes head on with palm kernel oil (PKO). The first challenge is improving reliability of supplies of CNO and bringing the price of CNO down to be competitive with PKO. There are at least three ways to do this: 1) increase primary production of coconut through fertilization and better agronomy (immediate) and replanting with hybrids (long term), 2) conserve CNO by substitution of coconut cooking oil with palm oil, and 3) granting of incentives and strong government support to the domestic oleochemical processors of coconut oil (Javier, 2015).

In view of the European Union's recent import ban on palm oil/palm kernel oil from Indonesia and Malaysia for use in biofuels out of concern that oil palm cultivation accelerated deforestation and global warming, it is projected that more oleochemicals using coconut oil from the Philippines would be absorbed in the European market. Similarly, the import ban on palm oil exports of three large Malaysian palm oil companies by the United States will likely increase imports of Philippine coco methyl ester in this country.

# VIRGIN COCONUT OIL

## Key Demand Drivers

Important factors that stimulate the worldwide demand for virgin coconut oil are the following (Juliano, 2007; VCO Market, 2010; Goldstein Market Intelligence, 2010; Infiniti Research Limited 2017; ACA 2019; Costales, 2019; Verified Market Research, 2020; and Gravitas, 2021):

- One of the key factors influencing the global demand for virgin coconut oil is its health benefits. Several studies have shown the beneficial effects of virgin coconut oil. With the rising number of health- conscious consumers aiming to maintain good lifestyle and the growing perception that VCO is healthier than other oils, the market for virgin coconut oil is expected to rise further in the near future.
- The wider application of virgin coconut oil to beauty, cosmetics, and personal care products such as soaps, lotions, massage oils, beauty creams, lipsticks, and other hair and skin care products is expected to stimulate further growth to the virgin coconut oil market. More than 40% of consumers are using organic beauty products while 8% more are interested to shift to organic beauty products. Technological advancements in the field of dermatology, chemistry, and cosmetics have found ways to produce better and more effective products to address the perceived demand of consumers to look better and younger. Cosmetic and nutritional products, with some degree of pharmaceutical activity are now called cosmeceuticals and nutraceuticals. Scientists have considered the effectiveness and safety of traditional products from nature such as virgin coconut oil.
- The increasing demand from the food industry is expected to propel growth in the virgin coconut oil market. Greater consumer spending on functional food and beverages favoring a nourishing lifestyle as well as growing interest on virgin coconut oil over coconut oil are observed. More companies are also gearing towards catering the market for culinary purposes.
- 
- Virgin coconut oil plays an important role in the field of pharmaceuticals. It can serve

as medicine to cure diabetes. Based on the World Health Organization (WHO), around 463 M people worldwide are living with diabetes in 2019. This poses a huge potential for the virgin coconut oil market. Furthermore, an experiment conducted by the Department of Science and Technology (DOST) showed that covid-19 patients who were administered with virgin coconut oil experienced lesser symptoms and speedy recovery than those who were not given virgin coconut oil. The Philippine Council for Health Research and Development (PCHRD) study also reveals that the compounds from virgin coconut oil decreased coronavirus count by 60-90% at low viral load. This would entail an enormous market for virgin coconut oil.

- Virgin coconut oil is also used as food supplement. It can be taken orally by spoonful or by capsule or applied externally for various ailments. As testimonials from more satisfied users of virgin coconut oil are proliferating and as greater number of consumers are preferring to increase their intake of omega fatty acid, a significant growth in virgin coconut oil consumption is predicted in the future.
- Increase in population especially the aging population can trigger higher demand for virgin coconut oil. Moreover, with modern access to online market and wide variety of products at a discounted price, there would be a surge in the demand for virgin coconut oil.
- Due to heightened environmental concerns, a rise in the demand specifically for organic virgin coconut oil is seen in the future. The organic virgin coconut oil market accounted for a bigger market share in 2019. This is due to rising demand for healthier and nutritious food. The inadequacy of vitamins found in food because of rapid climate change is the main driver for the organic virgin coconut oil market.

The factors that may impede the growth of virgin coconut oil demand are the introduction of newer products, availability of substitutes such as extra virgin olive oil, sunflower seed oil, grapeseed oil, almond oil, avocado oil, and neem oil (similar uses in the household, cosmetics, and health sector), lack of awareness on the benefits of the virgin coconut oil and lastly, the negative image, in general, of coconut oil due to its unsaturated fat content.

## Virgin Coconut Oil Domestic and Export Market Prospects

**Domestic Market.** PCA reported the growing local consumption of virgin coconut oil as manifested by the increase in the sales volume of virgin coconut oil producers (Juliano, 2007). Based on an interview with one of the major producers of virgin coconut oil in the Philippines, there is still a lot of demand to fill in the country. The limiting factor is the supply of high-quality raw materials appropriate for virgin coconut oil.

A surge in the local demand for virgin coconut oil is projected in the country in the coming years. With the disclosure of the results of DOST's experiment on the health benefits from virgin coconut oil intake on covid-19 patients, a trajectory trend in its market demand is anticipated. As more covid-19 cases are being reported daily, this would create interest among covid-19 patients to purchase virgin coconut oil as an immune-health supplement for faster recovery. Based in their sales data, Amway Philippines observed an increase in demand for its health supplements (Manila Standard Lifestyle, 2020). This means that more Filipino consumers are getting more health conscious. As a preventive measure against COVID-19, it is expected that the demand for virgin coconut oil as food supplement will rise, not only for COVID-19 patients but for the entire Filipino consumers. The future is bright for the virgin coconut oil industry not only locally but also internationally.

The existence of multi-B food and cosmetics companies in the country would indicate that domestic use of virgin coconut oil is present (Bello et al., 2020). Filipinos are also looking for organic and natural beauty products. Several virgin coconut oil-based beauty soaps and scrub are currently available in the market. This pattern of using natural products will continue in the long run as the benefits of having a healthier lifestyle is being recognized.

**Export Market Prospect.** According to Verified Market Research (2020), the global virgin coconut oil market was valued at US $ 1,280.6 M in 2019 and is expected to grow at a CAGR of 10.04% over the forecast period of 2020 to 2027. It is projected to reach US $ 2,874.9 M by 2027 (Verified Market Research, 2020). Based on Goldstein Research, growth in global market demand for virgin coconut oil is expected to be driven by growing consumer interest in natural beauty products (ACA, 2019).

The global virgin coconut oil market is segmented by region classified as: Asia-Pacific Region, European Region, Middle East, and African Region (MEA) and the Americas Region. Asia Pacific comprises of countries like China, India, Sri Lanka, Singapore, Japan, South Korea, Taiwan, Indonesia, Malaysia, Thailand, Vietnam, Australia, Fiji, Guam, Hawaii, and Papua New Guinea. The European market, on the other hand, includes Germany, France, Italy, Spain, United Kingdom and Russia while USA, Canada, and Mexico fall in the Americas Region. The African Region covers African continent countries and the Middle East countries of Abu Dhabi, Qatar, Kuwait, and the Kingdom of Saudi Arabia (Costales, 2019).

Aside from occupying the biggest part in the global market, Asia Pacific is also the largest producer and exporter of virgin coconut oil. This is due to easy access to coconuts in the region (Costales, 2019). Japan, China, Singapore, South Korea and Australia are among the top importers, while the three major exporters are also in this region like the Philippines, Indonesia and Sri Lanka (Costales, 2019).

The regional market has an expected hike in the demand for virgin coconut oil for culinary purposes (Market Research Future 2021). The use of virgin coconut oil for cooking purposes in countries like China, India, and Japan is likely to increase the demand in this region. Aside from this, Asia-Pacific has a notable presence of manufacturing companies of virgin coconut oil such as Edward and Sons Trading Company, MaxCare, Greenville Agro Corporation and others (Verified Market Research, 2020). With the pressing demand for virgin coconut oil, the market players are finding it hard to meet the high demand from consumers. The governments in this region are reaching out to provide technological assistance to the players to enhance their production capabilities (Research and Markets, 2019).

The demand for virgin coconut oil in the European Region is driven by an increasing awareness of consumers towards healthy lifestyles and diets. There has been a rising demand for organic beauty and health supplements (Goldstein Market Intelligence 2010). Having proven that virgin coconut oil reduces cholesterol levels, it produced interest in the use of this product among consumers. It has transformed from a niche market to a main stream market and currently has expanded its market outlets in large supermarkets. The rapid virgin coconut oil market growth in Europe is influenced by the United Kingdom's growing demand for virgin coconut oil. The Region imports from the Philippines, Sri Lanka, Indonesia, India, Thailand, Malaysia, and Papua New Guinea. The expanding volume of sales of virgin coconut oil and virgin coconut oil-based products on-line, in supermarkets and special retail stores as food and beauty and cosmetics products reveals its growing popularity among consumers (Costales, 2019).

In the Middle East and African Region, virgin coconut oil has gained popularity particularly in Dubai and the United Arab Emirates (UAE). Virgin coconut oil was introduced in UAE by Vita Coco, the leading coconut water producer and exporter in the world. Based on market research, the African Region can reach a potential of about US$10 B for its coconut product market. The growing market for virgin coconut oil has motivated the entry of coconut processors in Africa. Specifically, the ROCAC Group from Nairobi, Kenya started to export virgin coconut oil and coconut water to the UAE and other countries (Costales, 2019).

In the Americas Region, greater awareness and nutritional benefits led to the popularity of virgin coconut oil. The notion that virgin coconut oil aids in fighting obesity and overweight related problems prevalent in the area also catalyzes the demand for this product, specifically in the US market, the major virgin coconut oil importing country in the region (Costales, 2019).

In the Philippines, the top importers are USA, Germany, Canada, United Kingdom, Brazil, the Netherlands, and China. The North American market is still the biggest market for virgin coconut oil from the Philippines, mainly provided by the desiccated coconut producers that have branches in the United States (VCOP, 2019). In 2015, it acquired more than 50% of the Philippines' and 41% of Sri Lanka's total virgin coconut oil exports (Costales, 2019). Although the US market showed signs of slowing down as seen from the country's declining export of virgin coconut oil beginning in 2016 due to AHA's advisory on the negative effect of coconut oil on health, the slack in demand growth can be boosted by venturing to the still untapped markets and by promoting virgin coconut oil for industrial applications. Industry wise, the use of virgin coconut oil in food products is not popular. Nevertheless, there are some manufacturers who have been using virgin coconut oil in the European market for their products like Get Fruity Bar (United Kingdom), Bio Paranuss-Guarana Riegel (Germany) and Lifefood Coconut Bar (Germany/ Europe) (Costales, 2019).

# Coconut Water

## Key Demand Drivers

Coconut water is gaining popularity worldwide due to the following key demand drivers (ACA 2019; Costales 2019; CBI Ministry of Foreign Affairs, 2020):

- The increasing popularity of coconut water as a healthy functional drink is one of the main drivers behind the growing interest in coconut water. The market will be growing fast as more consumers are becoming health conscious. Coconut water is marketed as a 'health booster' in several ways. It is considered as a 'rehydrator' or 'anti-aging' product, stressbuster, natural diuretic, digestive soother, detoxifier, stomach comforter, and cholesterol-lowering product.
- Due to its higher content of minerals and carbohydrates, coconut water can be classified as an isotonic beverage. In Europe, the market for sports drinks is forecasted to increase at an average yearly rate of more than 5% according to several sources.
- The competitive advantage of coconut water is that it is completely a natural drink. This makes it appealing to more buyers. While most other drinks are artificially created, coconut water has even less natural sugar. The sugar intake of most Europeans has gone down in the last few years, as consumers opted to live a healthier lifestyle. This change in consumption pattern has negatively affected the fruit juice and soft drinks industry. Greater demand for a natural drink is expected to be the trend.
- On one hand, since coconut water has low energy value and does not have sweetness flavor like fruit juices, it is often mixed with small quantities of fruit juices or purees to create more fragrant coconut water drinks and an improved nutritional value. With this, it is increasingly used as an ingredient in juice-based beverages that leads to projected increase in demand.
- Plant-based diets are also becoming increasingly popular. Coconut water is used as an ingredient in plant-based drinks. Coconut water is combined with 'no-added-sugar' products to come out with the desired sweetness of the drink. Multiple plant-based drink manufacturers have used coconut water in their products.

## Coconut Water Domestic and Export Market Prospects

**Domestic Market.** The domestic consumption of coconut water is relatively low which implies the need for promotional efforts. Due to the abundant nature of coconut trees in the country leading to greater access to coconut, local consumers prefer to drink the water from fresh young nut rather than the packaged one. Aside from this, coconut water from young buko has better taste and subjecting it to a certain process will lose its refreshing, sweet taste. The challenge is to prolong the shelf life without changing its taste. There is a great market potential for bottled pasteurized coconut water. The study conducted by Hidalgo (2017) which targeted local consumers revealed that pasteurized coconut water is widely accepted by general consumers and that 97% of the college students are willing to buy and substitute coco water to their preferred beverages. For the product test administered to three segments of the market under study such as those with an active lifestyle (athletes/ sports enthusiasts), health-conscious individuals, and students, the study showed that after tasting the 330-ml pasteurized coco water, 98% are willing to replace their preferred beverage with coco water. This indicates that Filipino consumers are continuously looking for a healthier option to soft drinks and other commercial beverages. This reveals that given the market response, there is a great potential for pasteurized coconut water to enter the Philippine beverage industry. The research on the Philippines Food and Drinks Market: Emerging Opportunities showed that the health-conscious segment of the society is dominant particularly among the young, affluent population. The survey conducted by the Philips Index Health and Living also showed that 54% of the Filipinos considered themselves as conscious about their health and well-being which means they pay attention to the food they are eating. In another study done by the Food and Nutrition Research Institute (FNRI), it was found out that 76.6% of Filipino consumers are greatly influenced by nutrition facts when buying a product. In another market survey, around 36% consider health benefits as their reason for buying a beverage.

**Export Market Prospect.** According to a global research study conducted by ACA (2019), the worldwide market for coconut water is predicted to grow at a CAGR of roughly 14.4% from 2017 to 2023. Thus, from US$ 6,150 M in 2017, this will reach at about US$ 13,800 M in 2023.

The global consumption of coconut water is approximately more than 600 M liters yearly. This amount is based on coconut water retail sales, but the actual world consumption is higher since the estimation excludes direct consumption from young coconuts, which is also an important part in coconut production (CBI Ministry of Foreign Affairs, 2020).

Western Europe is a significant market for packaged coconut water while Australia and New Zealand are also outlets for packaged coconut water. The European market for coco water accounted for 10% of the total world sales. This is about 60-70 M liters consumption in the European Union on an annual basis. The rate of increase in their consumption ranges from 15-20% annually and the increase will persist but predicted to be at a much lower rate of 10% per year. The physical import of coconut water in Europe is smaller compared to its consumption since the imported concentrated coconut water is further repacked with water or used as a beverage ingredient. In terms of import demand, it is expected only to be roughly 30-40 M liters annually. The growth in the European market for coconut water is influenced by an alternative way of living among consumers such as their adherence to functional and plant-based drinks that led to an innovative and healthier solution with coconut water (CBI Ministry of Foreign Affairs, 2020).

Specific countries in Europe like the United Kingdom, France, Spain, Germany, Italy, and the Netherlands provide great opportunities for producers in developing countries. The United Kingdom, being the main consumer of coconut water, the Netherlands as a trade hub with numerous specialized traders, and Austria with several beverage processors, all these countries in the region offer gainful opportunities for coconut water trade (CBI Ministry of Foreign Affairs, 2020).

In France, coco water consumption has increased at least five times over for the last five years. Currently, they are consuming around 12–14 M liters and are expected to be of similar level with the United Kingdom. Their demand for coconut water is stimulated by the healthy nature of coconut water as well as market promotional efforts of companies. With lower fruit juice demand in the country, French processors of juice and soft drinks offer less sugar content and even mix coco water with fruit juice (CBI Ministry of Foreign Affairs, 2020).

Germany was the first country where coconut water was introduced but the market did not develop as rapidly as in the United Kingdom. However, the consumption rate is currently rising and will likely be included in Europe's top three largest coconut water-consuming countries. Annual consumption of coconut water in Germany ranged from 6-8 M liters. Germany has the largest market for organic food and suppliers would have a great deal of market for organic coconut water (CBI Ministry of Foreign Affairs, 2020).

The Italian consumption of coconut water lies between of 3 and 4 M liters yearly. New product developments are prevalent in the country as well as the existence of a wide variety of domestic and foreign brands. On the other hand, the Netherlands' consumption of coconut water is moving at a fast rate and many new brands are sprouting in the market. Coconut water is also traded from the Netherlands by specialized juice ingredient suppliers who have processing facilities in Brazil, Vietnam, Mexico, and Poland (CBI Ministry of Foreign Affairs, 2020).

In Australia, the packaged coconut water market is also expected to grow at an enormous rate. The demand is driven by Australian's changing food habits and preferences, especially the working population. Coconut water has greater appeal to the Australian population due to its benefit of lowering blood pressure, maintaining blood glucose levels, and rehydrating the body, among other benefits. This in turn is expected to positively influence the market growth through 2025. The availability of coconut water throughout the year due to its longer shelf life as well its accessibility in online shopping also added to the increase in sales. The presence of cheaper substitutes and the high cost of packaging are seen to be the blockage to market growth (ReportLinker, 2020).

# COCONUT SUGAR

## Key Demand Drivers

There are several key factors that could drive the global demand for coconut sugar. These include the following (Transparency Research 2016; Technavio 2018; Grandview Research 2019; Gminsights 2020; IndustryARC 2020; CBIEU 2020; Marketresearch.biz, 2021):

- More people are opting for healthier products. With the growing knowledge on the health benefits of coconut sugar, while a considerable number of the population are becoming aware of the ill- effects of processed white sugar, coconut sugar is likely to gain a competitive advantage over mainstream products. The organic coconut sugar has a low glycemic index compared to cane sugar and honey. Coconut sugar will also be good for dairy substitutes. A rise in the number of lactose intolerant people worldwide will also drive the market further in the projected period.
- The rising cases of diabetes, cardiovascular diseases, obesity rates, the change in dietary patterns, and substandard healthcare conditions in developed and developing countries may trigger an increase in the product demand. According to WHO, an estimated of 1.6 M deaths in 2016 were directly caused by diabetes while 1.9 B adults were overweight and around 650 M of these are obese. The cardio vascular disease is the number one cause of death globally, with an estimated 17.9 M people who died in 2016 due to this disease. Coconut sugar has features that do not spike insulin levels quickly like regular sweeteners. It is rich in antioxidants and minerals and it has lauric acid which is a good compound that destroys different varieties of host diseases such as flu and viral infections. Coconut sugar also contains a fiber that reduces glucose absorption. It is predicted that increasing levels of diabetes, cardiovascular disease, and obesity will give rise to demand for coconut sugar as a healthier alternative.
- Coconut sugar has unlimited application to food and beverage ranging from snacks, chocolate, breakfast cereals bakery products, confectionery, food seasoning to juices, coffee, and tea. Based on the estimation of the Industry ARC's analyst, the above uses will have a CAGR of 5% to 6% in the sector.
- A more specific demand will be for organic food and drink products, particularly in the European market. The primary concern of consumers is to do away with products that made use of synthetic pesticides and related chemicals. A lot of food and drink companies are increasingly using natural sweeteners. Organic coconut sugar is a choice because of its nutritional qualities and ecological value. The reputation of organic certification is also perceived to be a quality standard. With this, the demand for organic coconut sugar will escalate in the European market. There is a great potential for exporters of coconut sugar in developing countries to capitalize on this. Since coconut sugar has a higher price than regular sugar, exporters can target the

organic sector to justify the premium. It is anticipated that the demand for organic products in Europe will continue to rise.

- The trend towards vegan food and drink products, especially in Europe is increasing. This trend is expected to persist as companies are geared towards developing new vegan products. Europe, which occupies more than one-third of the global vegan product market, leads the way in terms of organic food innovations and will continue to dominate in the coming years. According to Allied Market Research, the global vegan industry is valued at US$ 14.2 B in 2018 and is expected to reach US$ 31.4 B by 2026. With the vegan trend, the suppliers of coconut sugar in developing countries can take advantage of the opportunity being set in the European market.
- An uptrend in the demand for healthier ingredients from the chocolate industry is expected to take a portion in the market share. An increasing market demand for coconut sugar-based vegan chocolates and the availability of coconut sugar-based products in premium brands such as Lindt, Toblerone, Hershey are seen to have a favorable gain in the penetration of the product. In Sweden, there was an over US$65 M sales turnover for organic chocolates, sugar, jam, and confectionary in 2017.
- The application of organic coconut sugar in producing skincare products like body scrubs, shaving gels, facial and body creams as well as hair care products is also contributing to the demand growth. These coconut sugar-based scrubs and face packs are preferred because of their granular, lubricating, and antioxidant nature as well as their ability to remove dead cells without harming the skin. With the worsening air pollution level due to modern industrialization, these herbal cosmetic products in Europe are projected to drive the demand for coconut sugar in the region.
- The increasing geriatric population and the number of middle-aged are prospective customers of coconut sugar for skincare. Coconut sugar is a superior anti-aging ingredient because of its production of collagen. Hence, people whose age ranges from 40-50 years old would most probably use coconut sugar as a skincare product.

Most of the coconut sugar manufacturers are operating on a small scale and the quality of coconut sugar produced by different processors varies. Since their coconut sugar products differ in terms of appearance and texture, it would be difficult for them to penetrate the export market.

Some leading diabetes organizations in UK such as Diabetes UK viewed that although coconut sugar is marketed as a better substitute to cane sugar, it is still a form of sugar and it could still pose some risks to consumer health. Thus, they suggest consumers to reduce all forms of sugar consumption. They provided advice on how to cut down on sugar. This in turn would have a negative impact on coconut sugar demand.

## Coconut Sugar Domestic and Export Market Prospects

**Domestic Market.** The local demand for coconut sugar has not been very well documented because the use of the product is very minimal. Domestic consumers have continued reliance on sugarcane-based sweeteners/additives (Angulo). As dictated by the international market, the price of coconut sugar will remain high for some time as demand (outside the country) will continue to outweigh the supply. The possible entrance of big players would also have an impact on the future price. The degree of influence on prices will depend on their production capacity and rate of supplying the market (Costales, 2019).

The prevalence of diabetes among adults in the Philippines is 6.3%. Out of the total 63,265,700 adult population, there are 3,993,300 cases of diabetes in the country (IDF, 2020). The Philippines ranks fifth in the Western Pacific (behind China, Indonesia, Japan, and Thailand) in terms of the number of diabetics. Based on the IDF Atlas 2017 Edition, deaths related to diabetes in the Philippines were estimated to be 50,000 for ages 18 to 99 years old. The rate is expected to climb by 20% more in 2045 (Litonjua, 2018). These records show that with the increasing number of diabetics, there could also be a rising number of possible users of coconut sugar. With better promotion or information dissemination, the projected market demand can largely increase.

**Export Market.** The analyst projected that the coconut sugar market will have a CAGR of 5.86% from 2019 to 2024 and reach US$ 397.34 M by the end of 2024. The global market for coconut sugar can be analyzed in four key regions, namely, North America, Europe, Asia-Pacific, and the rest of the world. The North American coconut sugar market covers the USA, Canada, and Mexico while the European coconut sugar market includes the UK, Germany, France, Italy, Spain, and the rest of Europe. The coconut sugar market in Asia-Pacific is divided into China, India, Japan, Australia, New Zealand, and the rest of Asia-Pacific. The rest of the world includes South America, the Middle East, and Africa (Market Research Future, 2021).

Coconut sugar market demand in North America is led by the USA and Canada. A significant growth is forecasted due to rising consumer awareness on health issues pertaining to obesity and diabetes. A growing number of big restaurants across the USA and Canada such as Starbucks, and Tim Hortons are serving coconut sugar alternative food and beverages in their branches (Gminsights, 2020). Large food and beverage manufacturers such as Tyson Foods, JBF, National Beef, and Pepsi Cola Co. are also present in the USA and are expected to drive the demand for alternative sweeteners (Grandview Research, 2019).

The demand for coconut sugar in the European market is growing. Greater demand for natural and high-quality food products paved a way for coconut sugar suppliers in developing countries to create a market (CBI EU, 2020). In Denmark, the stringent government regulations on quality, awareness campaigns, and rising consumer inclination towards high-quality products are expected to have a positive impact on coconut sugar market demand. Furthermore, the Danish Agriculture and Food Council planned that 20% of the Danish land area shall be used for organic farming by 2020 (Gminsights, 2020).

European consumers are also concerned with the nutritional values of their food and beverages. Europeans prefer healthier products and natural sweeteners such as coconut sugar are increasingly taking the place of sugar in food and beverage products. Based on the results of a 2016 food consumption survey, out of 2,500 European consumers, 60% of adults monitored how much sugar they consumed (CBI EU, 2020).

The increasing share of the population aged 65 years and above and the growing number of them experiencing chronic diseases such as diabetes and heart diseases are expected to propel the demand for alternative sweeteners such as coconut sugar. Moreover, the growing interest for bio-based cosmetics in the region is forecasted to open a new door for coconut sugar market growth over the next eight years (Grandview Research 2019).

Consumers in countries in Europe like UK, Germany, France, and Italy have increasing inclination towards organic chocolates, jams, honey, and confectionery items as brought about by the rise in disposable income and their turning towards healthy and high-quality products. Coconut sugar is widely used in manufacturing chocolates and jams due to its organic nature and flavor-enhancing quality. This is anticipated to accelerate the future market demand share for coconut sugar (Gminsights 2020).

The UK government implemented the so-called "sugar tax" on soft drinks in 2018. This was done to fight childhood obesity. As a result, around 50% of soft drinks manufacturers decreased their sugar content even before its implementation. This policy leads the way to stimulate demand for alternative sweeteners such as coconut sugar (CBI EU, 2020).

In the Asia Pacific, the increase in disposable income and growing inclination for high-quality and natural cosmetics may foster market growth for coconut sugar. Coconut sugar is widely used in manufacturing face scrubs, peel-off masks, and moisturizers. It has certain characteristics that prevent loss of moisture in the skin and is compatible with other organic ingredients such as aloe vera, charcoal, and fruit extracts. The rapid growth in the cosmetics industry in Korea, India, and China is expected to have a favorable impact on the future trend of the coconut sugar market (Transparency Research, 2016).

Due to the rising geriatric population as well the increasing diabetic patients and obesity cases, most consumers are on the lookout for alternatives like organic coconut sugar to lower down their health risk (Transparency Research 2016). This would be an influencing factor for the growth in demand for coconut sugar in Europe. In addition, the increasing demand in the food and beverage sector is expected to support the growth in the target coconut sugar market (Marketresearch.biz, 2021).

The Asia Pacific is also the largest producer of organic coconut sugar due to the abundance of raw material (i.e., coconut sap) in the area. Coconut sugar prices are likely to increase over the course of time due to the anticipated demand in the international market. The cost of coconut sugar is much higher in the international market compared with the domestic market. As a result, the manufacturers need to consider the prices to gain a larger share in the global market (Grandview Research, 2019).

To increase the export demand for Philippine coconut sugar, the DTI suggested that there is a need to classify and promote Philippine coconut sugar as Philippine coconut sweetener due to the sensitivity of the international market and health-conscious consumers in the word "sugar".

# COCO COIR

## Key Demand Drivers

The versatility of coir fiber as a raw material for a range of uses such as floor coverings, carpets, doormats, furniture padding, filling for mattresses, floor brushes, ropes, twines, geotextiles, automobile seat, insulation and as packaging material had made it a much sought-after product. Below are some of the catalysts for growth in the demand for coir fiber and its value- added products (Entre Pinoys, 2017; ICC, 2018; and Persistence Market Research, 2020):

- With the trend in the world going green, products that are sustainable and environmentally friendly are also in demand. Coir and its products are the much suitable eco-friendly products available in the market. It is 100% natural and organic and does not cause any damage to the environment and is relatively cheaper.
- Application to horticulture, soil conditioning, gardening, and hydroponics are some of the key market drivers for growth of coir products. Coir pith is one of the media being used for hydroponics which is a water-based method of growing fruits and vegetables. Hydroponics is gaining popularity among plant growers all over the world. An increasing number of people are venturing into vegetable growing through hydroponics system due to several advantages. This will likely lead to a spike in the demand for coir pith. This medium has certain properties which allow the crop to grow due to better air-to- water ratio.
- Geotextiles are applied to civil engineering, agriculture, and horticulture such as in controlling soil erosion and firming soil build up. Synthetic polymers were previously utilized in producing geotextiles, but coir has appeared to be nature-friendly and more cost-effective. Coir geotextiles are more fitting for use as they absorb water and control soil erosion. This eco-friendly property of coir geotextiles is boosting the coir market. An increasing demand for geotextile products is therefore forecasted.

Other innovations for coir use would create demand in the market as an alternative environmentally friendly product. Coir ply from coir fiber as a substitute for wood, rubberized coir mattresses for orthopedic beds and automobile seat cushions, garden articles from coir fiber to replace plastic ones, converting coir pith into organic manure or as a plant growth medium in nurseries and reforestation programs would all spur growth as it creates its own market. However, these require market development, market intelligence, and intensive promotional efforts.

## Coco Coir Domestic and Export Market Prospects

**Domestic Market.** The local consumption of coir comes in the form of coco geotextiles (geonets), stitched fiber for bed mattresses, plant liners, and other garden products, doormats, and bio logs. The demand for these products used to be small (DA, 2014). In 2012, the Philippine government, however, mandated the Department of Public Works and Highways (DPWH) to patronize coconut bioengineering technology such as coco nets, coco logs, coco twine, and coco peat in all its construction projects if necessary. This agreement made by the Office of the Presidential Assistant for Food Security and Agricultural Modernization (OPAFSAM) during the Aquino administration with the National Irrigation Administration (NIA), DPWH, and PCA has expanded the use of these materials (Costales, 2019). The DPWH needed up to 4 M square meters of geonets for its road construction and irrigation projects, erosion control, and embankment protection. In Bicol, the main market for coco geonets are government agencies like DPWH, the Mines and Geosciences Bureau (MGB), as well as the different LGUs. The utilization of coco nets has grown at a fast pace, averaging 273% in annual growth rates from 2011 to 2014. Data showed that the demand for coco geonets for DPWH projects in Bicol increased from 6,467 m2 in 2011 to 198,017 m2 in 2014, a 2,962% increase. This implies an increasing compliance with the circulars and directives to use geonets for concrete and riprap (DA, 2014).

The mining sector also served as a big market for coco geonets. The coco geonets that are applied for environmental rehabilitation are being adopted by the mining companies to rehabilitate their mined areas, as part of their mandate to mitigate the environmental effect of their activities (DA, 2014). The mining companies in Surigao del Norte and

Surigao del Sur are also using geonets on sloping areas near communities and highways to prevent landslides (Panganiban, 2014). In the Bicol Region, the total demand for coco geonets was 1.45 M m2 in 2014, 86.4% of which comes from mining companies. This total demand would require 1,928 MT of coir. The region would be able to satisfy the demand if all decorticators are operating at full capacity and if they do not export or sell the coir they produce, but instead process them into coco geonets. Filling this need will create a huge impact in terms of employment in the countryside (DA, 2014).

Much of the demand are coming from the DPWH, NIA, other government agencies and mining firms. There is also a demand from resorts like in Misamis Oriental and Bohol that used geonets on slopes near the shoreline (Panganiban, 2014). This trend is expected to persist in the future because apart from the high tensile strength of the material, it is relatively abundant, making it cheaper compared to imported synthetic geotextiles. Most importantly, it is eco-friendly, making it perfect for controlling soil erosion. Its biodegradable nature promotes vegetation growth underneath, keeping its nutrients intact. Widespread promotion and dissemination of its beneficial uses and effects would fast track the growth of the industry. Aside from geonets, there is also an increasing demand for horticultural purposes. Local markets are making available coco peat/dust due to its high demand (Bello et al., 2020).

Another coir product that has a good market prospect is coco fiberboard, which is a better substitute for lawanit, a low-cost panel board being imported in the country. The total value of imported lawanit reaches US$ 64 M per year while the local yearly demand for fiberboard is approximately 350,000 cubic meters which is equivalent to Php 5.4 B per year. Coco fiberboard has superior quality and is more competitive than lawanit. It has better material strength and can be used in interior and exterior walls as wood parquet, roof tiles, furniture, and materials for housing construction. Moreover, the production of coco fiberboards does not need a binder because coir has natural lignin, an adhesive which is activated at a certain temperature and pressure. Hence, the processing of coco fiberboards is simpler and cheaper than other particle fiber boards. The cost of producing coco fiberboard is Php 150 which is less than P 100 compared to lawanit. Since lawanit is made from timber, its costs may have gone up and its volume of production is less. Coco fiberboards are now considered more sustainable (DA, 2014).

**Export Market Prospect.** Previously, the global demand for coco coir and peat has declined due to the slack in the Chinese economy and the switching of demand to more value-added coco coir products. Despite this, the Coir Board of India remains positive that it will revert to normal. The drivers of growth in the global arena would be the eventual recovery of the Chinese economy, the expanded applications of coco coir products in the industry and the intensified use of coco peat in horticulture to replace peat moss in landscaping works and in potting medium. China is a major importer of coco fiber, accounting for about 70- 75% of the total exports. It uses the raw material for industrial applications with an estimated requirement of about 450,000 MT annually and is expected to increase by 10% to 20% per year (Arancon, 2013) as cited by Costales in 2019. In South Korea, cocopeat is widely used in rice farming while in the Middle East, such as Saudi Arabia, Kuwait, and Qatar, coco peat could substitute for peat moss as a soil conditioner for 'imported' soil for landscaping and horticultural applications. There is also a projection of an increase in demand from USA (Costales, 2019).

An extensive growth in the global coir market for the period 2020-2030 is anticipated by the market analyst. The most contribution to market growth would emanate from Europe and North America. Europe has a 29% share in the global coir market in 2019. Hydroponics in Europe is becoming favorable to consumers and it is highly related to the use of coir pith. The leading coir companies such as Fibre Dust LLC, Pelemix Ltd., Coco Argo, and others are devising ways to penetrate the hydroponics market. They are also focusing on product diversification and product customization (as per customer demand) and expanding the production capacity of coir products. American consumers, on the other hand, are interested in the use of geotextiles, as the demand for eco-friendly products is soaring high in the country (Persistence Market Research, 2020). Aside from these regions, demand would also come from other sources such as Asia where there is a strong demand for rubberized coir for mattresses use (ACA, 2019).

Sri Lanka is the top producer of coir while India is leaning towards the production of value-added coir products such as mats, rugs, rope, and geotextiles (Entre Pinoys, 2017). It is projected that exports from India will continue since the world market for coir and its products is improving, particularly from China and the USA (ICC 2018). Sri Lanka and India will continue to be a major supplier of coco coir products with coco peat as their dominant product. Other coir producers such as the Philippines, Indonesia, Malaysia, Thailand, and Vietnam will have modest gains in their export of coir products as they improve on their productivity. Raw coco coir and coco peat products will still be the dominant export in terms of volume surpassing the other coco coir-based value-added products except for tufted coco coir mats (Costales, 2019).

In terms of price, the trend will continue to be affected by the performance of China's economy and the exports of two major manufacturers and exporters in the world, Sri Lanka and India. The combined exports volume of these two countries account for about 90% of the global exports for coir products (Costales, 2019).

The Philippines is one of the largest coconut-producing countries in the world, but its coir production remains very low, and it has very limited participation in exportation in the world market (Persistence Market Research 2020). This may be attributed to the priority given to major products of coconut such as copra and desiccated coconut that generate higher income than coir (Entre Pinoys, 2017). However, there is a very large market demand and opportunities for coir products. The Philippines can venture into coco chips, a new coir product which is a good medium for growing plants in greenhouses. Holland has a Westland with 7,000 hectares of land for plant production under greenhouse conditions using 1/3 cocopeat, 1/3 chip moist, and 1/3 rock wool, but the country is slowly removing rock wool due to environmental issues. At present, only Europe and Korea are using coco chips. These countries import 10,000 containers a year. Future potential markets would be USA and China. Opportunities are present, but value-adding, or technical know-how is needed to take advantage of the market demand.

The Philippines also has a potential market for coconut fiber in Switzerland. One of the universities in Switzerland has developed an organic plywood that is made from coconut husks which is as good as any wood but without chemicals and glue. Among other products that Switzerland is eyeing from the Philippines are textile, food and processed food, and other sustainable products like coconut husks. After the Philippines- European Free Trade Agreement (EFTA) took effect, the trade between EFTA countries and the Philippines increased by 9% in 2019. The agreement provides duty-free entry of local exports to EFTA countries, which include Iceland, Liechtenstein, Norway, and Switzerland (Business Mirror, 2020).

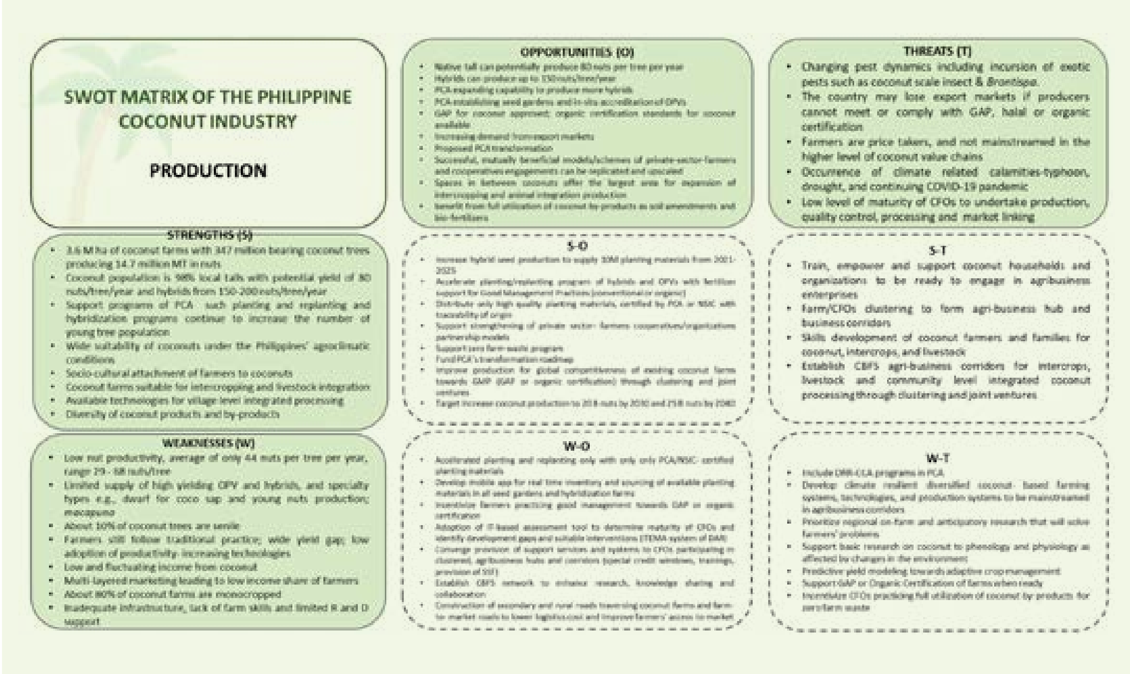
Although there exist several export market opportunities for coco peat, coco chips for hydroponics growing medium, coco boards for housing and furniture making, coco coolers as alternative to styro boxes and coco pallets for shipping of products, the Philippine coco coir industry would require further product and market development, market intelligence, and intensive promotional efforts to realize the potential demand and compete globally particularly with India and Sri Lanka.

# SWOT ANALYSIS OF THE COCONUT INDUSTRY

**FIGURE 6.1. SWOT MATRIX OF THE PHILIPPINE COCONUT INDUSTRY, FARMERS' WELFARE**

| SWOT MATRIX OF THE PHILIPPINE COCONUT INDUSTRY<br><br>FARMERS' WELFARE | OPPORTUNITIES (O) | THREATS (T) |
|---|---|---|
| | • RA 11524 (Coconut Farmers and Industry Trust Fund Act) signed by Pres. Duterte on Feb 26, 2021<br>• PCA regular programs supportive of coconut farmers and organizations<br>• Coconut preservation act of 1995 prohibits the cutting down of coconut trees<br>• Existing national and local government programs on providing social and emergency benefits to the poor sector<br>• Existence of government centers for skills training and development<br>• Private-public partnerships to support projects to increase coconut farmers' income | • Covid-19 pandemic poses continued threats on health and livelihood<br>• Reduced investments and poor management of coconut farms especially by absentee landowners<br>• Rampant cutting, without replanting and conversion of coconut farms<br>• Climate-related calamities |
| **STRENGTHS (S)**<br>• 2.5 million coconut farmers registered qualified to receive support<br>• Willingness to participate in planning and programming and skills training<br>• Organized farmers groups<br>• Farmers in consultations demand for strengthening of partnership and network with DA-PCA, other agencies, institutions and the private sector for harmonious relationships | **S-O**<br>• Benefits from the provisions of RA 11524 which include capacity building and social protection and improved access to credit<br>• Participatory Planning and Execution of Programs<br>• Establishment of Farm Business Schools<br>• Capacity building of farmers organizations<br>• Creation of Local Coconut Farmers Councils to provide them platform and mechanisms for consultations and participation | **S-T**<br>• Qualified coconut farmers who have welfare benefits should still be provided with other social protection benefits<br>• CFOs to provide expanded services to members to include underwriting/facilitation of insurance membership and claims, membership and loans<br>• Strengthen existing CFOs to a higher standard of maturity for them to qualify to undertake and manage agribusiness enterprises |
| **WEAKNESSES (W)**<br>• Prevalence of poverty and food insecurity among coconut farmers<br>• Lack of social protection and welfare benefits<br>• Small, fragmented farms (80% 2 ha and below; 55% one ha and below) with 45% landless farmers<br>• Ageing farmers and decreasing interest of youth in coconut production<br>• Vulnerability to external shocks including disasters<br>• Lack of access to credit, services and inputs<br>• Limited capability, hence limited extended services of organizations to farmer members | **W-O**<br>• Provision of a platform for farmers' organizations and cooperatives to actively participate in the project cycle<br>• Ensure active participation of farmers in crafting the CFIDP<br>• Organize farmers in areas where they are not yet organized | **W-T**<br>• Expand services of CBOs to create a service unit of trained and skilled crew from among tenants and workers whom owners can hire for harvesting, copra processing, land preparation for intercrops and general farm management<br>• Support for weather-based crop insurance for coconuts and intercrops |

## FIGURE 6.2. SWOT MATRIX OF THE PHILIPPINE COCONUT INDUSTRY, PRODUCTION




## FIGURE 6.3. SWOT MATRIX OF THE PHILIPPINE COCONUT INDUSTRY, PROCESSING

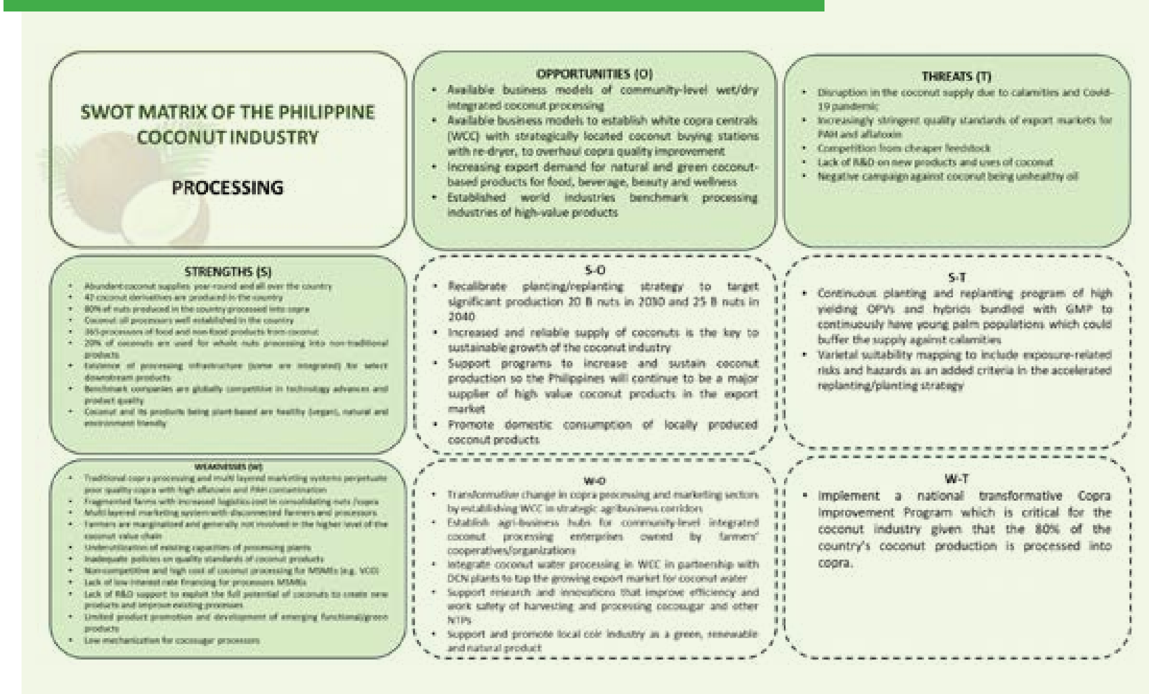


FIGURE 6.4. SWOT MATRIX OF THE PHILIPPINE COCONUT INDUSTRY, MARKETING

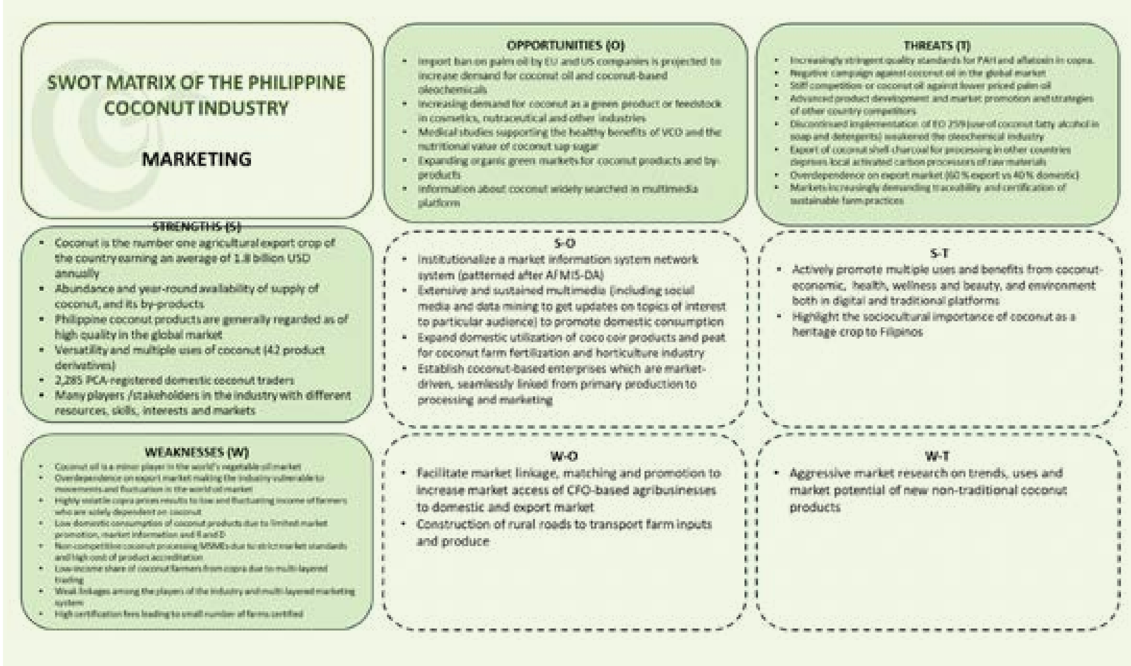
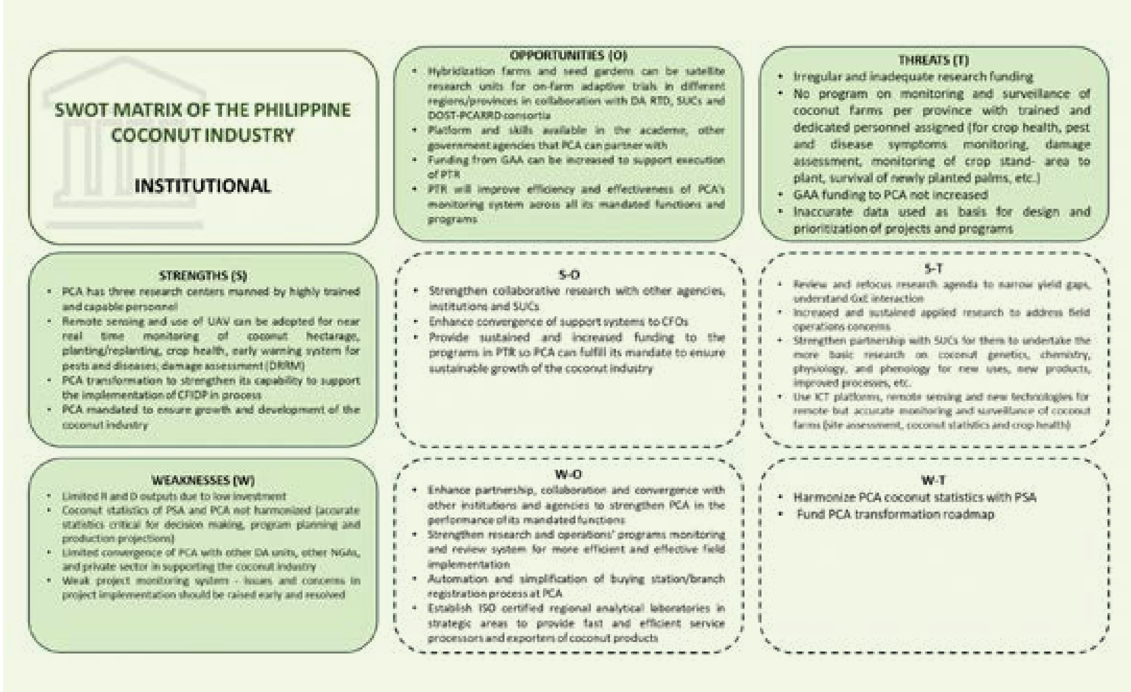



FIGURE 6.5. SWOT MATRIX OF THE PHILIPPINE COCONUT INDUSTRY, INSTITUTIONAL



# TARGET SETTING

### TABLE 7.1. PROGRAM/STRATEGIES PHYSICAL TARGETS, RESPONSIBILITY MATRIX, 2021-2025

| PROGRAM/STRATEGIES | PHYSICAL TARGETS | | | | | | RESPONSIBLE ENTITY |
|---|---|---|---|---|---|---|---|
| | 2021 | 2022 | 2023 | 2024 | 2025 | Total | |
| **A. Social Protection Program** | | | | | | | |
| 1. Educational Scholarship Program for Coconut Farmers' Children | At least 1 child of 2.54 M coconut farmers | At least 1 child of 2.54 M coconut farmers | At least 1 child of 2.54 M coconut farmers | At least 1 child of 2.54 M coconut farmers | At least 1 child of 2.54 M coconut farmers | At least 1 child of 2.54 M coconut farmers | CHED and TESDA |
| 2. PhilHealth Insurance for Coconut Farmers | 2.54 M coconut farmers | 2.54 M coconut farmers | 2.54 M coconut farmers | 2.54 M coconut farmers | 2.54 M coconut farmers | 2.54 M coconut farmers | PCA and PhilHealth |
| 3. Intensive Information on the Crop Insurance Program and Expansion of Its Insurance Coverage | 2.54 M coconut farmers | 2.54 M coconut farmers | 2.54 M coconut farmers | 2.54 M coconut farmers | 2.54 M coconut farmers | 2.54 M coconut farmers | PCIC |
| 4. Cash for Work Under the KAANIB Program and the *Agrikulturang Pantawid Pamilyang Pilipino* Program (A4Ps) Coconut Planting Program; and the SEA-K Program | 2.54 M coconut farmers | 2.54 M coconut farmers | 2.54 M coconut farmers | 2.54 M coconut farmers | 2.54 M coconut farmers | 2.54 M coconut farmers | PCA and DSWD |
| **B. Entrepreneurship Program** | | | | | | | |
| 1. Sustained Conduct of Entrepreneurship Trainings to Farmers Organizations/ Cooperatives | At least 1 farmers' organization/ cooperative per municipality | At least 1 additional farmers' organization/ cooperative per municipality | At least 1 additional farmers' organization/ cooperative per municipality | At least 1 additional farmers' organization/ cooperative per municipality | At least 1 additional farmers' organization/ coop per municipality | 1,306 coops, 10,506 farmers' organization | ATI and TESDA |

| PROGRAM/STRATEGIES | PHYSICAL TARGETS 2021 | 2022 | 2023 | 2024 | 2025 | Total | RESPONSIBLE ENTITY |
|---|---|---|---|---|---|---|---|
| 2. Skills Development/ Training Program on Improved Farm Technologies and New Value-adding Technologies/Enterprises for Coconut Farmers Listed in the National Coconut Registry System | 1.25M coconut farmers | 0.76 M coconut farmers | 0.25M coconut farmers | 0.122M coconut farmers | 0.122M coconut farmers | 2.54 M coconut farmers | PCA and ATI |
| 3. Establishment and/or Expansion of Farm Business Schools (FBS) in Coconut Communities at the Municipal or Barangay Levels | At least 1 FBS per coconut-producing municipal LGU | 1 additional FBS per coconut-producing municipal LGU | 1 additional FBS per coconut-municipal LGU | 1 additional FBS per coconut-municipal LGU | 1 additional FBS per coconut-municipal LGU | All coconut municipal LGUs with at least 1 FBS per municipality | ATI and TESDA |
| **C. Institutional Development Program** | | | | | | | |
| 1. Organization and/or Capacity-building/Strengthening of Coconut Farmers / Organizations Cooperatives | At least 1 farmers' organization/coop organized and trained per municipality | At least 1 addt'l farmers' orgn/coop organized and trained per municipality | At least 1 addt'l farmers' orgn/coop organized and trained per municipality | At least 1 addt'l farmers' orgn/coop organized and trained per municipality | At least 1 addt'l farmers' orgn/coop organized and trained per municipality | All municipal LGUs with at least 1 farmers' orgn/coop | CDA |
| 2. Creation of Local Small Farmers Councils (LSFCs) to Provide Mechanisms for Consultation and Participation | At least 1 LSFC per province | At least 1 addt'l LSFC per province | At least 1 addt'l LSFC per province | At least 1 addt'l LSFC per province | At least 1 addt'l LSFC per province | All coconut provinces with at least 1 LSFC | Local LGUs at the municipal and provincial levels |

| PROGRAM/STRATEGIES | PHYSICAL TARGETS 2021 | 2022 | 2023 | 2024 | 2025 | Total | RESPONSIBLE ENTITY |
|---|---|---|---|---|---|---|---|
| **D. Market Research, Development, Promotion and Expansion Program** | | | | | | | |
| 1. Institutionalization of a Market Information Network System (i.e., data generation, processing, continuous updating, and dissemination of market and other related information) to benefit all players in the value chain and policy makers, replicating DA's Agriculture and Fisheries Market Information System (AFMIS) | 1 Market Information Network System developed at PCA | Annual updating of market information in the MIS website | Annual updating of market information in the MIS website | Annual updating of market information in the MIS website | Annual updating of market information in the MIS website | 1 Market Information Network System operational at PCA | PCA-Trade and Market Development Division |
| 2. Extensive Market Promotion Program through Multi-media to Promote Domestic Consumption of Coconut Food Products | At least 5 coconut products promoted via multi-media | At least 1 addt'l coconut product promoted via multi-media | At least 1 addt'l coconut product promoted via multi-media | At least 1 addt'l coconut product promoted via multi-media | At least 1 addt'l coconut product promoted via multi-media | All traditional products coconut products including promising non-traditional products promoted via-multi-media | DTI (BSMED and BETP) and PCA |
| 3. Expansion of the Utilization of Coco Net or Geotextile in | As needed | As needed | As needed | As needed | As needed | All areas that need the use | DENR and DPWH |

| PROGRAM/STRATEGIES | PHYSICAL TARGETS 2021 | 2022 | 2023 | 2024 | 2025 | Total | RESPONSIBLE ENTITY |
|---|---|---|---|---|---|---|---|
| Construction, Slope Protection and Erosion Control Projects; Stream Bank and River Protection; Mangrove Protection; Road Construction, Mined-out Areas; National Greening Program; etc. | | | | | | of geotextile of DENR and DPWH Projects | |
| 4. Institutionalization of the Utilization of Coco Peat in Fertilization and Food Security Programs | All PCA and DA Fertilization and Food Security Programs | All PCA and DA Fertilization and Food Security Programs | All PCA and DA Fertilization and Food Security Programs | All PCA and DA Fertilization and Food Security Programs | All PCA and DA Fertilization and Food Security Programs | All PCA and DA Fertilization and Food Security Programs | PCA and DA |
| 5. Market Facilitation, Linkages, and Matching to increase market access (domestic and export) within the value chain); should focus on direct trading of farmers organizations and cooperatives to coconut processing companies and institutional buyers; capacity building on market negotiation, and participation of SMEs in international trade fairs and exhibits | As needed | As needed | As needed | As needed | As needed | As needed | DTI-BSMED, DA-AMAS, and PCA -Trade and Market Development Division |

| PROGRAM/STRATEGIES | PHYSICAL TARGETS 2021 | 2022 | 2023 | 2024 | 2025 | Total | RESPONSIBLE ENTITY |
|---|---|---|---|---|---|---|---|
| 6. Market Research – trends and market potential of new nontraditional coconut products as well market strategies to create or expand the demand for existing coconut products | At least 1 market research conducted | At least 1 addt'l market research conducted | At least 1 addt'l market research conducted | At least 1 addt'l market research conducted | At least 1 addt'l market research conducted | All new nontraditiona l coconut products with market potential with market research | DTI-BSMED |
| **E. Infrastructure Development Program** | | | | | | | |
| 1. Construction of Secondary or Rural Roads (e.g., foot trails) within Coconut Farms and Farm- to- Market Roads (FMR) | At least 1 FMR constructed per coconut municipal/ barangay LGU | At least 1 addt'l FMR constructed per coconut municipal/ barangay LGU | At least 1 addt'l FMR constructed per coconut municipal/ barangay LGU | At least 1 addt'l FMR constructed per coconut municipal/ barangay LGU | At least 1 addt'l FMR constructed per coconut municipal/ barangay LGU | All coconut municipal/ barangay LGUs with FMRs | Provincial and Municipal LGUs |
| 2. Construction of Product Quality Testing Laboratories in Coconut Supply Grid Areas in Visayas and Mindanao in Collaboration with SCUs (e.g., National Coconut Center-Visayas of VSU) Replicating the PCA Laboratory Services Division's Facilities and Services; budget should be earmarked for construction and | At least 1 product quality testing laboratory constructed in Visayas | At least 1 product quality testing laboratory constructed in Mindanao | At least 1 additional product quality testing laboratory constructed in Visayas | At least 1 additional product quality testing laboratory constructed in Mindanao | At least 1 additional quality testing laboratory constructed in Luzon | At least 1 product quality testing laboratory constructed in Luzon, Visayas and Mindanao | PCA |

| PROGRAM/STRATEGIES | PHYSICAL TARGETS 2021 | 2022 | 2023 | 2024 | 2025 | Total | RESPONSIBLE ENTITY |
|---|---|---|---|---|---|---|---|
| yearly MOE for the operation of the Product Quality Testing Laboratories | | | | | | | |
| **F. Financing Programs** | | | | | | | |
| 1. Special Financing Window/Credit Program for Coconut Farmers' Organizations/Cooperatives to provide production, processing, trading, and microfinancing loans at low interest rate | 100% Coconut FOs and Coops allowed to have credit access based on credit standing | 100% Coconut FOs and Coops allowed to have credit access based on credit standing | 100% Coconut FOs and Coops allowed to have credit access based on credit standing | 100% Coconut FOs and Coops allowed to have credit access based on credit standing | 100% Coconut FOs and Coops allowed to have accredit access based on credit standing | 100% Coconut FOs and Coops allowed to have accredit access based on credit standing | LBP and DBP |
| 2. Financing for MSMEs in the Coconut Processing Sector | Open to 100% MSMEs in need of credit | Open to 100% MSMEs in need of credit | Open to 100% MSMEs in need of credit | Open to 100% MSMEs in need of credit | Open to 100% MSMEs in need of credit | Open to 100% MSMEs in need of credit | LBP and DBP |

**TABLE 7.2. PROGRAM/STRATEGIES, FINANCIAL TARGETS, RESPONSIBILITY MATRIX, 2021-2025**

| PROGRAM/STRATEGIES | FINANCIAL TARGETS (PHP) | | | | | | RESPONSIBLE ENTITY |
|---|---|---|---|---|---|---|---|
| | 2021 | 2022 | 2023 | 2024 | 2025 | Total | |
| **A. Social Protection Program** | | | | | | | |
| 1. Educational Scholarship Program for Coconut Farmers' Children | 0.8 B | 0.8 B | 1.2B | 1.2 B | 2.0 B | 6.0 B | CHED and TESDA |
| 2. PhilHealth Insurance for Coconut Farmers | 1.0 B | 1.0 B | 1.5B | 1.5 B | 2.5 B | 7.5 B | PCA and PhilHealth |
| 3. Intensive Information on the Crop Insurance Program and Expansion of Its Insurance Coverage | 0.4 B | 0.4 B | 0.6B | 0.6 B | !.0 B | 3.0 B | PCIC |
| 4. Cash for Work Under KAANIB Program and the *Agrikulturang Pantawid Pamilyang Pilipino* (A4Ps) Coconut Planting Program; and the SEA-K Program | Depends on GAA funds | Depends on GAA funds | Depends on GAA funds | Depends on GAA funds | Depends on GAA funds | Depends on GAA funds | PCA and DSWD |
| **B. Entrepreneurship Program** | 0.8 B | 0.8 B | 1.2 B | 1.2 B | 2.0 B | 6.0 B | |
| 1. Sustained Conduct of Entrepreneurship Trainings to Farmers Organizations/ Cooperatives | | | | | | | ATI and TESDA |
| 2. Skills Development/ Training Program on Improved Farm Technologies and New Value-adding Technologies/Enterprises for Coconut Farmers Listed in the National Coconut Registry System | | | | | | | PCA and ATI |

| PROGRAM/STRATEGIES | FINANCIAL TARGETS (PHP) | | | | | | RESPONSIBLE ENTITY |
|---|---|---|---|---|---|---|---|
| | 2021 | 2022 | 2023 | 2024 | 2025 | Total | |
| 3. Establishment and/or Expansion of Farm Business Schools (FBS) in Coconut Communities at the Municipal or Barangay Levels | | | | | | | ATI and TESDA |
| **C. Institutional Development Program** | 0.5 B | 0.5 B | 0.75 B | 0.75 B | 1.25 B | 3.75 B | |
| 1. Organization and/or Capacity- building of Coconut Farmers / Organizations Cooperatives | | | | | | | CDA |
| 2. Creation of Local Small Farmers Councils (LSFCs) to Provide Mechanisms for Consultation and Participation | | | | | | | Local LGUs at the municipal and provincial levels |
| **D. Market Research, Development, Promotion and Expansion Program** | 0.5 B | 0.5 B | 0.75 B | 0.75 B | 1.25 B | 3.75 B | |
| 1. Institutionalization of a Market Information Network System (i.e., data generation, processing, continuous updating, and dissemination of market and other related information) to benefit all players in the value chain and policy makers, replicating DA's Agriculture and Fisheries Market Information System (AFMIS) | | | | | | | PCA-Trade and Market Development Division |

| PROGRAM/STRATEGIES | FINANCIAL TARGETS (PHP) 2021 | 2022 | 2023 | 2024 | 2025 | Total | RESPONSIBLE ENTITY |
|---|---|---|---|---|---|---|---|
| 2. Extensive Market Promotion Program through Multi-media to Promote Domestic Consumption of Coconut Food Products | | | | | | | DTI (BSMED and BETP) and PCA |
| 3. Expansion of the Utilization of Coco Net or Geotextile in Construction, Slope Protection and Erosion Control Projects; Stream Bank and River Protection; Mangrove Protection; Road Construction, Mined-out Areas; National Greening Program; etc. | | | | | | | DENR and DPWH |
| 4. Institutionalization of the Utilization of Coco Peat in Fertilization and Food Security Programs | | | | | | | PCA and DA |
| 5. Market Facilitation, Linkaging, and Matching to increase market access (domestic and export) within the value chain); should focus on direct trading of farmers organizations/cooperatives to coconut processing companies and institutional buyers; capacity building on market negotiation, and participation of SMEs in international trade fairs and exhibits | | | | | | | DTI-BSMED, DA-AMAS, and PCA - Trade and Market Development Division |
| 6. Market Research – trends, uses, and market potential of new non-traditional coconut products | | | | | | | DTI-BSMED |

| PROGRAM/STRATEGIES | FINANCIAL TARGETS (PHP) | | | | | | RESPONSIBLE ENTITY |
|---|---|---|---|---|---|---|---|
| | 2021 | 2022 | 2023 | 2024 | 2025 | Total | |
| **E. Infrastructure Development Program** | | | | | | | |
| 1. Construction of Secondary Roads (e.g., foot trails) within Coconut Farms and Farm- to-Market Roads | | | | | | Depends on available Infra LGU Budgets | Provincial and Municipal LGUs |
| 2. Construction of Product Quality Testing Laboratories in Coconut Supply Grid Areas in Visayas and Mindanao in Collaboration with SCUs (e.g., National Coconut Center-Visayas of VSU) Replicating the PCA Laboratory Services Division's Facilities and Services; budget should be earmarked for construction and yearly MOE for the operation of the Product Quality Testing Laboratories | | | | | | Depends on PCA Infra Budget | PCA |
| **F. Financing Programs** | 1.0 B | 1.0 B | 1.5 B | 1.5 B | 2.5 B | 7.5 B | |
| 1. Special Financing Window/Credit Program for Coconut Farmers' Organizations/Cooperatives to provide production, processing, trading, and microfinancing loans at low interest rate | | | | | | | LBP and DBP |
| 2. Financing for MSMEs in the Coconut Processing Sector | | | | | | | LBP and DBP |

## TABLE 7.3. PROGRAM/REPLANTING, INTERCROPPING, LIVESTOCK INTEGRATION AND ORGANIC TARGETS FOR 2021-2025

| TARGETS | MODULE | COST/MODULE/CLUSTER (MILLION, PHP) | 2021 | 2022 | 2023 | 2024 | 2025 | TOTAL | | COVERED (Ha) |
|---|---|---|---|---|---|---|---|---|---|---|
| **Planting/replanting** | 100 ha /cluster; 10 CFOs @10 ha/CFO | | | | | | | | | |
| Hybrids | | | **224** | **336** | **480** | **480** | **480** | **2,000** | | |
| | seedlings PHP 100/pc=10,000/ha | 1.6 | 140 | 210 | 300 | 300 | 300 | 1,250 | **Hybrid planted** | **125,000** |
| OPVs (Talls, dwarfs) | fertilizer Y1= 6,000/ha | | **48** | **72** | **160** | **160** | **160** | **600** | | |
| | seedlings PHP 30/pc=3,000/ha fertilizer Y1= 5,000/ha | 0.8 | 60 | 90 | 200 | 200 | 200 | 750 | **OPVs planted** | **75,000** |
| | | **subtotal (Million PHP)** | **272** | **408** | **640** | **640** | **640** | **2,600** | **Total planted (5% of 2019 area)** | **200,000 20M palms** |
| | | | **156** | **168** | **168** | **168** | **168** | **828** | | |
| Seed farm (on-farm hybridization through assisted pollination) | 50 ha 69 provinces | 12 | 13 | 14 | 14 | 14 | 14 | 69 | **Hybrid seed nuts** | **3,450** |
| | | | **97.5** | **105** | **105** | **105** | **105** | **518** | | |
| On-farm outstanding population (OPV) | 50 ha 69 provinces | 7.5 | 13 | 14 | 14 | 14 | 14 | 69 | **OPV seed nuts** | **3,450** |
| | | **subtotal (Million PHP)** | **525.5** | **681** | **913** | **913** | **913** | **3,946** | | |
| **Intercropping** | | | **175** | **175** | **175** | **175** | **175** | 875 | | |
| Perennials (coffee, cacao, fruit trees) | 100 ha /cluster ; 10 ha /CFO | 3.5 | 50 | 50 | 50 | 50 | 50 | 250 | **Perennials planted (ha)** | **25,000** |
| | | | **175** | **175** | **175** | **175** | **175** | 875 | | |
| Biennials (banana, pineapple, abaca, papaya) | 100 ha /cluster ; 10 ha /CFO | 3.5 | 50 | 50 | 50 | 50 | 50 | 250 | **Biennials planted (ha)** | **25,000** |
| | | | **675** | **1125** | **1125** | **1125** | **1125** | **5,175** | | |
| Annuals-agronomic (corn, legumes, root crops) | 75 ha/cluster; 10 ha/CFO | 2.25 | 300 | 500 | 500 | 500 | 500 | 2,300 | **Corn, legumes, root crops planted** | **31,050** |
| | | | **450** | **750** | **750** | **750** | **750** | **3,450** | | |

| TARGETS | MODULE | COST/MODULE/CLUSTER (MILLION, PHP) | 2021 | 2022 | 2023 | 2024 | 2025 | TOTAL | | AREA COVERED (Ha) |
|---|---|---|---|---|---|---|---|---|---|---|
| Annuals - vegetables | 50 ha/cluster; 10 ha/CFO | 1.5 | 300 | 500 | 500 | 500 | 500 | 2,300 | High value vegetables, ornamentals planted | 115,000 |
| | | **subtotal (Million PHP)** | **1475** | **2225** | **2225** | **2225** | **2225** | **10,375** | **Total intercropped** | **202,950** |
| **Livestock integration** | | | | | | | | | | |
| | | | **375** | **375** | **375** | **375** | **375** | **1,875** | | |
| Dairy /meat (cattle, carabao) | 100 heads/cluster, 20/CFO | 7.5 | 50 | 50 | 50 | 50 | 50 | 250 | Dairy/meat (cattle/carabao) heads | 25,000 |
| | | | **19.5** | **28** | **28** | **28** | **28** | **132** | | |
| Goat | 200 heads /cluster 25/CFO | 0.75 | 26 | 28 | 28 | 28 | 28 | 138 | Goat (heads) | 27,600 |
| | | | 375 | 375 | 375 | 375 | 375 | 1,875 | | |
| Swine | 250 HH/cluster; dos por cinco; 5 sows/HH | 2.5 | 150 | 150 | 150 | 150 | 150 | 750 | Swine | 1,312,500 |
| | | | **225** | **225** | **225** | **225** | **225** | **1,125** | | |
| Poultry | 50 heads/HH; 250 HH/cluster | 1.5 | 150 | 150 | 150 | 150 | 150 | 750 | Poultry (ready to lay hens), heads | 9,375,000 |
| | PHP 100,000/HH | **subtotal (Million PHP)** | **994.5** | **1003** | **1003** | **1003** | **1003** | **5,007** | | |
| **Support to GAP /organic certification* (with private sector)** | | **subtotal (Million PHP)** | **300** | **500** | **500** | **1500** | **1000** | **3,800** | | |
| | 50 ha cluster | 0.5 | 300 | 500 | 1000 | 750 | 2000 | 4550 | Ha certified | 227,500 |

*Participatory Guarantee System (PGS ) is recognized in RA 11511 as a credible and acceptable way to certify organic produce.

TABLE 7.4. PROGRAM/STRATEGIES AND FINANCIAL TARGETS, RESPONSIBILITY MATRIX, 2021-2025

| PROGRAM/STRATEGIES | COST/UNIT PHP, MILLIONS | IV. FINANCIAL TARGETS YEAR 1 | YEAR 2 | YEAR 3 | YEAR 4 | YEAR 5 | TOTAL | RESPONSIBLE ENTITY |
|---|---|---|---|---|---|---|---|---|
| 1) Copra – CNO – Oleochemicals value chain | | | | | | | | |
| Establish Farmers-owned Copra Buying Stations | 8.00 | 800.00<br>100 | 1,600.00<br>200 | 1,760.00<br>220 | 1,816.00<br>227 | 2,400.00<br>300 | 8,376.00<br>1,074 | PHilMech, PCA, DTI |
| Establish Farmers-owned White Copra Centrals | 10.00 | 1,000.00<br>100 | 1,800.00<br>180 | 1,840.00<br>184 | 2,000.00<br>200 | 2,000.00<br>200 | 8,640.00<br>864 | PHilMech, PCA, DTI |
| 2) DCN Value Chain | | | | | | | | |
| Establish Farmers-owned Coconut Water Concentrate Plant | 5.00 | 150.00<br>30 | 250.00<br>50 | 300.00<br>60 | 300.00<br>60 | 375.00<br>75 | 1,375.00<br>275 | PHilMech, PCA, DTI |
| Establish Farmers-owned Buying Stations for Dehusked Nuts | 3.00 | 120.00<br>40 | 300.00<br>100 | 300.00<br>100 | 300.00<br>100 | 300.00<br>100 | 1,320.00<br>440 | PHilMech, PCA, DTI |
| 3) VCO Value Chain | | | | | | | | |
| **Micro-scale** | 3.0 | 132.00<br>40 | 330.00<br>100 | 330.00<br>100 | 330.00<br>100 | 330.00<br>100 | 1,452.00<br>440 | PHilMech, PCA, DTI |
| Integrated dry process via DCN 600 kg-nut/day | | | | | | | | |
| Integrated wet process, fermentation 1200 kg-nut/day | | | | | | | | |
| Integrated wet process, cream/heating 400 kg-nut/day | | | | | | | | |
| Integrated wet process, freezing 400 kg-nut/day | | | | | | | | |
| **Medium-scale integrated wet process 10,000 kg-nut/day** | 40.00 | 0.00<br>0 | 0.00<br>0 | 40.00<br>1 | 40.00<br>1 | 40.00<br>1 | 120.00<br>3 | PHilMech, PCA, DTI |

| PROGRAM/STRATEGIES | COST/UNIT PHP, MILLIONS | IV. FINANCIAL TARGETS YEAR 1 | YEAR 2 | YEAR 3 | YEAR 4 | YEAR 5 | TOTAL | RESPONSIBLE ENTITY |
|---|---|---|---|---|---|---|---|---|
| **4) Coco coir Value Chain** | | | | | | | | |
| Establish community-based husk processing plants | 3.00 | **36.00**<br>12 | **36.00**<br>12 | **36.00**<br>12 | **36.00**<br>12 | **36.00**<br>12 | **180.00**<br>60 | PHilMech, PCA, DTI |
| Mobile chipping machines (husk chips for composting) | 0.25 | **55.00**<br>220 | **55.00**<br>220 | **55.00**<br>220 | **55.00**<br>220 | **55.00**<br>220 | **275.00**<br>1,100 | PHilMech, PCA, DTI |
| Coco coir rubberizing plant (mattresses, furniture) | 30.00 | **0.00**<br>0 | **0.00**<br>0 | **0.00**<br>0 | **30.00**<br>1 | **0.00**<br>0 | **30.00**<br>1 | PHilMech, PCA, DTI |
| Establishment of husk-based fiberboard processing plant | 90.00 | **0.00**<br>0 | **0.00**<br>0 | **90.00**<br>1 | **90.00**<br>1 | **90.00**<br>1 | **270.00**<br>3 | PHilMech, PCA, DTI |
| **5) Coconut shell Value Chain** | | | | | | | | |
| Establish charcoal granulating plant with briquetting | 2.00 | **12.00**<br>6 | **12.00**<br>6 | **12.00**<br>6 | **12.00**<br>6 | **12.00**<br>6 | **60.00**<br>30 | PHilMech, PCA, DTI |
| Establish activated carbon plants | 40.00 | **0.00**<br>0 | **0.00**<br>0 | **0.00**<br>0 | **0.00**<br>0 | **120.00**<br>3 | **120.00**<br>3 | PHilMech, PCA, DTI |
| **6) Coconut sap Value Chain** | | | | | | | | |
| Establish a toll re-distilling facility for *lambanog* in Quezon | 10.00 | **0.00**<br>0 | **10.00**<br>1 | **10.00**<br>1 | **0.00**<br>0 | **0.00**<br>0 | **20.00**<br>2 | PHilMech, PCA, DTI |
| Retooling of facilities for coco sugar, coco syrup processing | 0.50 | **22.00**<br>44 | **50.00**<br>100 | **60.00**<br>120 | **60.00**<br>120 | **60.00**<br>120 | **252.00**<br>504 | PHilMech, PCA, DTI |
| **7) Establish Farm Service Groups (FSGs)** | | | | | | | | |
| Farm rehabilitation/maintenance, harvesting, dehusking | 1.50 | **1,200.00**<br>800 | **1,200.00**<br>800 | **1,200.00**<br>800 | **1,200.00**<br>800 | **1,350.00**<br>900 | **6,150.00**<br>4,100 | PHilMech, PCA, DTI |

| PROGRAM/STRATEGIES | COST/UNIT PHP, MILLIONS | IV. FINANCIAL TARGETS | | | | | | RESPONSIBLE ENTITY |
|---|---|---|---|---|---|---|---|---|
| | | YEAR 1 | YEAR 2 | YEAR 3 | YEAR 4 | YEAR 5 | TOTAL | |
| 8) Coffee and Cacao Value Chain | | | | | | | | |
| Coffee and cacao processing center | 3.00 | **240.00**<br>80 | **270.00**<br>90 | **270.00**<br>90 | **270.00**<br>90 | **300.00**<br>100 | **1,350.00**<br>450 | PHilMech, PCA, DTI |
| 9) Banana Value Chain | | | | | | | | |
| Banana packing houses/trading posts | 3.00 | **0.00**<br>90 | **480.00**<br>160 | **525.00**<br>175 | **600.00**<br>200 | **600.00**<br>200 | **2,205.00**<br>825 | PHilMech, PCA, DTI |
| 10) Young coconut Value Chain | | | | | | | | |
| Establish modern young coconut processing plant | 80.00 | **0**<br>0 | **0**<br>0 | **80.00**<br>1 | **160.00**<br>2 | **160.00**<br>2 | **400.00**<br>5 | PHilMech, PCA, DTI |
| | Grand total | 3,789 | 6,443 | 6,929 | 7,320 | 8,249 | 32,730 | |

For FY 2021 to 2025, PCA's farm-level programs are focused on improving farmers' productivity through the Accelerated Coconut Planting and Replanting Project (ACPRP), Coconut Fertilization Project (CFP), and Coconut Seed Farm Development Project (CSFDP). Aggregately, these three (3) programs had a lion's share of 98% or PHP 38.8 billion of the total farm-level programs, projected to cover 280,000 hectares during the period. Although strategic KAANIB Enterprise Development Project intercropping and household-level coconut processing activities are needed to enhance farmers' income through diversification and value adding, these two programs had only a total share of PHP 205 million for the five-year period (Table 5).

## TABLE 7.5. PROGRAM/STRATEGIES , TARGET SETTING, RESPONSIBILITY MATRIX, 2021-2025

| PROGRAM/ STRATEGIES | TARGET SETTING | | | | | | | | | | | | RESPONSIBLE ENTITY |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2021 | | 2022 | | 2023 | | 2024 | | 2025 | | TOTAL | | |
| | AREA (HECTARES) | INVESTMENT (₱) | AREA (HECTARES) | INVESTMENT (₱) | AREA (HECTARES) | INVESTMENT (₱) | AREA (HECTARES) | INVESTMENT (₱) | AREA (HECTARES) | INVESTMENT (₱) | AREA (HECTARES) | INVESTMENT (₱) | |
| Accelerated Coconut Planting and Replanting Project (ACPRP) | 32,279.85 | 476,000,000 | 32,279.85 | 476,000,000 | 32,280.00 | 476,000,000 | 16,325.00 | 248,038,000 | 17,955 | 272,841,800 | 131,119.70 | 1,948,879,800 | PCA |
| Coconut Fertilization Project | 19,887 | 225,489,000 | 19,887 | 225,489,000 | 19,887.00 | 225,489,000 | 41,726.00 | 523,600,000 | 46,046 | 575,960,000 | 147,433 | 1,776,027,000 | PCA |
| Coconut Seed Farm Development Project (SFDP) | - | - | 335 | 10,000,000 | 335 | 14,000,000 | 335.00 | 18,000,000 | 335 | 19,000,000 | 1,340 | 61,000,000 | PCA |
| KAANIB Enterprise Development Project (KEDP) - Coconut Intercropping Project (CIP) | - | 16,146,250 | 625 | 16,146,250 | 850 | 16,146,250 | 625.00 | 16,146,250 | 850 | 16,146,250 | 2,950 | 80,731,250 | PCA, DA, HVCC |
| GRAND TOTAL | 52,166.85 | 717,635,250 | 53,126.85 | 727,635,250 | 53,352 | 731,635,250 | 59,011 | 805,784,250 | 65,186 | 883,948,050 | 282,842.70 | 3,866,638,050 | |
| KAANIB Enterprise Development Project (KEDP) - Community/Household Level Coconut Processing | - | 24,922,000 | 42 | 24,922,000 | 42 | 24,922,000 | 42.00 | 24,922,000 | 42 | 24,922,000 | 168 | 124,610,000 | PCA, PHilMech |
| RESEARCH Basic, Applied, and Socio-economics in collaboration with SUCs, and other research institutions | - | 200,000,000 | - | 200,000,000 | - | 200,000,000 | - | 200,000,000 | - | 200,000,000 | - | 1,000,000,000 | PCA, DA, HVCC, SUCs, DOST-PCAARRD |
| GRAND TOTAL | - | 24,922,000 | 42 | 24,922,000 | 42 | 24,922,000 | 42.00 | 24,922,000 | 42 | 24,922,000 | 168 | 1,124,610,000 | |

# RECOMMENDATIONS FOR POLICIES, STRATEGIES AND PROGRAMS

| STRATEGIES/POLICIES/ PROGRAMS | ISSUES/CONSTRAINTS/ OBJECTIVES BEING ADDRESSED | TIME FRAME[1] | | | WHO WILL DO IT? | |
|---|---|---|---|---|---|---|
| | | S | M | L | LEAD AGENCIES | SUPPORT AGENCIES |
| **1. Promoting Coconut Farmers' Welfare and Social Protection** | | | | | | |
| Educational scholarship program for coconut farmers' children | Vulnerable coconut farmers do not have the financial resources to send their children to pursue a college degree or diploma course. Many farmers are already old and need their children to take over the management of their coconut farms. Providing scholarships for the poor coconut farmers' children to pursue a college or diploma degree in agriculture in any field of specialization related to coconut will equip them with the technical knowledge and skills to manage/operate their parents' coconut farms successfully in the foreseeable future. | ✓ | ✓ | ✓ | CHED and TESDA | |
| PhilHealth insurance for coconut farmers | The poor and the near-poor coconut farmers are most vulnerable to diverse risks such as sickness and disability because they lack the resources to prevent or mitigate the effects of any health or social shocks. Currently, the poor and near-poor coconut farmers do not have access to social protection programs such as PhilHealth Insurance that will enable them to deal with health risks. | ✓ | ✓ | ✓ | PhilHealth | PCA |
| Intensive information on the crop insurance program and expansion of its insurance coverage | Most coconut farmers are not aware of the coverage of the crop insurance program and how to avail of this program. Some farmers who availed of the crop insurance coverage indicated that the crop insurance only covers the coconut crop. The current insurance program does not cover intercrops planted under coconut. | ✓ | ✓ | ✓ | PCIC | LGUs |

| STRATEGIES/POLICIES/ PROGRAMS | ISSUES/CONSTRAINTS/ OBJECTIVES BEING ADDRESSED | TIME FRAME[1] | | | WHO WILL DO IT? | |
|---|---|---|---|---|---|---|
| | | S | M | L | LEAD AGENCIES | SUPPORT AGENCIES |
| **1. Promoting Coconut Farmers' Welfare and Social Protection** | | | | | | |
| Educational scholarship program for coconut farmers' children | Vulnerable coconut farmers do not have the financial resources to send their children to pursue a college degree or diploma course. Many farmers are already old and need their children to take over the management of their coconut farms. Providing scholarships for the poor coconut farmers' children to pursue a college or diploma degree in agriculture in any field of specialization related to coconut will equip them with the technical knowledge and skills to manage/operate their parents' coconut farms successfully in the foreseeable future. | ✓ | ✓ | ✓ | CHED and TESDA | |
| PhilHealth insurance for coconut farmers | The poor and the near-poor coconut farmers are most vulnerable to diverse risks such as sickness and disability because they lack the resources to prevent or mitigate the effects of any health or social shocks. Currently, the poor and near-poor coconut farmers do not have access to social protection programs such as PhilHealth Insurance that will enable them to deal with health risks. | ✓ | ✓ | ✓ | PhilHealth | PCA |
| Intensive information on the crop insurance program and expansion of its insurance coverage | Most coconut farmers are not aware of the coverage of the crop insurance program and how to avail of this program. Some farmers who availed of the crop insurance coverage indicated that the crop insurance only covers the coconut crop. The current insurance program does not cover intercrops planted under coconut. | ✓ | ✓ | ✓ | PCIC | LGUs |

| STRATEGIES/POLICIES/ PROGRAMS | ISSUES/CONSTRAINTS/ OBJECTIVES BEING ADDRESSED | TIME FRAME[1] | | | WHO WILL DO IT? | |
|---|---|---|---|---|---|---|
| | | S | M | L | LEAD AGENCIES | SUPPORT AGENCIES |
| Establishment and/or expansion of farm business schools in coconut communities at the municipal or barangay levels | There are still few Farm Business Schools established in coconut farming communities where coconut farmers acquire knowledge and skills in entrepreneurship and farm business management. Through the Farm Business School, which is a unique educational system, the coconut farmer-learners will be able to apply newly developed skills to their own farm business and consider market and weather-based risks in their farm business planning to improve profitability and sustainability. | ✓ | ✓ | ✓ | TESDA and ATI | PCA, DA, LGU agricultural extension workers, MAP, private companies (e.g., Cargill, Ayala Foundation) |
| Organization of coconut farmers organizations/cooperatives | Absence of farmers' organizations/cooperatives in some coconut-producing barangays/municipalities. An association provides a platform for policy advocacy, facilitation of marketing and credit information system to support enterprise decision-making, serves as conduit for credit assistance and other support services from different government agencies, and provides economic services to its members in terms of serving as a source of farm inputs and processing supplies, facilitating group or collective marketing, and extending micro-lending assistance to its members. | ✓ | ✓ | ✓ | | |

| STRATEGIES/POLICIES/ PROGRAMS | ISSUES/CONSTRAINTS/ OBJECTIVES BEING ADDRESSED | TIME FRAME[1] | | | WHO WILL DO IT? | |
|---|---|---|---|---|---|---|
| | | S | M | L | LEAD AGENCIES | SUPPORT AGENCIES |
| Strengthening and/or capacity building of coconut farmers organizations/cooperatives | Many cooperatives have failed in the past because of mismanagement. Continuous trainings and monitoring by CDA should be conducted to build up the technical, financial, managerial, and marketing capabilities of leaders and members of agricultural cooperatives. Values orientation training should be strengthened. | ✓ | ✓ | ✓ | CDA | Barangay LGUs |
| Creation of local small farmers councils to provide mechanisms for consultation and participation | Weak capacity of small coconut farmers to interact effectively and to undertake collective action to air their major social and economic concerns. Most often, they are not consulted in planning and implementing government programs. | ✓ | ✓ | ✓ | Local LGUs (municipal and provincial levels) | PCA |
| **3. Increasing and Sustaining Coconut Production to Maintain the Philippines' Stature as a Major and Reliable Supplier of Quality Coconut Products in the Global and Domestic Markets** | | | | | | |
| A. Hybridization Program | | | | | | |
| Rehabilitation and upgrading of PCA seed gardens and hybridization farms | PCA seed gardens and hybrid farms are valuable genetic resources that need to be conserved and utilized in order to develop varieties ad hybrids of desired quality and with high yield. | ✓ | ✓ | | PCA | |

| STRATEGIES/POLICIES/ PROGRAMS | ISSUES/CONSTRAINTS/ OBJECTIVES BEING ADDRESSED | TIME FRAME[1] | | | WHO WILL DO IT? | |
|---|---|---|---|---|---|---|
| | | S | M | L | LEAD AGENCIES | SUPPORT AGENCIES |
| **Seed Farm Program** On farm hybridization program from PCA-seed farm cooperators in strategic provinces of the country with a target of at least 100,000 mother palms | To supply quality seed nuts to the accelerated planting and replanting program, targeting 10M seed nuts/year; Strategic distribution of sources of planting materials to cater to local demand and for emergency deployment of seeds if needed. | ✓ | ✓ | ✓ | PCA | LGUs, SUCs, farmers' organizations, DA-BPI, DA-HVCCP, DOST, NGOs, private sector |
| Selection of tall population with outstanding qualities and local adaptability in farmers' fields for accreditation/certification by PCA/NSIC as sources of high-quality seed nuts in every coconut region and islands | Selection of local tall populations with outstanding qualities and adaptability in farmers' fields across the country is recommended, taking off from previous PCAARRD-funded project in Region 4. Criteria for selection, standard recommendations and assessment of the adoption of good management practices, a simplified but trustworthy accreditation system (with bar code) for traceability of these trees. | ✓ | ✓ | ✓ | PCIC | LGUs, SUCs, farmers' organizations, DA-BPI, DA-HVCCP, DOST, NGOs, private sector |
| Accelerated and strategic planting and replanting program (bundled with fertilizer support for 2 years) with outstanding talls and hybrids | Supplementary source of cash income or temporary employment to small coconut farmers and their family members that could help them meet their food and other basic needs and tide them over during the lean months is lacking. | ✓ | | | PCA | |

| STRATEGIES/POLICIES/ PROGRAMS | ISSUES/CONSTRAINTS/ OBJECTIVES BEING ADDRESSED | TIME FRAME[1] | | | WHO WILL DO IT? | |
|---|---|---|---|---|---|---|
| | | S | M | L | LEAD AGENCIES | SUPPORT AGENCIES |
| Strategic planting of outstanding dwarfs (sap products) and tissue-cultured *makapuno* for specialty uses (bundled with fertilizer support for 2 years) | Areas with market-driven demand for sap products and green nuts (*buko*) can be identified for planting dwarfs, and areas with potential for *makapuno* can be identified for the development of agro hub and agribusiness corridor. | ✓ | ✓ | ✓ | PCA | LGUs, DTI |
| Development of a mobile application that will provide an inventory of seed nuts and planting materials in a particular seed garden hybrid farm /accredited farmers' fields in real-time | There is a need to develop and utilize ICT-based tools for monitoring of seed nuts and seedlings inventory for strategic planning and to respond to emergency needs. | ✓ | ✓ | | PCA | SUCs, DOST-PCAARRD |
| B. Intensify Hybridization Research | | | | | | |
| Enhancement of the incentivized Participatory Coconut Planting Program (PCPP) thru the selection of quality planting materials from identified mother palms of OPVs with known desired traits | Continuous selection of traits and varieties to support continuous planting and replanting with outstanding qualities and site-specific OPVs will ensure the diversity and quality of the next population of coconut, contributing to the sustainable growth of the industry and increased yield and income for farmers. | ✓ | ✓ | ✓ | PCA | DOST-PCAARRD |
| Sustain research to coconut somatic embryogenesis technology | A promising complementary source of clonal, uniform and mass propagated planting materials in the future. | ✓ | ✓ | ✓ | DOST | PCA, SUCs |

| STRATEGIES/POLICIES/ PROGRAMS | ISSUES/CONSTRAINTS/ OBJECTIVES BEING ADDRESSED | TIME FRAME[1] | | | WHO WILL DO IT? | |
|---|---|---|---|---|---|---|
| | | S | M | L | LEAD AGENCIES | SUPPORT AGENCIES |
| Explore utilization of coconut embryo tissue culture in partnership with VCO/DCN processors | Coconut embryos are valuable resources but unutilized in VCO processing. Mature embryos can be used in tissue culture; embryo-rescue TC technique for *makapuno* is a mature technology that can be adapted for coconut. | ✓ | ✓ | | PCA | DOST, SUCs |
| Basic and on-farm studies on Genotype x Environment (G x E) interactions in hybrid farms and seed gardens | Anecdotal evidence suggests the strong influence of various environmental factors (soil, season, water stress, particularly drought, high summer temperature, crop nutrition, pests and diseases, under story crops, etc.) on the growth, flowering, nut fall and yield of mother palms. There is death of information on how the different coconut types and hybrids respond to the new climate normal and these need to be studied to attain our target number and quality of seed nuts. | | ✓ | ✓ | DOST | PCA , SUCs |
| Developing protocols for remote monitoring of plant health in seed gardens and hybridization farms using GIS and UAV | There is a need develop and use ICT-based platforms in monitoring crop health and early warning for pests and diseases. | ✓ | | | DOST | PCA, UPLB |
| Streamline the Integration of PCA's coconut fertilization and replanting programs with KAANIB livelihood enhancement program | Rather than the compartmentalized implementation of these coconut production enhancing programs, it is recommended to have an integrating mechanism with programs that focus on improving the socio-economic well-being and welfare of all coconut farmers (e.g., KAANIB-based-intercropping, livestock and processing projects). This will provide a more holistic perspective of how PCA is | ✓ | | | PCA | |

| STRATEGIES/POLICIES/ PROGRAMS | ISSUES/CONSTRAINTS/ OBJECTIVES BEING ADDRESSED | TIME FRAME[1] | | | WHO WILL DO IT? | |
|---|---|---|---|---|---|---|
| | | S | M | L | LEAD AGENCIES | SUPPORT AGENCIES |
| | supporting the coconut farmers and industry in an agro hub enterprises setting. | | | | | |
| Support farmers' organizations securing certification for GAP | Traceability of their raw materials and adoption of sustainable practices at the farm level is validated only through certification. | ✓ | ✓ | ✓ | PCA | DA-BPI |
| Develop a parallel track for organic coconut-based farming systems in all the programs above and organic seed production;<br>Coconut intercrops production system;<br>Poultry and livestock production system; Support to organic certification | Given the promising prospect of the green market for coconut products, an organic track for coconut (and intercrops) production can be included in the fertilization (and intercropping) program(s). Parallel programs for organic seed production are an option for these farmers. | ✓ | ✓ | ✓ | PCA ,HVCC , BAI, BPI | TESDA, DTI, PCIC |
| Integrated pest management | The unpredictability of the agroclimatic conditions in the country bring forth biotic and abiotic stresses to the coconut plants. The case of *Brontispa longissimi, Gestro* and *Aspidiotus rigidus* or scale insects, are occurrences that need emergency measures as provided for by Executive Order No. 664, s. 2007 and Executive Order No. 169, s. 2014. Monitoring developments in the agricultural ecosystem that might result in the occurrences of pest and diseases of the coconut should be an inherent service of PCA. | ✓ | ✓ | ✓ | PCA | NCPC, UPLB, LGU, BPI |

| STRATEGIES/POLICIES/ PROGRAMS | ISSUES/CONSTRAINTS/ OBJECTIVES BEING ADDRESSED | TIME FRAME[1] | | | WHO WILL DO IT? | |
|---|---|---|---|---|---|---|
| | | S | M | L | LEAD AGENCIES | SUPPORT AGENCIES |
| **4. Establishing CBFS Agri-business Hubs and Corridors for Coconut Products, Intercrops and Livestock** | | | | | | |
| A. COPRA – CNO – Oleochemicals Value Chain:<br><br>Overhauling through copra quality improvement | The present practice of drying with smoke kilns and trading and storing wet copra results in high aflatoxin and PAHs levels in copra which do not augur well in the global market. Further, physical losses are as high as 5%, while quality losses in terms of price discounts on CNO are 2–3% of its value. More and more, the global markets take into account the quality of life of the people involved in the value chain | | | | | |
| Establish farmer-owned copra buying stations (FCBS) | Farmers sell partially dried copra (15–20% MC) to barangay traders. Copra will subsequently pass through two more hands before it reaches the oil mills. The time interval from the farm to the mill runs between one to three months.<br><br>The FCBS will buy the wet copra from farmers and immediately re-dry to a safe MC of 6% to stop mold growth. This value adding step plus the skipping of one to two layers of traders will mean a significant increase in farmers' income. Furthermore, it will increase the efficiency of the supply and value chain by 4–8%. | ✓ | ✓ | ✓ | PCA | DTI, DOST, PHilMech |

| STRATEGIES/POLICIES/ PROGRAMS | ISSUES/CONSTRAINTS/ OBJECTIVES BEING ADDRESSED | TIME FRAME[1] | | | WHO WILL DO IT? | |
|---|---|---|---|---|---|---|
| | | S | M | L | LEAD AGENCIES | SUPPORT AGENCIES |
| Establish Farmers-owned White Copra Centrals (FWCC) | Copra making with *tapahan* is a tedious process aggravated by the accompanying health hazards due to smoke inhalation. These are the reasons why farmers do not make fully dry copra. (Partial drying takes 12 hours while full drying takes at least 24 hours).<br><br>The FWCC will buy dehusked nuts from farmers, freeing them from the "slavery" of copra making. The FWCC will process dehusked nuts into white copra (with 6% MC), with charcoal and coco water as by-products in semi-mechanized facility run by trained workers paid with respectable wages.<br><br>The oil millers are paying premium prices for white copra with low MC.<br><br>The FWCC will buy dehusked nuts at prices almost at par with the buying prices of DCN producers, giving higher income to farmers. | ✓ | ✓ | ✓ | PCA | DTI, DOST, PHilMech |
| B. DCN Value Chain | For a long time, coconut water has been discharged by DCN factories as waste (with only little treatment) into the waterways. Today, the DCN factories are models for large-scale integrated coconut processing by recovering and processing coconut water into exportable concentrates. By crushing DCN, virgin coconut oil (VCO) is produced at volumes attractive to global players. The by-product is coconut flour. The market for coconut water has grown to | | | | | |

| STRATEGIES/POLICIES/ PROGRAMS | ISSUES/CONSTRAINTS/ OBJECTIVES BEING ADDRESSED | TIME FRAME[1] | | | WHO WILL DO IT? | |
|---|---|---|---|---|---|---|
| | | S | M | L | LEAD AGENCIES | SUPPORT AGENCIES |
| | the point where the coconut water from DCN factories is not sufficient anymore. This is where the coconut water from the white copra centrals can be useful to fill the requirements of the DCN factories. | | | | | |
| Establishment of farmers-owned Coconut Water Concentrate Stations (FCWCS) at the farmers-owned White Copra Centrals (FWCC) | The facilities for making coconut water concentrate are not too complicated. Furthermore, the concentrates are a stable product even at room temperature. The FCWCS can produce the coconut water concentrate under the close monitoring or supervision of the DCN quality control unit. | ✓ | ✓ | ✓ | PCA | DTI, DOST, PHilMech |
| Establishment of farmers-owned Buying Stations for Dehusked Nuts (FBSDN) | With the farmers freed from copra-making, they can now be involved in the trading of dehusked nuts by having barangay-based buying stations and bulking stations for direct delivery to DCN factories. | ✓ | ✓ | ✓ | PCA | DTI, DOST, PHilMech |
| **C. MODERNIZING THE VCO VALUE CHAIN** | The earliest VCO export to the US was done by Tropical Traditions company based in Sariaya, Quezon in early 2002. VCO processing was done by the farmers in their households using the traditional fermentation method. Tropical Traditions buys the VCO, consolidates and repacks for export. As the VCO became acceptable in the export market, new players came in with better product and lower prices. Similar arrangements are still practiced today with the improvement where the consolidator uses a high-rpm tubular centrifuge to completely remove moisture (long shelf life) and remove fine sediments (water-clear | | | | PCA | DTI, DOST, PHilMech |

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| | appearance). Inconsistent quality and low process efficiency are common problems. | | | | | |
| Integrated dry process via DCN route (600 kg-nut/day) | Provision of small tubular centrifuge for removing fine sediments and removing moisture. Sized for local market, close to the farms. | ✓ | ✓ | ✓ | PCA | DTI, DOST, PHilMech |
| Integrated wet process, fermentation (1200 kg-nut/day) | Provision of small tubular centrifuge for removing fine sediments and removing moisture. | ✓ | ✓ | ✓ | PCA | DTI, DOST, PHilMech |
| Integrated wet process, cream separation/mild heating (400 kg-nut/day) | Provision of small tubular centrifuge for removing fine sediments and removing moisture. Sized for local market, close to the farms. | ✓ | ✓ | ✓ | PCA | DTI, DOST, PHilMech |
| Integrated wet process, freezing method (400 kg-nut/day) | Provision of small tubular centrifuge for removing fine sediments and removing moisture. Sized for local market, close to the farms. | ✓ | ✓ | ✓ | PCA | DTI, DOST, PHilMech |
| Medium-scale integrated wet process (10,000 kg-nut/day) | Packaged proposal for review and assessment. | | ✓ | | PCA | DTI, DOST, PHilMech |
| **D. COCO COIR VALUE CHAIN** | | | | | | |
| Establish Community-based Integrated Coconut Husk Processing Plants | Improvement in the production of geonets, cocopeat, coco logs, doormats, and twine hanks. | ✓ | ✓ | ✓ | PCA | DTI, DOST |

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| Provide on-wheels coconut husks chipping machines (for making raw mat for composting) | The fuel that will be used in the white copra centrals is coconut shell. It is expected that there will be a lot of coconut husk surplus. It is recommended that the husks be chipped into smaller pieces and used as part of compost mix. | ✓ | ✓ | ✓ | PCA | DTI, DOST |
| Establish coco coir rubberizing plant (mattresses, hospital beds) | Rubberized coco coir fiber is a superior material for mattresses and hospital beds. | | ✓ | | PCA | DTI, DOST |
| **E. COCONUT SHELL VALUE CHAIN** | | | | | | |
| Establish charcoal granulating facility | The white copra central will produce coconut shell charcoal as by-product. Charcoal must be sold to consolidators in granulated form. | ✓ | | | PCA | DTI, DOST, PHilMech |
| Establish Activated carbon plants | More value adding plants locally, and more jobs created. | | ✓ | ✓ | PCA | DTI, DOST, PHilMech |
| **F. COCONUT SAP VALUE CHAIN** | | | | | | |
| Establish a toll re-distilling facility for *lambanog*, in Quezon | The reputation of *lambanog*, a heritage drink that Filipinos enjoyed for centuries, has been tarnished due to adulteration and inconsistent quality in recent years. To solve these problems, it is recommended that a common service facility for re-distillation be installed in the *lambanog* producing areas. A 2nd and 3rd distillation will make purer and smoother *lambanog*, opening the door to the elite high-paying markets. | ✓ | ✓ | | PCA | DTI, DOST, PHilMech |

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| Re-tooling of coco sugar, coco syrup production units | Provision of biomass-fired double jacketed kettles for better temperature control. | ✓ | | | PCA | DTI, DOST, PHilMech |
| Establish well-equipped consolidators facilities | The consolidators themselves should be processors where their facilities demonstrate best practice. | ✓ | ✓ | | PCA | DTI, DOST, PHilMech |
| **G. YOUNG COCONUT VALUE CHAIN** | | | | | | |
| Processing plants for young coconuts | Establish processing plants for young coconut similar to that of *Eau de Coco*. This will expand the usage of coconut production. | | ✓ | | PCA | DTI, DOST, PHilMech |
| **H. INTERCROPPING** | | | | | | |
| Support to development of KAANIB clusters' integrated coconut and intercrops plantations and processing hub | Coconut-based farming systems programs that integrate crops, livestock and/or community-processing enterprises (for coconuts and intercrops) complement these productivity-enhancing programs as the tenant, caretakers and workers can also directly participate and benefit. About 80% of coconut farms are monocropped and utilizing the wide spaces in between the trees for intercropping will significantly increase land-use intensity and agricultural production without opening up new lands. Coconut farming alone does not provide a decent living for coconut farmers and their families, most of whom live below poverty the threshold. Integrated CBFS can earn the farmers up to 10x more than their earnings form coconut alone (e.g., JED's farm) | ✓ | ✓ | ✓ | HVCCP, PCA | DTI, LGU, TESDA, ATI, DPWH |

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| I. PROCESSING, CERTIFICATION AND SHARED SERVICE FACILITIES (SSF) | | | | | | |
| Support farmers organizations securing certification for GAP | Traceability of their raw materials and adoption of sustainable practices at the farm level are validated only through certification. | ✓ | ✓ | ✓ | PCA | DA-BPI |
| Community-based poultry and livestock enterprises under coconut | Coconut farming alone does not provide a decent living for coconut farmers and their families, most of whom live below the poverty threshold. Integrated CBFS with crops and livestock can earn the farmers and their cooperative much more than their earnings from coconut alone (e.g., Paliparan Coop) | ✓ | ✓ | ✓ | HVCC, BAI, PCA | DTI, PCIC |
| Establishment of shared facilities for processing of coconut, intercrops and livestock | Series of farmers' consultations in Luzon, Visayas, and Mindanao agree on the need for shared facilities for timely and efficient processing and value-adding of the coconuts, intercrops, and livestock products. | ✓ | ✓ | ✓ | PHilMech, PCA | DA, TESDA, DTI |
| Integrated processing system to optimize the full utilization of quality products and by-products of the coconut tree | Memorandum Circular No. 25, s. 2002 is a directive mandating all concerned government institutions to use coco peat or coir dust, and coconut fiber as materials for soil conditioning and prevention of soil erosion.<br>Coco husk is an example of a coconut by-product where only 2% of its supply is commercially used for coir-based products for exports and the domestic market. Around 90% of coconut husks are burned and wasted in the field. There are other by-products such as coconut water and coconut shell which are left commercially underutilized while the | ✓ | ✓ | ✓ | PCA | LGUs, CFOs, Private Processing Plants |

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| | coconut is being processed into copra for CNO and other products derived from DCN.<br><br>The White Copra Central (WCC) and the Barangay Copra Buying Stations, dedicated for high-quality copra production, and integrated at the village levels are investment modalities being introduced in the COCOFIRM, that can operationalize the zero-waste management concept. This can enhance farmers' income, due to the potential price premium of quality copra sold, and value-adding activities at the village level. The proof of concept on these business modalities is already in place in selected parts of the country. | | | | | |
| Quality production of copra | Administrative Order No. 02, s. 2003 calls for the production of quality copra in terms of moisture content and aflatoxin levels. Under the proposed Integrated Processing System to optimize the full utilization of quality coconut products and by-products, farmers can increase their income through price premium for quality value adding, direct trading, eliminating marketing margins that will be internalized by traders. | ✓ | ✓ | ✓ | PCA | Coconut Farmers' Organizations |

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| Expansion and utilization of chemicals derived from CNO | This strategic program is to revisit the re-implementation of Executive Order No. 259 to require the use of CNO derived locally produced surfactants in all detergent formulation. This strategy will increase the domestic utilization of CNO-based products providing additional income, and employment opportunities in the coconut industry. Higher Domestic Utilization of CNO-based products; expanded value adding activities are expected to accrue to participant of this program. | ✓ | ✓ | ✓ | PCA | Private Companies |
| Adoption of an automated system for coco sap and coco sugar processing, mechanized sap collection, and more efficient decorticating machines | Inadequate access to automated technology in intermediate processing and drying for coco sugar. Inefficiency of existing decorticating machines while lacking of access to modern ones. | ✓ | ✓ | ✓ | PHilMech | PCA Trade and Market Development Division, and SUCs with funding from DA-BAR, DOST-PCAARRD |
| Incentivize adoption of centrifuge process of VCO extraction. Special credit facilities can be provided. | The centrifuge technology is a much faster process and produces better quality of VCO. Technology access is a problem because micro and small enterprises find it expensive to purchase a centrifuge. | ✓ | ✓ | ✓ | DTI | PCA, LBP, DOST |

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| Adopt mechanical equipment to ease climbing for inexperienced climbers, lessen the risk of accident, allow more workers to be tapped as harvesters and to be used even during rainy days. Train out of school youths as *'mananguetes'* and on other skills in processing to encourage entrepreneurship. | Dwindling number of *'mananguetes'* or coconut tree climbers. Sri Lanka and India have mechanical climbing equipment that broadens the base of workers for harvesting. Women could even use the equipment to climb the tree and harvest the nuts and/or sap. | ✓ | ✓ | ✓ | PCA | PHilMech, DTI |
| **5. Improving Competitiveness of Traditional and Non-Traditional Coconut Products in Local and Global Markets** | | | | | | |
| Construction of product quality testing laboratories in coconut supply grid areas in Visayas and Mindanao in collaboration with SUCs (e.g., National Coconut Research Center-Visayas of VSU) Replicating the PCA Laboratory Services Division's facilities and services; budget should be earmarked for construction and yearly MOE for the operation of the product quality testing laboratories | Lack of product quality testing laboratories in coconut supply grid areas in Visayas and Mindanao to test and monitor whether product samples comply with the set PNS; coconut processor-exporters from Visayas and Mindanao complain of high travel cost in having their product samples analyzed at PCA's Laboratory Services Division in Manila prior to exporting their products | ✓ | ✓ | ✓ | PCA | PCA Regional Offices and SUCs (i.e., VSU) |

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| **6. Enhancing Trade and Marketing** | | | | | | |
| Institutionalization of a market information network system (i.e., data generation, processing, continuous updating, and dissemination of market and other related information) to benefit all players in the value chain, replicating DA's Agriculture and Fisheries Market Information System (AFMIS) | Lack of market information dissemination on the prices, suppliers, and buyers (domestic and foreign) of coconut raw materials and different processed coconut products as well as information on suppliers, fabricators/manufacturers of coconut processing equipment /machinery and PNS, etc. that are needed by different users of market information (e.g., farmers, prospective investors, processors, etc.) to make wise/appropriate production, marketing and/or investment decisions. | ✓ | ✓ | ✓ | PCA-Trade and Market Developme nt Division | DTI, DA-AMAS, and PSA |
| Extensive market promotion program through multi-media to promote domestic consumption of coconut food products | Low domestic consumption of coconut food products (e.g., RBD as cooking oil, coco sugar, etc.) due to limited market information dissemination and market awareness of the health benefits from consuming various coconut food products | ✓ | ✓ | ✓ | DTI (BSMED and BETP) | DA-AMAS/AMAD, PCA-Trade and Market Development Division, TV Stations (i.e., GMA, TV5, and TV4), local radio stations; print media |

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| Expansion of the utilization of coco net or geotextile in construction, slope protection and erosion control projects; stream bank and river protection; mangrove protection; road construction, mined-out areas; national greening program; etc. | Low domestic market utilization of coir products | ✓ | ✓ | ✓ | DENR and DPWH | LGUs, DA, Philippine Coco Coir Exporters Association, Inc. (PhilCoir) |
| Institutionalization of the utilization of coco peat in fertilization and food security programs | Low domestic market utilization of coir products | ✓ | ✓ | ✓ | PCA and DA | LGUs and PhilCoir |
| Market facilitation, linkages and matching to increase market access (domestic and export) within the value chain); should focus on direct trading of farmers organizations/cooperatives to coconut processing companies and institutional buyers; capacity building on market negotiation, and participation of SMEs in international trade fairs and exhibits | Weak market linkage among actors within the value chain especially between farmers' organizations/ cooperatives/small enterprises and coconut processing companies/institutional buyers | ✓ | ✓ | ✓ | DTI-BSMED | DTI-CITEM, DTI-BETP, DA-AMAS/AMAD, PCA-Trade and Market Development Division |
| Market Research – trends and market potential of new non-traditional coconut products; | Lack of market research including market feasibility studies | ✓ | ✓ | ✓ | DTI-BSMED | PCA-Trade and Market Development |

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| development of market strategies for new and existing coconut products | | | | | | Division, and SCUs with funding from DA-BAR, DOST-PCAARRD |
| Diversification to widen the base of the NTCPs niche market to other geographical and domestic markets, to multiproduct processing, to more value addition, and to greater uses other than food such as for industrial application and introducing new products like MCT from VCO. | NTCPs cater only to consumers that are health conscious, food safety conscious, environmentally aware and quality discriminating. The narrow market base creates more risks and results in slow growth rate and high price. Expansion and greater variants of products could move NTCPs from a niche market to a main stream market. | ✓ | ✓ | ✓ | DTI | PCA-Trade and Market Development Division, and Industry Associations |
| Easing of rules of origin (ROOs) compliance and administration, adoption of electronic Certificates of Origin (COOs) and self-certification, and linkage to the national single window (NSW) that facilitate participation of MSMEs in FTA agreements and improve timelines and ease the entry of MSMEs. | MSMEs have relatively low level of awareness of free trade agreements (FTAs). Those that are aware are not taking advantage of the benefits of the trade agreement. The existence of red tape in complying with the requirements of the FTA e.g., COO have discouraged participation of MSMEs. | ✓ | ✓ | ✓ | DTI | PCA-Trade and Market Development Division, and Industry Associations |

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| Construction of secondary roads (e.g., foot trails) within coconut farms and farm- to- market roads | Lack of farm-to-market roads and secondary roads within coconut farms especially those located in upland areas and makes it difficult for the coconut farmers to transport farm inputs from their input sources to their farms and their products from their farms to the market; providing road access from farms to commercial hubs will both reduce transportation costs and induce economic inclusion of farmers to markets. | ✓ | ✓ | ✓ | Provincial and Municipal LGUs | DA |
| 7. Strengthening Institutional, Policy and Support Services | | | | | | |
| Special financing window/credit program for coconut farmers' organizations/cooperatives to provide production, processing, trading, and microfinancing loans at low interest rate | Lack of access to financing to enable the farmers associations/cooperatives (especially newly organized ones that are not yet bankable) to engage in coconut farming, processing, and trading activities as well as for microlending to members | ✓ | ✓ | ✓ | LBP and DBP | Cooperative Rural Banks, ACPC |
| Financing for MSMEs in the coconut processing sector | MSMEs lack financing to upgrade or modernize their processing facilities to enable them to improve their competitiveness. For example, small and medium-scale VCO processors should be incentivized to adopt the centrifuge process of VCO extraction. The centrifuge technology is a much faster process and produces better quality of VCO. Technology access is a problem because micro and small enterprises find it expensive to purchase a centrifuge. | ✓ | ✓ | ✓ | LBP and DBP | DTI (through its SME Financing Programs) and DOST-SETUP |

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| Financial assistance to MSMEs in getting domestic and international organic certifications and conduct of technical assistance to enable them to comply to the protocols of these standards. This could be integrated with a technology assistance package that will encourage micro- and small enterprises to be certified for export. In addition, crafting and implementing of standardization and certification that differentiates organic and non-organic and grades VCO as to quality can be carried out. | There are several standard certification requirements and regulations facing MSMEs such as for food safety, good working environment, quality of working life and decent jobs and in some countries, Child Labor free certification. The certifying process is complex. MSMEs generally have small processing plant capacity and do not have the financial capacity to pay for the certification fees. Certification resolves the problem on standardization or quality variability which in turn would allow consolidation of supply to meet large volume orders, hence solving supply tightening. | ✓ | ✓ | ✓ | PCA and DTI | |
| Development of accreditation standards and protocol coconut for seed gardens and nurseries | Program on seed nuts and seedlings certification and traceability will ensure that only planting materials that pass the standard will compose the next generation of coconut populations in the country. | ✓ | | | PCA | NSIC-BPI |
| Policy requiring accreditation of coconut seed gardens and nursery | Program on seed nuts and seedlings certification and traceability will ensure that only planting materials that pass the standard will compose the next generation of coconut populations in the country. | ✓ | ✓ | ✓ | PCA | NSIC-BPI |

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| Policy on distribution (with 1-year fertilizer support) of only certified planting materials from PCA | Program on seed nuts and seedlings certification and traceability will ensure that only planting materials that pass the standard will compose the next generation of coconut populations in the country | | ✓ | ✓ | PCA | NSIC-BPI |
| Construction of secondary roads (e.g., foot trails) within coconut farms and farm- to- market roads | The lack of farm-to-market roads and secondary roads within coconut farms especially those located in upland areas and makes it difficult for the coconut farmers to transport farm inputs from their input sources to their farms and their products from their farms to the market; providing road access from farms to commercial hubs will both reduce transportation costs and induce economic inclusion of farmers to markets. | ✓ | ✓ | ✓ | Provincial and Municipal LGUs | DA |
| **Policy Directions** | | | | | | |
| Establishing coconut-based agribusiness enterprises, which are market-driven, and market-based, seamlessly linked from primary production, with product processing, marketing, distribution, and consumption points (domestic and export). Closely linked supply value chains can lead to efficiency in terms of farm production costs, logistics and distribution costs, and targeted processing investments | Review of past coconut programs indicated that they were mostly implemented as stand-alone systems with little provisions of effective linkages among the participants in the supply value chain segments of the industry. The new legislation (Republic Act No. 11321, s. 2019) and Administrative Circular No. 08, s. 2019, mandates DA and its attached agencies and bureaus to employ market-driven and market-based approaches in promoting sustainable agribusiness enterprises. These enterprises can be further clustered and consolidated for expansion, to attain economies of scale along the supply value chain. | ✓ | ✓ | ✓ | DA, PCA | DTI, LBP, LGU, Private Sector |

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| for quality coconut products, intercrops, integrated with livestock production, and eventually can lead to more income for farmers. | | | | | | |
| Protection/preservation of the coconut tree (for implementation and compliance to sustain supply of coconut). | There are some lapses on the full implementation of Republic Act No. 8048 as amended by Republic Act No. 10593, s. 2013. This can be done by a more effective monitoring at the Provincial Level. However, the age of senile trees at 60 years should be revisited to include lower than 60-year-old trees which are already non economical to operate. | ✓ | ✓ | ✓ | PCA | LGU, PNP |
| Increasing the coconut biodiesel blend from 2% to 5% | Under the Biofuels Act (Republic Act No. 9367, s. 2007), the National Biofuels Board (NBB) chaired by the Secretary of DOE will be responsible in determining the expansion of the National Biofuels Program (NBP). The increase in coco biodiesel blend from 2% to 5% will surely stimulate the demand in the domestic production of Coconut-based Methyl Ester (CME), in terms of increase in employment of workers, in CME processing plants and coconut farmer workers. However, the merit of this policy direction needs a further study in terms of the economics of CME production, level of revenue losses from excise tax of PHP6/liter under the TRAIN Law, vis-a-vis its positive impact on domestic | ✓ | ✓ | ✓ | DOE (NBB) | PCA, DOF, Private Sector |

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| | employment and the protection of the environment from fossil fuels emission. | | | | | |
| New Initiative: Executive Order or memorandum circular assigning PCA as the major agency to implement the Food Safety Standards under Republic Act No. 10611 or the Food Safety Act of 2013 | Under the Food Safety Act of 2013, the PCA was recognized as one of the Food Safety Regulatory Agencies (FSRAs), under the Department of Agriculture. However, the provisions of Republic Act No. 10611 only designate PCA to have jurisdiction over fresh coconut.<br><br>Under the PCA Charter, PCA is the sole agency mandated to spearhead the rapid and integrated development of coconut & other oil palm products in all aspects. PCA is likewise given the full power and authority to regulate the marketing and export of coconut products, but under the Food Safety Act, PCA's coverage was limited to the food safety of "fresh coconut." When the coconut is opened, canned, or bottled, is not under PCA anymore.<br>Issues:<br>1) There are processing plants issued with license to operate (LTO) by FDA but are not GMP-compliant;<br>2) There are processing plants operating and selling products in the market without LTO due to limited number of FDA inspectors.<br>FDA has only 180 inspectors nationwide; | ✓ | ✓ | ✓ | FDA | PCA, DA, DOH |

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| | 3) Importation of palm oil is not regulated as regulatory power over processed food products was transferred to FDA from DA. | | | | | |
| Registration and accreditation of coconut farmers, coconut manufacturing companies and exporters of coconut products for better penetration of the global markets (New Initiative on trade) | Access to the global market is getting harder due to imposed quality requirements of the importing countries. Certificates of Traceability, GAP, GMP, HACCP, Organic Certification, and Fair Trade are compulsory requirements for most importing countries for coconut products. Complying with these requirements will allow Philippine coconut products to penetrate these external markets. | ✓ | ✓ | ✓ | PCA | DTI, DOST, DA |
| Exemption of *lambanog* from excise tax on alcoholic drinks (New Initiative) | The move is to apply for the classification of *Lambanog* as a heritage drink, like *tapuy* and *tuba*, so that it can be exempted from excise tax for alcohol. | ✓ | ✓ | ✓ | PCA | BIR, DOF |
| Negotiations with the EU and the US for the Generalized System of Preference (GSP) a formal system of exemption for Philippine coconut products | Under the General Systems of Preference (GSP), duty-free savings for exported coconut products can provide significant economic opportunities for coconut industries in the Philippines. | ✓ | ✓ | ✓ | PCA, DTI | DFA, Private Sector |
| Government incentives under the Corporate Recovery and Tax Incentives for Enterprises (CREATE Law) | The tax incentive system under the CREATE Law will forge closer collaboration between coconut farmers' groups and coconut processors/exporters, a seamless partnership to ensure sustainable farmers' income and tax benefits for the processing/exporting companies. | ✓ | ✓ | ✓ | DA-PCA | BIR, Private Sector |

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| "Ease of Doing Business" (Anti Red Tape Act of 2007) thru automation/computerization/ digitization of business transactions of buying stations and branch registration process of PCA | One of the major challenges of investment fund utilization in the coconut agribusiness system is the red tape, undocumented procedures and manual processing of business transactions. Efficiency of these agribusiness transactions can be effectively achieved thru automation/computerization/digitization of business transactions under an organized project management system. | ✓ | ✓ | ✓ | PCA | |
| **Institutional Restructuring of PCA** | | | | | | |
| Ensure total personnel complement by filling up plantilla positions and retool skills of professional staff for better services rendered | In 2013, the Governance Commission approved the Rational Plan of PCA which provided major shifts in field operations by improving the quality of copra to be complemented by research, market development, and regulatory undertakings.<br>The Rationalization Plan also reduced the Plantilla positions by 59% (from 1,400 to 826) which drastically affected the PCA's basic services to the coconut industry. This personnel complement has not improved to the present with only the same Plantilla positions of 826, of which only 527 (64%) are filled up. The remaining 299 positions (36%) are still unfilled. PCA has total personnel to date of 1,365, of which 838 positions (62%) are hired as project-based, either through contract of service or job orders. | ✓ | ✓ | ✓ | PCA, DBM | SUCs |

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| Ensure GAA funding PCA operations | The operations of PCA are supposed to be funded by the Authority's corporate income. Historical fluctuations in collection of fees from the industry are only enough to pay 50% of total personnel complement disrupting the needed services for the industry. | ✓ | ✓ | ✓ | PCA, DBM | Congress |
| Support the PCA Transformation Roadmap | The restructuring of the organizational setup of PCA, which is tied down specifically to the mission and vision of the COCOFIRM, needs support and approval. The new Performance Governance System being proposed will ensure a more efficient, transparent, Program Management System in the implementation of the different development programs of the coconut industry. | ✓ | ✓ | ✓ | PCA, DA, GC | |
| Advocate for a bigger budget allocation for PCA | The coconut industry is a huge, complex, and multifaceted group of diversified industries, generating annually Multibillion USD as foreign exchange earnings. The PCA GAA allocation of P1.24 Billion annually is relatively small considering the value for money that the government is investing in the coconut industry. It should be within the range of, at least, PHP3.5 Billion (PCIC), PHP5.2 Billion (PFDA) or PHP7 Billion (NFA). | ✓ | ✓ | ✓ | PCA, Congress | DA, DBM |

| STRATEGIES/POLICIES/ PROGRAMS | ISSUES/CONSTRAINTS/ OBJECTIVES BEING ADDRESSED | TIME FRAME[1] | | | WHO WILL DO IT? | |
|---|---|---|---|---|---|---|
| | | S | M | L | LEAD AGENCIES | SUPPORT AGENCIES |
| Accelerated collection of coconut industry fees | The PCA has been constrained in its operations to help the growth and development of the coconut industry. This is due to the binding policy that the Authority's corporate income should finance its operations. Over the past six (6) years, collection efficiency averaged 42.5% from total collectibles of PHP 1.1 Billion. This low-efficiency collection rate resulted in deficits to cover the cost of personnel services. For breakeven in its personnel expenditures, PCA should increase its collection efficiency to at least 60%. | ✓ | ✓ | ✓ | PCA | Private Companies |
| Accelerated Development of the Oil Palm Industry | PCA is also mandated to develop the oil palm industry. The slow phase of development is mainly due to inadequate funds to accelerate its growth. Although very limited in scale, the Authority has been successful in the oil palm planting/replanting of F1 hybrids in suitable areas. During the period of 2016 to 2020, the Smallholder Oil Palm Plantation Development Project (SOPDP) had planted/replanted 3,525 ha and rehabilitated 5,566 ha of oil palm plantations. The target accomplishments in terms of Planting/Replanting were 100%, Rehabilitation 86%, and Fertilizer support, 96%. The program served 5,762 farmer-beneficiaries. The Philippine oil palm industry is indeed an "infant industry." The import of cheap crude palm oil has flooded the Philippine market, thus competing with coconut oil. There is room to explore the "infant industry" argument to restrict such palm oil imports. | ✓ | ✓ | ✓ | PCA | Private sector |

# INDUSTRY CLUSTER GOVERNANCE NETWORK

### TABLE 9.1. INDUSTRY CLUSTER GOVERNANCE NETWORK (IMPLEMENTATION TEAM)

| 1. Promoting Coconut Farmers' Welfare and Social Protection | | |
|---|---|---|
| **Role** | **Actors** | **Responsibilities** |
| Lead agencies/enablers in implementing the Educational Scholarship Program for Coconut Farmers' Children | CHED and TESDA | Set the criteria for selecting the children-beneficiaries for the Educational Scholarship Program; screen the applicants and choose the qualified children-beneficiaries; responsible for the efficient management of the fund allotted for th Educational Scholarship Program |
| Lead agencies/enablers in implementing the Health and Medical Insurance for Coconut Farmers and their Families | PhilHealth and PCA | Determine the medical insurance premium to be paid per coconut farmer and the health and insurance coverage benefits per coconut farmer and his family |
| Lead agencies/enablers in the Crop Insurance Program and Expansion of Its Insurance Coverage | PCIC | Determine the additional crop insurance premium to be paid per coconut farmer by expanding the insurance coverage to include intercrops under coconut; coordinate with LGUs in disseminating information about the Expanded Crop Insurance Program |
| Lead agencies/enablers in the Cash for Work Under KAANIB Program and the *Agrikulturang Pantawid Pamilyang Pilipino* (A4Ps) Coconut Planting Program; and the SEA-K Program | PCA and DSWD | Provide cash incentives to coconut farmers who will participate in planting/replanting of coconut trees (PCA and DSWD); DSWD to provide seed capital to coconut farmers under the SEA-K Program |
| **2. Strengthening and Empowering Coconut Farmers' Organizations (CFOs)** | | |
| **Role** | **Actors** | **Responsibilities** |
| Lead agencies/enablers in the conduct of Entrepreneurship Trainings to Farmers Organizations/ Cooperatives | ATI and TESDA | Develop entrepreneurship training modules for farmers' organizations and cooperatives; conduct these training programs in collaboration with the Management Association of the Philippines (MAP). |

| 7. Strengthening Institutional, Policy and Other Support Services | | |
|---|---|---|
| **Role** | **Actors** | **Responsibilities** |
| Establish road network and infrastructure prioritized for the hybridization program | DPWH | Infrastructure support to seed farms and hybridization gardens |
| Lead Agencies in Developing New Policies and Programs to access the EU GSP+ and US GSP for Philippine coconut products, under the General System of Preference (GSP) | PCA, DTI, DFA, and Private Companies | Ensure that the basic country compliance required to qualify for the preferential tariff reductions are in place |
| Enablers for compliance on quality standards and regulations, R & D for training, technology, and international market development for sustainable coconut products, including CNO for better premium prices to coconut farmers | PCA, DTI, DOST and Private Companies | Develop the basic protocols of quality for coconut products as demanded by the domestic and international markets |
| Enablers for the Provisions of Government Incentives under the Corporate Recovery and Tax Incentives for Enterprises (CREATE Law), directed to PCA's Integrated Coconut Farmers' Development Program, CBFS of intercropping and livestock integration, support to planting/replanting and hybridization programs with direct linkage to exporters/processors which can be granted lower VAT exemptions and percentage tax rate of 25% | PCA, DOF, DA, and DOST | Establish the blueprint for collaboration and business linkages among farmers' groups and the private processors and exporters |
| Enabler of promoting "ease of doing business" (ARTA Law) thru automation/computerization/digitization of business transactions in buying stations/branches of PCA | PCA | Set the process of establishing automation/MIS, ISO Certification, Project Management System, and GIS M&E System |

| 7. Strengthening Institutional, Policy and Other Support Services | | |
|---|---|---|
| **Role** | **Actors** | **Responsibilities** |
| Lead Role in Coordination and Collaboration with other Agencies/Institutions and Partnership with the Private Sector | PCA | Development of a logical framework that defines the specific activities and measurable outputs, outcomes and impacts of specific projects/programs on the coconut industry. Provide mechanisms for an effective participatory program monitoring and evaluation activities in the coconut industry |
| Enabler for full implementation of all existing regulatory policies in coconut, such as the protection of the coconut tree, illegal trade, certification and registration of coconut industries, and enforcement of quality standards of copra and other coconut products.<br>Stronger collaborative role with the other government agencies is expected | PCA | Under its Charter PCA is given the full mandate of executing the full implementation of all legal issuances on coconut products and by-products. The strengthening of PCA as an organization is expected to do better collaborative efforts with other agencies in attaining the objective of this initiative |

| | | |
|---|---|---|
| Lead agencies in the implementing the proposed Skills Development/Training Program on Improved Farm Technologies (i.e., for coconut, intercrops, livestock) and New Value-adding Processing Technologies and Enterprises | PCA and TESDA | Conduct skills training programs on improved farm technologies and new value-adding processing technologies and enterprises; serve as training lecturers/resource persons in these training programs; invite resource persons from SUCs, DA-HVCC and DA-BAI |
| **2. Strengthening and Empowering Coconut Farmers' Organizations (CFOs)** | | |
| **Role** | **Actors** | **Responsibilities** |
| Lead agencies/enablers in the establishment and/or expansion of Farm Business Schools (FBS) in coconut communities at the municipal or barangay levels | ATI and TESDA | Establish Farm Business Schools in municipalities with no existing Farm Business Schools to help farmers learn and improve their knowledge and skills in entrepreneurship and farm business management; reproduce the Farm Business School handbook materials for distribution to coconut farmer-participants; oversee how the Farm Business Schools are run by facilitators |
| Enabler in the Organization and/or Capacity-building /Strengthening of Coconut Farmers Organizations and Cooperatives | CDA | In collaboration with barangay and municipal LGUs and PCA-CDOs, organize coconut farmers organizations/cooperatives in coconut areas with no existing coconut farmers organization or cooperative; identify weak or low-performing farmers' organizations and cooperatives using PCA's or the modified criteria developed by DAR in evaluating the level of maturity of farmers organizations/ cooperatives; strengthen weak or low-performing farmers' organizations/ cooperatives by conducting trainings on leadership, values formation, financial management, governance, and management of cooperatives, investment and fund management, enterprise development, internal control, and credit management, among others |
| Enablers in the formation of Local Small Farmers Councils (LSFCs) | Local LGUs at the municipal and provincial levels | Organize local small farmers councils at the municipal and provincial levels and provide logistical support (e.g., meeting space, etc.) to enable the coconut farmers to voice out their sentiments and needs as well as participate in the local planning process |

| | | |
|---|---|---|
| Support to strengthening KAANIB organization and cooperatives | CDA | Organize coops in coconut communities where there is none, Build /enhance values, bookkeeping, managerial capability of farmers' cooperatives to provide expanded services to their members (including insurance underwriting for crop/livestock, health, accident, SSS membership, loans and claims), manage technical crew unit, manage agribusiness enterprises professionally |
| 3. Increasing and Sustaining Coconut Production/Farm Improvement to Maintain the Philippines' Stature as a Major and Reliable Supplier of Quality Coconut Products in the Global and Domestic Markets | | |
| **Role** | **Actors** | **Responsibilities** |
| Coordination with other agencies, institutions and private sector, Provision of support through PCA programs | PCA | Technical and Operations support to farmers and cooperatives in enhancing coconut productivity, including improved farm management technologies (fertilization, IPM), copra /whole nut processing and trading, planting/replanting, intercropping /livestock integration, and integrated coconut processing;<br>Coordination with other agencies and private sector for market linkages, clustered production, cooperative marketing, capability enhancement of members and KAANIBs |
| Lead Support for intercropping projects | DA-HVCCP | Mobilization of Funds for intercropping projects, coordination with PCA and other NGAs and institutions, NGOs and private sector for provision of needed support system to develop agri-corridors of high value intercrops through consolidated/clustered production, post-harvest processing/value-adding and cooperative marketing |
| Enhancing Farmers capability | ATI | Training of coconut farmers on crop production and cropping systems technologies and strategies using Farmers Field School methodology<br>Training of coconut farmers on agribusiness management and business models using Farmers Field School methodology; Certification of farmers' learning sites |
| Lead provider of technical and vocational trainings | TESDA | Professionalize skills needed by the coconut industry from farm maintenance, nut harvester (depending on the age of nuts). Processing of various coconut products |

| 3. Increasing and Sustaining Coconut Production to Maintain the Philippines' Stature as a Major and Reliable Supplier of Quality Coconut Products in the Global and Domestic Markets | | |
|---|---|---|
| **Role** | **Actors** | **Responsibilities** |
| Lead Support for poultry and livestock projects | DA-BAI | Mobilization of funds for poultry and livestock integration projects, coordination with PCA and other NGAs and institutions, NGOs and private sector for the provision of needed support system to develop agri-corridors of dairy products through consolidated/clustered production, post-harvest processing/value-adding and cooperative marketing |
| Lead breeder, producer of hybrids, certification of planting materials; distribution of hybrids | PCA | Implementation hybridization program; selection and set-up hybrid gardens and seed farms; Certification of planting materials; Set criteria for hybrid suitability; distribute certified planting materials |
| Funder, coordinator, monitor and evaluate research on coconut hybridization | DOST | Prioritization and provision of support basic and applied research for development on hybridization; Research funding, prioritization, coordination, monitoring and evaluation; Support capability development of SUCs, PCA, and other research institutions on coconut |
| Implement research program on hybridization; technical support to PCA | SUCs | Basic and applied research on hybridization and optimizing hybrid performance on-farm; Technical support to PCA and farmer organizations as needed |
| Support hybridization program in their areas of responsibility | LGUs | Provision of support to the establishment of community nurseries; Distribution of hybrid planting materials |
| Capability building -develop core competency needed to implement and sustain hybridization program | CHED /TESDA | Provision of scholarships and specialized certificate trainings |

| 4. Establishing CBFS Agri-business Hubs and Corridors for Coconut Products, Intercrops and Livestock | | |
|---|---|---|
| **Role** | **Actors** | **Responsibilities** |
| Support for establishment/procurement of shared facilities | PHilMech | Support for the establishment of shared facilities for (1) farm improvements e.g., tractors, irrigation, and (2) drying/processing display/sale, and (3) trucking for distribution of coconuts, intercrops and meat and dairy products |
| Lead agencies/enablers in implementing the: Projects under the shared service facilities such as: white copra centrals, copra buying stations; coconut water concentrate, whole nut buying stations; VCO micro-scale integrated coconut processing (wet and dry methods), medium scale VCO processing plant (wet method); integrated coco coir processing units, coir rubberizing plants, particle boards from coconut husks; charcoal granulating and briquetting plants, activated carbon plants; redistilling facility for *lambanog*, retooling of coco sugar and coco syrup facilities; young coconut processing plants; farm services teams; coffee and cacao processing plants; banana packing houses and trading posts | PHilMech, PCA, DTI | Review the technical and financial viability of the recommended projects; set the criteria for selecting the cooperative-beneficiaries for projects; procure the facilities; design the technical support system for assisting the recipient cooperatives in the operation of the facilities |
| Lead agencies/enablers in implementing the: Establishment of grading standards that will provide sufficient incentives for making high quality copra | PCA, DTI, DA-BASP, PHilMech | Set the technical or scientific basis for providing price incentives for high quality copra. Prepare premium table for high-quality copra |
| **5. Improving Competitiveness of Traditional and Non-Traditional Coconut Products in Local and Global Markets** | | |
| **Role** | **Actors** | **Responsibilities** |
| Enabler in the construction of additional product quality testing laboratories in coconut supply grid areas in Visayas and Mindanao | PCA | Allocate budget for the construction and annual operation of product quality testing laboratories in Visayas and Mindanao; facilitate the construction of product quality testing laboratories in coconut supply grid areas in Visayas in collaboration |

| | | |
|---|---|---|
| | | with the National Coconut Research Center Visayas of the Visayas State University and in Mindanao in collaboration with the Davao Research Center. |
| Enabler in providing mechanical harvesting equipment to farmers organizations and cooperatives as a shared facility | PHilMech | PHilMech to provide farmers' associations and cooperatives with mechanical equipment for coconut harvesting as a shared facility. ATI will conduct training for out-of-school youth and/or farm workers on the use of mechanical harvesting equipment. The farmers organizations and cooperatives can hire/maintain a crew of farm workers who will perform harvesting operations for members of the association for a fee using the mechanical harvesting equipment. |
| 6. Enhancing Trade and Marketing | | |
| Role | Actors | Responsibilities |
| Lead agency in designing and operating the Coconut Market Information System (MIS) | PCA | Design the Coconut Market Information System in collaboration with PSA, UCAP, DTI, DA-AMAS, and other data sources, generate, process and upload in the MIS website coconut production and market/trade-related data, market new reports and other relevant information as well as conduct yearly updating of all the data generated in the Coconut MIS website. |
| Lead agency/enabler in the Extensive Market Promotion Program for Coconut Food Products | DTI | In collaboration with PCA-Market and Trade Division, DA-AMAS, and the private sector (e.g., tv station and radio station operators as well as the different coconut industry associations under UCAP), take the lead in conducting extensive market promotion activities via multi-media for various coconut products using the budget allocated to DTI from the Coco Levy Fund; through the initiative of the different coconut industry associations, they can also collect monetary contributions taken out of each member-company's social development fund to generate additional funding for the implementation of the proposed Market Information Program. |
| 6. Enhancing Trade and Marketing | | |
| Role | Actors | Responsibilities |

| | | |
|---|---|---|
| Enablers in the increased utilization of coco coir products | DENR, DPWH, PCA, DA, and LGUs | DENR to expand their utilization of geotextile nets in their slope protection, erosion control, and mangrove protection projects and DPWH in their road construction and improvement projects; PCA, DA, and LGUs to institutionalize the utilization of coco peat in fertilization, food security, and greening programs. |
| Lead agency/enabler in market facilitation and matching activities in support of coconut farmers organizations/cooperatives and MSMEs | DTI | In collaboration with the PCA Trade and Market Division and DA-AMAS, take the lead in facilitating market linkages and matching between coconut farmers organizations/cooperatives and potential market outlets (i.e., coconut processing companies, institutional buyers, and exporters) to increase their market access (domestic and export) and enable them to engage in direct trading; assist coconut farmers organizations/cooperatives in building their capacity on market negotiation; increase the participation of coconut farmers organizations/cooperatives and MSMEs in international trade fairs and exhibits to link them to different buyers of coconut products. |
| Lead agency in conducting market research on newly developed nontraditional coconut products and on market strategies to create and/or enhance the demand for existing coconut products | DTI | With research funding from the Coco Levy Fund and additional research funds tapped from DOST-PCAARRD and DA-BAR, take the lead in conducting collaborative market research with the PCA-Trade and Market Development Division, DA-AMAS, and SUCs on the trends and market potential of newly developed nontraditional coconut products and on market strategies to create and/or enhance the demand for existing coconut products. |
| Lead agency to widen the base of the NTCPs' niche market to other geographical and domestic markets | DTI | In collaboration with the PCA-Trade and Market Development Division and Industry Associations, DTI should take the lead in assisting MSMEs in expanding their market base to enable them to have market access to other countries, and advertise their products in local tourist areas, and promote introduce new products. |

| 6. Enhancing Trade and Marketing | | |
| --- | --- | --- |
| **Role** | **Actors** | **Responsibilities** |
| Lead agency to assist MSMEs in complying with the requirements of the free trade agreements (FTAs) and to raise awareness on the benefits of the trade agreement | DTI | DTI in collaboration with the PCA-Trade and Market Development Division, should take the lead in easing the rules of origin (ROO), reform the electronic certificates of origin (COOs) and promote linkage to the national single window (NSW). Industry Associations to advocate the easing of rules of origin (ROOs) compliance and administration. |
| Enabler in the construction of secondary/rural roads within coconut farms and farm- to- market roads | Provincial and Municipal LGUs | Allocate budget for local/rural road construction and maintenance; take charge of selecting contractors for local/rural road construction and maintenance |
| Support to market information, creation and linkage | DTI | Provide real-time market information; help farmers in market survey, market creation for new products and linking clustered farmers coops/organizations to reputable markets |
| **7. Strengthening Institutional, Policy and Other Support Services** | | |
| **Role** | **Actors** | **Responsibilities** |
| Enablers in designing and implementing a Special Financing Window/Credit Program for Coconut Farmers' Organizations/Cooperatives | LBP and DBP | Implement a Special Credit Program designed to provide production, processing, trading, and microfinancing loans at low interest rate to both bankable and non-bankable coconut farmers' organizations and cooperatives |
| Enablers in the provision of financial assistance to MSMEs in the Coconut Processing Sector | LBP, DBP and DTI | Extend loans at a low-interest rate for the upgrading of processing equipment of MSMEs engaged in coconut processing enterprises |
| Enablers in incentivizing the adoption of centrifuge technology by VCO processors | DTI, DOST, and PCA | DTI in collaboration with PCA and DOST should take the lead in identifying the number of VCO producers who need centrifuge machine. MSME-associations producing VCO can avail of equipment/machine assistance under DTI's shared facility program and DOST's SETUP. Training on the use of the centrifuge |

| | | |
|---|---|---|
| | | machine should be carried out by DOST and PCA. DTI should allocate a budget to provide incentives to users of the centrifuge technology. |
| **7. Strengthening Institutional, Policy and Other Support Services** | | |
| **Role** | **Actors** | **Responsibilities** |
| Lead agency in supporting MSMEs to meet the international standard certification requirements and the regulations accompanied with it | PCA | To provide financial support to MSME's, PCA together with DTI should institute a policy that will subsidize the payment of organic certification fees. DTI, DOST, and DA through FDA should conduct technical assistance to MSMEs in complying with the protocols of these standards. PCA with DOST and Industry Associations together should craft and implement standardization and certification that differentiates organic and non-organic products. |
| Enabler in the construction of secondary/rural roads within coconut farms and farm- to- market roads | Provincial and Municipal LGUs | Allocate budget for local/rural road construction and maintenance; take charge of selecting contractors for local/rural road construction and maintenance |
| Enabler in the construction of additional product quality testing laboratories in coconut supply grid areas in Visayas and Mindanao | PCA | Allocate budget for the construction and annual operation of product quality testing laboratories in Visayas and Mindanao; facilitate the construction of product quality testing laboratories in coconut supply grid areas in the Visayas in collaboration with the National Coconut Center Visayas of the Visayas State University and in Mindanao in collaboration with the Davao Research Center. |
| Lead agencies/enablers in the provision of low-cost rural mini-roads for transporting farm-products to roadside. | DPWH, PCA, DA, and PHilMech, LGUs | LGUs will identify/plan the rural mini-roads requirement of the barangays; DPWH will provide technical assistance in the design of the rural mini-roads; PHilMech will design the suitable handling and transporting equipment for moving coconuts and other crops to the roadside. |
| Enabler in the institutional re-engineering of PCA to be a more effective agency in promoting the rapid development and growth of the coconut and oil palm industry | PCA | Formulation of a comprehensive enabling mechanism for the PCA transformation roadmap |

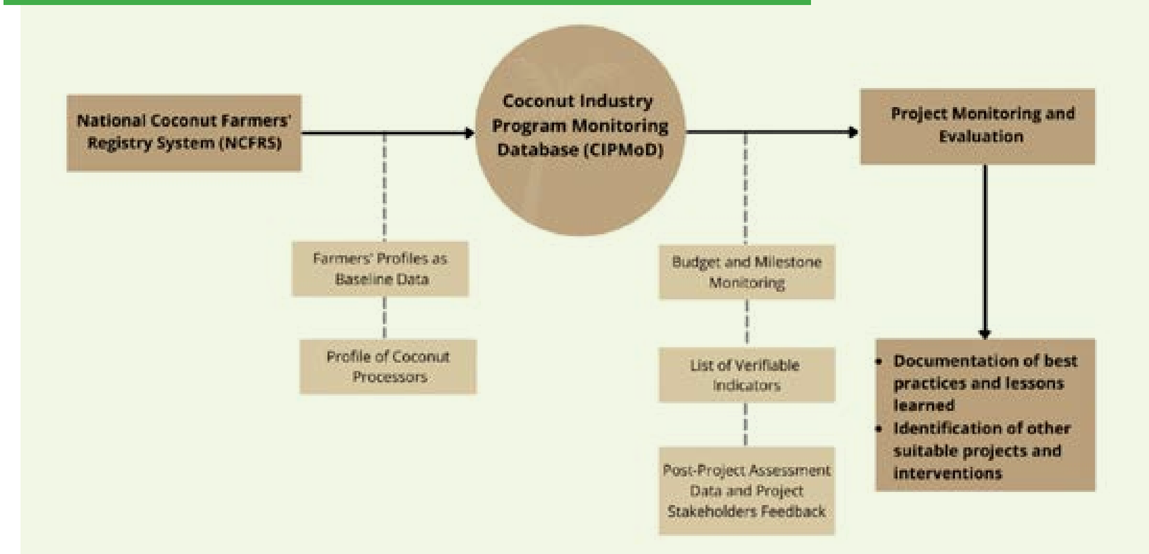
# MONITORING EVALUATION & IMPACT ASSESSMENT

COCOFIRM forges strategic partnerships with the coconut industry stakeholders, DA-PCA, other government agencies, and the private sector in achieving the coconut industry's vision, mission, and goals.

In Figure 10.1, the COCOFIRM will be implemented by the DA-PCA, in collaboration with other government agencies or partnership with the private sector. In the new organizational structure of the PCA, an Assessment and Monitoring Service (AMS) has been created under the Office of the Administrator. A major function of this Service Unit is to assess and monitor all development projects related to the coconut industry. A participatory collaboration with other government agencies and active partnership with the private sector is envisioned as central in the execution of the mandate of the Assessment and Monitoring Service.

It is desirable for PCA/AMS to develop a National Coconut Industry Program Monitoring Database (CIPMoD) to properly document projects and milestones and capture relevant data through baseline questionnaires complementary to the NCFRS, post-project assessments, and feedback mechanisms from various project stakeholders. A collaborative project planning, implementation, monitoring and evaluation helps support and understand communities better and encourage participation and project ownership of beneficiaries. CIPMoD can be instrumental in capturing best practices that can be scaled up or replicated as well as can document lessons learned to feed into better development of other projects and programs. The implementation of CIPMoD requires capacity building of national, regional, and provincial personnel to create and implement a transparent monitoring system. Provincial and regional data can feed into one national database.

FIGURE 10.1. PROPOSED NATIONAL COCONUT INDUSTRY PROGRAM MONITORING DATABASE (CIPMOD) FOR COCOFIRM

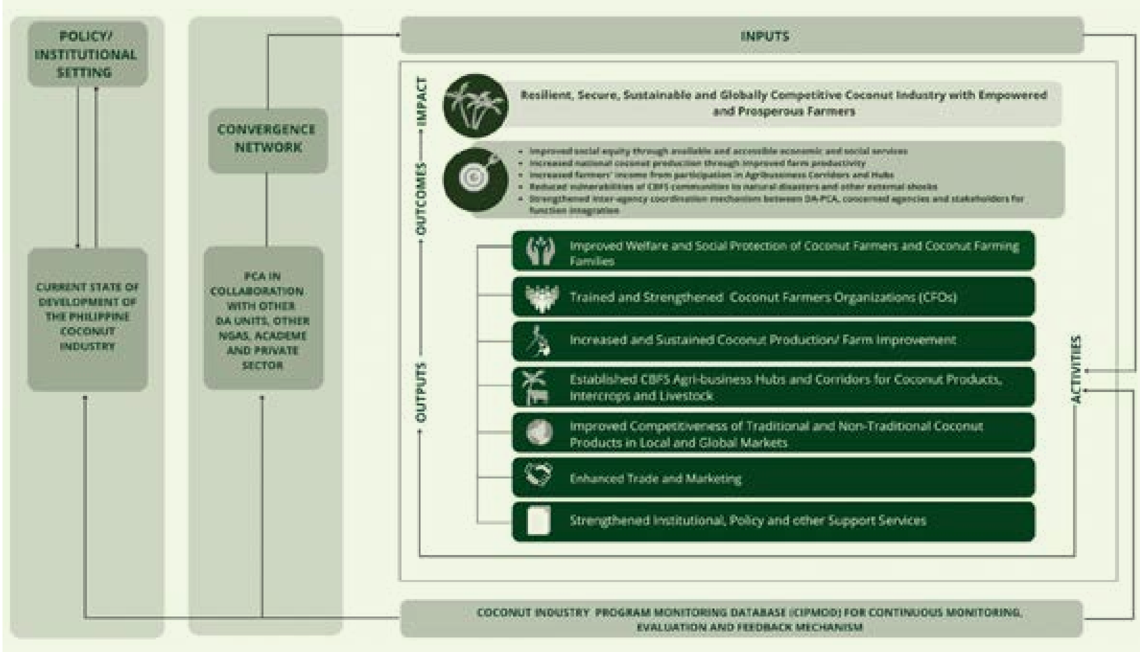



The COCOFIRM's VISION is to have a resilient, secure, sustainable, and globally competitive coconut industry with empowered and prosperous farmers. Its MISSION is to develop agro-industrial growth corridors with synergistic and inclusive integration of all stakeholders.

The mission and vision will be achieved through the transformation of seven (7) strategic programs which are elucidated in Figure 10.2. The proposed systems framework to monitor, evaluate, and assess the likely impacts of COCOFIRM is graphically illustrated below. In Figure 10.2, these program categories are not stand-alone systems. They were envisioned programs supporting and reinforcing each other. For example, given the General Market demand-driven strategy for COCOFIRM, any processed coconut product identified for the global and domestic markets will be communicated to the trade and marketing program. It is also important to note that products produced under the CBFS, like intercrops and livestock, are closely linked with Agri-business Hubs and Corridors.

Activities under each output are not mutually exclusive but are placed under an output where the activity has a more significant contribution in the achievement of the output. For example, activities under Output 5 (Improved Competitiveness of Traditional and Non-Traditional Coconut Products in Local and Global Markets), such as the construction of product quality testing laboratories in coconut supply grid areas, also contribute to Output 4 (Established CBFS Agri-business Hubs and Corridors for Coconut Products, Intercrops, and Livestock). Similarly, activities under Output 7, such as the development of a special financing window/credit program for coconut farmers' organizations/ cooperatives to provide production, processing, trading, and microfinancing loans at low-interest rate, also contribute to Outputs 2 and 3 since access to capital has a trickle-down effect on the access to inputs and resources, and help in the establishment of enterprises. These activities under each Output are specified under Chapter 6 and Chapter 10 in the logical framework.

**FIGURE 10.2. PROPOSED SYSTEMS FRAMEWORK FOR MONITORING, EVALUATION, AND IMPACT ASSESSMENT OF THE POLICIES/PROGRAMS/STRATEGIES DEVELOPED BY THE COCONUT FARMERS INDUSTRY ROADMAP (COCOFIRM), 2021-2040**



## TABLE 10.1. PROPOSED LOGICAL FRAMEWORK FOR COCOFIRM WITH INDICATIVE ACTIVITIES UNDER EACH OUTPUT

| | Results Chain | Indicators | Verification | Assumptions |
|---|---|---|---|---|
| *Impact (Overall objective)* | **Resilient, Secure, Sustainable and Globally Competitive Coconut Industry with Empowered and Prosperous Farmers** | % Increase in market share of coconut products in the international market<br><br>% Increase in export and domestic earnings from coconut products<br><br>% Increase in domestic consumption and demand for coconut products<br><br>% Decrease of coconut farmers living below the poverty threshold | Philippine Statistics Authority<br><br>Poverty Threshold data | No interruptions in program implementation<br><br>Timely release and utilization of Public Investment funds |
| *Short- to Medium - Term Outcomes* | **1. Improved social equity through available and accessible economic and social services** | % Increase of coconut farmers from the NCFRS and coconut farming families with health insurance coverage and educational scholarships | Data from PCA's National Monitoring Database (Baseline and post-project assessment data) | Well capacitated staff for program implementation<br><br>Availability of needed expertise in the area of project implementation<br><br>Participation of primary and other key stakeholders |
| | **2. Improved income levels from CBFS and other coconut-based livelihoods and enterprises** | % Increase in income of CFBS communities compared to baseline data | Data from PCA's National Monitoring Database (Baseline and post-project assessment data) | |
| | **3. Increase national coconut production through improved farm productivity** | % Increase in national, regional average yield of coconut | Data from PCA's National Monitoring Database (Baseline | |

| | Results Chain | Indicators | Source and Means of Verification | Assumptions |
|---|---|---|---|---|
| | | (disaggregated per coconut type and variety)<br>At least 20 Billion produced by 2030<br><br>% Number of new enterprises formed | and post-project assessment data) | during program planning and implementation |
| | **4. Reduced vulnerabilities of CBFS communities to natural disasters and other external shocks** | Percent (%) decrease in income losses or % reduction in damage brought by natural disasters and other external shocks<br><br>Percent (%) decrease of coconut farmers who are food insecure | Data from PCA's National Monitoring Database (Baseline and post-project assessment data) | |
| | **5. Establishment of an inter-agency coordination mechanism between DA-PCA, concerned agencies and stakeholders for function integration** | At least 1 inter-agency coordination mechanism established<br><br>Percent (%) increase in numbers of assisted farmers, CFOs, cooperatives and MSMEs | Data from PCA's National Monitoring Database (*Baseline and post-project assessment data*)<br><br>CDA and DTI data | |
| *Output and Activities* | 1. Improved Welfare and Social Protection of Coconut Farmers and Coconut Farming Families<br><br>**1.1.** *Promotion of social protection through the insurance and educational scholarship coverages among coconut workers and their families* | **1.1.a** *Number of Scholarships granted/Number of farmers' children with educational scholarships* | Data from PCA's National Monitoring Database (Baseline and post-project assessment data) | Availability of needed expertise in the area of project implementation<br><br>Participation of primary and other |

| | Results Chain | Indicators | Source and Means of Verification | Assumptions |
|---|---|---|---|---|
| | **4.8** *Upgrading the coconut sap value chain* | **4.8.a** *Number of established toll re-distilling facility for lambanog in Quezon*<br>**4.8.b** *Number of provided biomass-fired double jacketed kettles for better temperature control*<br>**4.8.c** *Number of established well-equipped consolidators' facilities*<br>**4.8.d** *Number of automated systems/machines developed, distributed and used for sap harvesting, coco sap and coco sugar processing* | | |
| | **4.9** *Improvement of the young coconut value chain* | **4.9.a** Number of processing plants for young coconut established | | |
| | **5. Improving Competitiveness of Traditional and Non-Traditional Coconut Products in Local and Global Markets** | | | |
| | **5.1** *Support to research and innovations for product discovery and process efficiency* | **5.1.a** *Number of new products developed from coconut yearly*<br>**5.1.b** *Percent increase in efficiencies from new technology and processes developed* | Data from PCA's National Monitoring Database (Baseline and post-project assessment data)<br><br>Monitoring Reports | |

| | Results Chain | Indicators | Source and Means of Verification | Assumptions |
|---|---|---|---|---|
| | **5.2** *Provision of incentives to farmers adopting GAP and Organic practices*<br><br>**5.3** *Automation of processes to reduce labor costs*<br><br>**5.4** *Improvement of product quality for domestic and global markets* | **5.2.a** *Number of Organic and GAP-certified farms and products*<br><br>**5.3.a** *Number of automated systems adopted for coco sap collection*<br><br>**5.3.b** *Number of more efficient decorticating machines distributed*<br><br>**5.4.a** *Number of constructed Product Quality testing Laboratories in coconut supply grid areas*<br>**5.4.b** *Number of Products complying with regulatory standards domestic and abroad (HACCP, Halal, FDA, etc.)*<br><br>**5.5** *Number of farmers trained and informed on product quality standards (on manufacturing, packaging, safety and storage).* | NCFRS Data | |
| | **6. Enhancing Trade and Marketing**<br><br>**6.1** *Promotion of domestic consumption of coconuts through marketing and data mining* | **6.1.a** *Total number of advertisements in traditional and print media*<br>**6.1.b** *Percent (%) Increase in domestic sales* | Data from PCA's National Monitoring Database (Baseline and post-project assessment data) | |

| | Results Chain | Indicators | Source and Means of Verification | Assumptions |
|---|---|---|---|---|
| | **6.2** *Institutionalization of a Market Information System* | **6.1.c** *Percent (%) increase in per capita consumption of coconut food products*<br>**6.2.a** *Number of links, partnerships and collaborations formed*<br>**6.2.b** *Percent (%) Increase in sales through the MIS* | NCFRS Data | |
| | **6.3** *Improvement of market access through facilitation, linkages, matching* | **6.3.a** *Number of international /domestic trade fairs and exhibits conducted*<br>**6.3.b** *Trainings on pricings, negotiations, contracts conducted* | | |
| | **6.4** *Conduct of market research on trend and market potential of new non-traditional coconut products* | **6.4.a** *Number of market research conducted and new product discovery annually for non-traditional coconut products* | | |
| | **6.5** *Diversification to widen the market of non-traditional coconut products (NTCPs)* | **6.5.a** *Percent (%) increase in sales through an expanded niche market for NTCPs* | | |
| | **6.6** Institutionalization of the utilization of cocopeat in fertilization and food security programs | **6.6.a** *Percent (%) increase in demand and sales of cocopeat* | | |

| | Results Chain | Indicators | Source and Means of Verification | Assumptions |
|---|---|---|---|---|
| | **6.7** Expansion of the utilization of coco Net for geotextile<br><br>**6.8** Easing of rules of origin (ROOs) compliance and administration, adoption of electronic Certificates of Origin (COOs) and self-certification, and linkage to the national single window (NSW) that facilitate participation of MSMEs in FTA agreements and improve timelines and ease the entry of MSMEs.<br><br>**6.9** Construction of secondary roads (e.g., foot trails) within coconut farms and farm- to-market Roads | ***6.7.a*** *Percent (%) increase demand of coconet*<br><br>***6.8.a*** *Number of MSMEs participating in FTA agreements*<br><br>***6.9.a*** *Percent (%) reduction in transportation costs in hauling and marketing of products*<br>***6.9.b*** *Number of farm-to-market roads and secondary roads constructed* | | |
| | **7. Strengthening Institutional, Policy and other Support Services**<br><br>***7.1*** *Improvement of access to finance* | ***7.1.a*** *Number of banks and microfinancing institutions providing special credit windows for CFOs, cooperatives and coconut farmers with lower interest rate*<br>***7.1.b*** *Number of CFOs, cooperatives and coconut farmers financially* | Data from PCA's National Monitoring Database (Baseline and post-project assessment data)<br><br>Monitoring Reports | |

| | Results Chain | Indicators | Source and Means of Verification | Assumptions |
|---|---|---|---|---|
| | | *assisted with various applications for certifications (GAP, organic, etc).* | NCFRS Data | |
| | **7.2.** *Provision of efficient services to coconut processors and exporters* | **7.2.a** *Number of ISO certified analytical laboratories constructed* | | |
| | **7.3** *Decentralization of coconut research centers* | **7.3.a** *Number of coconut research centers constructed (1 per region)* | | |
| | **7.4** *Harmonization of PSA and PCA data* | **7.4.a** *0% Discrepancy in PSA and PCA data* | | |
| | **7.5** *Development of accreditation standards and protocol* | **7.5.a** *Number of developed accreditation standards and protocol* | | |
| | **7.6** *Development of new policies and laws* | **7.6.a** *Number of permits issued for cutting of coconut trees*<br>**7.6.b** *Number of seed nuts planted for replacement of cut trees*<br>**7.6.c** *Percent (%) increase in domestic utilization of coconut biodiesel blend*<br>**7.6.d** *Percent (%) increase in coconut products entering mainstream markets and for export due to improved compliance on food safety* | | |

| | Results Chain | Indicators | Source and Means of Verification | Assumptions |
|---|---|---|---|---|
| | | **7.6.e** *Number of incentives given to coconut enterprises (corporate recovery, excise tax exemption for lambanog, tax incentives)* | | |
| | **7.7.** *"Ease of Doing Business" (Anti Red Tape Act of 2007) Automation/Computerization/ Digitization of business transactions of buying stations and branch registration process of PCA* | **7.7.a** *Percent (%) reduction in transaction time with PCA (Citizen's charter)* | | |

| | Results Chain | Indicators | Source and Means of Verification | Assumptions |
|---|---|---|---|---|
| | | ***1.1.b*** *Number of farmers/farming families ensured under PhilHealth*<br><br>***1.1.c*** *Number of coconut farmers benefited from supplementary cash for work programs* | Monitoring Reports<br><br>NCFRS Data | key stakeholders during program planning and implementation<br><br>No interruptions in program implementation (health, environmental hazards and catastrophic natural disasters)<br>Commitment of the community to participate in the implementation of the guidelines<br><br>There is enough trust among other members of the community in order to form organized groups with common socio-economic interests. |
| | **2. Strengthened and Empowered Coconut Farmers' Organizations (CFOs)**<br><br>***2.1*** *Formation of Coconut Farmers' Organizations (CFOs)*<br><br>***2.2*** *Creation of LSFCs (Local Small Farmers Councils) to provide mechanisms for consultations and participation*<br><br>***2.3*** *Improvement of capacities of CFOs through various capacity building activities* | ***2.1.a*** *Number of CFOs organized and registered*<br><br>***2.2.a*** *Number of Local Small Farmers Councils organized*<br><br>***2.3.a*** *Number of Farmers who were trained in Farm Business Schools (FBS)*<br>***2.3.b*** *Number of expanded FBS established and replicated in other areas*<br>***2.3.c*** *Number of Farmer who were trained in various skills upgrading, new technology, value adding enterprises*<br>***2.3.d*** *Number of CFOs providing expanded services on insurance,* | Data from PCA's National Monitoring Database (*Baseline and post-project assessment data)*<br>Monitoring Reports<br><br>NCFRS Data | |

| | Results Chain | Indicators | Source and Means of Verification | Assumptions |
|---|---|---|---|---|
| | | *social security services, access to loans and microfinance*<br>***2.4.e*** *Number of Farmers assisted by CFOs regarding their expanded services* | | Receptiveness of project beneficiaries in technological innovations/ practices |
| | **3. Increased and Sustained Coconut Production**<br><br>***3.1.*** *Rehabilitation and upgrading of PCA seed gardens and hybridization farms* | ***3.1.a*** *Number of established accredited seed gardens and hybridization farms*<br>***3.1.b*** *Number of seed nuts produced per type (dwarf, outstanding talls and hybrids) per year*<br>***3.1.c*** *Number of seed-farm cooperators with seed gardens per province* | Data from PCA's National Monitoring Database (Baseline and post-project assessment data)<br><br>Monitoring Reports<br><br>NCFRS Data | Wide adoption and utilization of ICT-Tools in cascading information to communities<br><br>Institutions continually support community organizing and coaching of CFOs on enterprise management and organizational development through extension work |
| | ***3.2*** *Real-time inventory of seed nuts and planting materials through a mobile application* | ***3.2.a*** *At least one (1) mobile app developed for seed nut inventory that has a traceability feature* | | |
| | ***3.3.*** *Accelerated planting and replanting program through an incentivized participatory program* | ***3.3.a*** *Number of seed nuts planted per year (disaggregated data per type and per geographical location, municipal, provincial and regional level)* | | |

| | Results Chain | Indicators | Source and Means of Verification | Assumptions |
|---|---|---|---|---|
| | | **3.3.b** *Number of farmers who received trainings and practiced appropriate fertilization during planting and replanting* | | |
| | | **3.3.c** *Hectarage planted to seed nuts (new area planted vs replanted)* | | |
| | **3.4** *Improvement of Hybridization Research on Coconut somatic embryogenesis technology* | **3.4.a** *Number of seedlings produced, distributed and planted using coconut somatic embryogenesis technology* | | |
| | **3.5** *Basic and on-farm studies of G x E interaction in hybrid farms and seed gardens* | **3.5.a** *Numbers of technologies developed, recommended and adopted in order to improve yield* | | |
| | **3.6** *Revision of crop suitability map that incorporates climate-related risks and hazards* | **3.6.a** *Adapted site-specific varieties planted in various areas* | | |
| | **3.7** *Integration of crops and livestock in CBFS* | **3.7.a** *Number of coconut farmers/coconut farmers practicing intercropping and integrated production systems* | | |
| | | **3.8.a** *Increase in yield from coconut intercrops and livestock integrated in CBFS* | | |

| | Results Chain | Indicators | Source and Means of Verification | Assumptions |
|---|---|---|---|---|
| | **3.9** *Integration of climate-resilient practices in CBFS* | **3.9.a** *Number of farmers who are trained in Climate-resilient Farmers' Field Schools (CS-FFS)*<br>**3.9.b** *Number of climate-resilient technologies and practices adopted by coconut farmers*<br>**3.9.c** *Percentage yield reduction from natural disasters and external shocks*<br>**3.9.d** *Number of IT-based tools developed in damage assessments and reporting* | | |
| | **3.10** *Improvement of information campaign regarding weather-based crop and livestock insurance system* | **3.10** *Number of farmers who availed of crop and livestock insurance* | | |
| | **3.11** *Provision of support certification to GAP and Organic certification* | **3.11.a** *Number of assisted farmers on GAP and Organic Certification application*<br>**3.11.b** *Number of trainings conducted on GAP and organic farming practices and certification application* | | |
| | **3.12** *Adoption of best crop and livestock management practices on CBFS* | **3.12.a** *Number of farmers practicing zero waste production systems* | | |

| | Results Chain | Indicators | Source and Means of Verification | Assumptions |
|---|---|---|---|---|
| | | **3.12.b** *Number of technologies adopted on Integrated Pest Management*<br>**3.12.c** *Number of technologies adopted on Water and Nutrient Management*<br>**3.12.d** *Number of protocols developed for Pest Monitoring and Surveillance*<br>**3.12.e** *Number of protocols developed for plant health in seed gardens and hybridization farms using GIS and AUV* | | |
| | **4. Established CBFS Agri-business Hubs and Corridors for Coconut Products, Intercrops and Livestock**<br><br>**4.1.** *Establishment of Shared Service Facilities (SSF)* | **4.1.a** *Number of SSF distributed and co-owned and managed by CFOs*<br>**4.1.b** *Number of enterprises using the SSF*<br>**4.1.c** *Number of coconut farmers benefiting from SSF*<br>**4.1.c** *Improvement in sales/prices and income of coconut products through the use of SSF* | Data from PCA's National Monitoring Database (Baseline and post-project assessment data)<br><br>Monitoring Reports<br><br>NCFRS Data | |

| | Results Chain | Indicators | Source and Means of Verification | Assumptions |
|---|---|---|---|---|
| | **4.2** *Development of Agribusiness hubs and corridors through Farm Clustering Approach* | **4.2.a** *Number of Agribusiness Hubs developed*<br>**4.2.b** *Number of CFOs and farmers participating in Farm Clusters*<br>**4.2.c** *Number of business models from KEDPs that are replicated and upscaled*<br>**4.2.d** *Number of private sector partnerships formed with clusters and CFOs*<br>**4.2.e** *Number of integrated coconut processing businesses formed/developed (varying scales and product streams)* | | |
| | **4.3** *Improvement of the COPRA-CNO-Oleochemicals Value Chain* | **4.3.a** *Percent (%) Reduction in Aflatoxin and PAH*<br>**4.3.b** *Number of established farmer-owned copra buying stations*<br>**4.3.c** *Number of established farmer-owned White Copra Centrals (WCC)* | | |
| | **4.4** *Improvement of the DCN Value Chain* | **4.4.a** *Number of farmer-owned coconut water concentrate stations (FCWS)*<br>**4.4.b** *Number of farmer-owned buying stations for dehusked nuts (FBSDN)* | | |

| | Results Chain | Indicators | Source and Means of Verification | Assumptions |
|---|---|---|---|---|
| | **4.5** *Modernization of the VCO Value Chain* | **4.5.a** *Number of distributed small tubular centrifuge*<br>**4.5.b** *Percent (%) increase in processed nuts per day using various processes*<br>**4.5.c** *Number of medium-scale VCO processing plants established* | | |
| | **4.6** *Modernization the Coco Coir Value Chain* | **4.6.a** *Number of established Community-based Integrated Coconut husk Processing Plants*<br>**4.6.b** *Number or product varieties and volume produced per area per year*<br>**4.6.c** *Number of on-wheels coconut husks chipping machines (for making raw mat for composting) provided*<br>**4.6.d** *Number of established coco* coir rubberizing plant (mattresses, hospital beds) | | |
| | **4.7** *Improvement of the coconut shell value chain* | **4.7.a** *Number of established charcoal granulating facility*<br>**4.7.b** *Number of established activated carbon plants* | | |

# ANNEXES

# Description and Uses of Traditional and Selected Nontraditional Coconut Products Included in the Coconut Farmers and Industry Roadmap

**Copra.** Copra is the dried meat or kernel of the coconut. It is used as raw material in processing coconut oil.

**Coconut Oil.** Coconut oil refers to the oil extracted from the edible part of a coconut, which is known as the "kernel" of the coconut. The Philippines exports three types of coconut oil, namely: crude coconut oil (CNO), refined bleached oil (RBO) or cochin oil, and refined bleached deodorized oil (RBD) (Agustin, 2012 and CIIF, n.d.).

a. **CNO** refers to the oil extracted from copra after it has undergone pre-treatments, such as reduction in size and heating. It is used as raw material in the manufacture of cooking oil, specialty fats, oils, and oleochemicals.

b. **Cochin oil or RBO** is a refined but undeodorized coconut oil. It is derived by refining crude coconut oil through neutralization and bleaching. Refined bleached oil is a preferred raw material in the production of edible as well as non-edible products for greater quality improvement.

c. **RBD** is a type of coconut oil that is "refined, bleached and deodorized". It is mostly used for home cooking, industrial and commercial food processing, and cosmetic and pharmaceutical purposes. Since RBD coconut oil has a high level of lauric and caprylic acid, it is an excellent choice for cooking. These fats are popular for fighting health issues such as inflammation caused by polyunsaturated fatty acids.

**Desiccated Coconut.** Desiccated coconut (DCN) is a white, grated, dried, and unsweetened fresh meat or kernel of a mature coconut, produced in many sizes and textures from extra fine to coarse grades (Grenville, 2020). It is available in various specialties or fancy-cuts like chips, threads, flakes, and slices. DCN is widely used in the bakery and confectionery industries to enhance the texture, flavor, aroma, degree of chewiness, and appearance of a wide variety of pastries and desserts, like nut bars cookies, biscuits, cakes, pies, and ice cream. It is used as toppings for cakes and pastries as well as fillers in chocolate candy bars, among others. Having low cholesterol and calories, yet high in fat, DCN is commonly consumed by those who pursue a low calorie-high fat diet and a ketogenic diet. More than giving additional flavor, DCN became a go-to-weight loss food or ingredient.

**Copra Meal.** Copra meal or copra cake is an important by-product of coconut oil milling or oil extraction. It is an important animal feed ingredient because of its high protein and fat.

**Coco Shell Charcoal.** Coconut shell charcoal is the by-product resulting from the burning of coconut shells of fully matured nuts with limited air supply and is carbonized (Coconut Board, n.d.). Coconut shell charcoal is widely used as fuel for domestic and industrial use. It has various uses for domestic, metallurgical, and chemical industries. It is used as the chief raw material in the production of activated carbon. Coconut shell charcoal forms the best raw material for producing granular activated carbon, an important product for many industries.

**Coco Shell-based Activated Carbon.** Activated carbon made from coconut shells is a form of carbon that has been processed by physicochemical activation method using zinc chloride or calcium chloride to increase its porosity creating a larger surface area for adsorption (CBTECH, 2018). Coconut shell carbon is the best material in eliminating taste and odor compounds and superior for gas/vapor phase application. The density of micro-pores is much higher in coconut than in other forms of activated carbon. It contains 50% more micro-pores than bituminous coal making it better able to adsorb volatile organic chemicals, which are otherwise difficult to remove from water. The most notable benefit is that coconut shell-based activated carbon creates the cleanest water than any activated carbon due to its porosity, total pore volume, and lack of leaching. Coconut shell-activated carbon is known for its high hardness and low dust. It has a very high hardness and is more abrasion-resistant than any other type of activated carbon. It is a totally natural, environmentally friendly product, that has a very small carbon footprint since it is derived from coconut shells.

**Virgin Coconut Oil.** Virgin coconut oil (VCO) is oil obtained from the fresh, mature kernel of the coconut by mechanical or natural means with or without the use of heat, without undergoing chemical refining, bleaching, or deodorizing, and which does not lead to the alteration of the nature of the oil (Cristobal, 2019). VCO is an oil that is suitable for consumption without the need for further processing. It consists mainly of medium-chain triglycerides, which are resistant to peroxidation. The saturated fatty acids in VCO are distinct from animal fats, the latter consisting mainly of long-chain saturated fatty acids. Some of the health benefits from VCO are lower cholesterol levels and reduced risk of heart disease and diabetes (Dy, n.d.). Its lauric acid content also helps in weight loss, healing wounds, and boosting the immune system. VCO is used as a food supplement, body oil, massage oil, and as an ingredient in various personal care products (Arancon, 2010). It is also used in animal pets and racehorses.

**Coco Water.** Coconut water, less commonly known as coconut juice, is the clear liquid inside coconuts (Dy, 2006). It is often extracted from young green coconuts. Domestically, it is usually sold by small traders along the streets and in small eateries. It was used intravenously during the war and in emergency situations. Nowadays, it is marketed as a natural alternative to sports drinks due to its high electrolyte content. Used as a hydrating drink, coconut water helps replenish fluids and minerals lost during prolonged physical activity. Currently, a common practice among Filipino processor-exporters is to process and export coconut water concentrate in a tetra pack. Concentrated coconut water is produced through a process in which the coconut water is turned into a syrup by vacuum evaporation and mostly concentrated to 60 degrees Brix, but it can be concentrated to lower Brix values before it is packed (iTi Tropicals, 2014). Once the syrup has been formed, water is added to it and then the water concentrate is packed. Coconut water concentrate has the same taste, appearance, and nutritional content as single-strength coconut water. Single-strength coconut water is the regular strength version of pure, filtered coconut water extracted from fresh coconuts, and is a clear to slightly cloudy liquid free from extraneous materials (Franklin Baker, n.d.). The characteristic of natural coconut water is its refreshing, slightly sweet, and nutty natural taste.

**Coco Coir Products.** Coco coir products are natural fibers extracted from the husk, which is the outer cover of the coconut fruit, with or without retting or soaking (Costales, 2019). The husk either comes from green or immature coconut or from mature or brown nuts. Coco coir consists of strands of coco fibers used in manufacturing value-added products such as organic ropes, twine, brooms, and brushes; doormats, rugs, cushion for car seats, bed mattresses, and other upholstery, often in the form of rubberized coir pads; geotextile nets for road construction; and bio-logs for erosion control, desertification, and riverbank rehabilitation. Coconut peat consists of fine particles churned out in the process of decorticating coconut husk to produce coco coir. Coir dust or coco peat is a byproduct of making coco coir and has many horticultural and agricultural uses like soil conditioner to substitute for peat moss and as a component of organic fertilizer and potting soil.

**Coco Sap Products.** Two new promising coco sap products covered in the roadmap are coconut sugar and coconut aminos. Coconut sugar is a sweetener derived from the sap of coconut trees (Dy, 2006). It is considered a healthy alternative to common table sugar and artificial sweeteners. It has gained popularity as a natural sweetener safe for diabetics because of its low glycemic index. It also contains a selection of amino acids and vitamins which are beneficial to the human body. Coconut aminos is a dark-colored salty, savory seasoning sauce made from the fermented sap of coconut trees and sea salt (Miller, 2019). Coconut aminos act as a soy-free and gluten-free alternative to soy sauce that provides a similar taste without the risk of allergic reactions or food sensitivities. Coconut aminos has 73% less sodium than soy sauce. It is used to produce a variety of food products.

# Regional Production Trends and Outlook

In designing appropriate agri-business corridors and products for coconut and intercrops, an analysis of the production trend and outlook at the regional level is important for targeted planning. This chapter presents the status and outlook of regional coconut production in the Philippines and supplements the information already provided by regional roadmaps. The coconut statistics used are from PSA while the data on planting/replanting, trees cut, farms applied for land conversion, and fertilization was obtained from PCA.

Consistent with the changes in coconut hectarage, nut production in the country is continuously fluctuating. The decline in production accompanied the yearly drop in area planted to coconut from 2010 to 2014. Thereafter, there had also been a continuous increase in area planted to coconut, reaching 3.65 M ha- the highest in the past 11 years. When managed well and risks from impending disasters are mitigated, this net increase in coconut areas by almost 150,000 ha from 2014 to 2019 (PSA, 2019) could significantly increase production in the coming years.

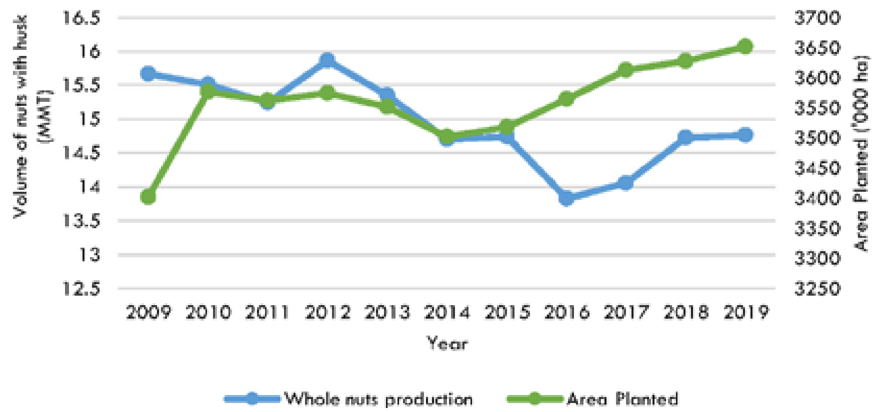
Despite the increased hectarage, the decline in yield started in 2012 and continued until 2016, followed by a slow recovery in nut production in 2017 which, by 2019, remained at a level that was 1.1B short of the 2012 production (Figure 3.94). The key to full recovery and sustainable growth of the production sector includes incentivizing farmers who replant senile and damaged trees, plant in new areas with good quality seedlings, and practice good, sustainable production management (whether producers opt for GAP or organic production system). The production system for intercrops and livestock to be integrated with coconuts should also follow the management system adopted for coconuts. Thus, in the agribusiness corridor, there will be a sector for organic production systems (which should be certified) to exploit the growing green niche market, and a sector for the modern, high-input (including chemicals) production systems.

The COCOFIRM Program Team expects the PCA regional management—in consultation with the coconut farmers' organizations and other stakeholders—to use these production trends and industry outlook as a supplement and complement to their regional development plans, particularly to strategize the priorities and targets for improving farmers' welfare and to incentivize those who sustainably increase coconut production and mainstream their participation at a higher level of the value chain, both in the coconut and intercrops agri-business corridors.

The PCA's coconut planting and replanting program from 2010/2011 to 2019 reported 102M trees planted in 962,134 ha, benefiting more than 608,000 farmers. This number was less than 3% of the population of coconut-bearing trees in 2009 and only a net increase of about 150,000 ha was reflected in 2019. Apparently, the majority of these newly planted/replanted trees were replacement trees for those that were cut under RA 8048, for the senile trees, or for those damaged by typhoon, pests, and diseases.

Replanting and expansion replace more than 20% senile and largely unproductive trees.

## FIGURE 3.94. AREA PLANTED AND VOLUME OF NUT PRODUCTION IN THE PHILIPPINES, 2009–2019




Source: PSA, 2019

## FIGURE 3.95. NUMBER OF BEARING TREES AND NUMBER OF SEEDLINGS PLANTED/ REPLANTED UNDER THE PCA PROGRAM, 2009–2019


Source: PSA, 2019

Mindanao produced more than half of the coconut production in the Philippines that accounts for almost 60% in 2019, while Luzon and Visayas contributed only 26% and 14%, respectively. Table 60 details the contribution of each region in Mindanao where Davao Region was the top regional nut producer of the country (13%), followed closely by Northern Mindanao and Zamboanga Peninsula (12% each). All three regions have more than 1.7B nut production over 300,000 ha planted to coconut with more than 32M bearing trees. All regions of Mindanao, have a higher average yield per tree relative to the national average except BARMM (39/nuts/tree/year).

The country's coconut production had an average of 22% difference between the first half of the year and the second half from 2015 to 2019. There were differences in trend among regions, as follows: MIMAROPA, CALABARZON (>60%), Bicol Region, Eastern Visayas, Central Visayas and Ilocos Region (30-45%), BARMM, Northern Mindanao, and Central Visayas (10-20%), Western Visayas, Cagayan Valley and Caraga (<10%), and Davao and SOCCSKSARGEN (<1%). Notably, Zamboanga Peninsula and CAR had higher yields in the first half of the year compared with the second half, with 2.4% and 26.4% differences, respectively.

#### TABLE 3.62. YIELD DIFFERENCE AMONG REGIONS BETWEEN THE JAN - JUNE AND JULY - DEC, 2015-2019, PHILIPPINES

| Region | Average Nut Yield (MT) | | Percent Difference | Difference in Nut Production (MT) |
|---|---|---|---|---|
| | Jan - June | July - Dec | | |
| CAR | 580 | 427 | 26.4 | 153 |
| Ilocos Region | 17,774 | 23,897 | -34.5 | (6,123) |
| Cagayan Valley | 35,935 | 38,981 | -8.5 | (3,045) |
| Central Luzon | 51,077 | 69,221 | -35.5 | (18,143) |
| CALABARZON | 592,499 | 955,678 | -61.3 | (363,179) |
| MIMAROPA | 270,831 | 515,403 | -90.3 | (244,572) |
| Bicol Region | 471,654 | 667,657 | -41.6 | (196,002) |
| Western Visayas | 204,559 | 221,608 | -8.3 | (17,049) |
| Central Visayas | 178,177 | 208,915 | -17.3 | (30,738) |
| Eastern Visayas | 468,939 | 640,231 | -36.5 | (171,293) |
| Zamboanga Peninsula | 853,308 | 832,897 | 2.4 | 20,411 |
| Northern Mindanao | 845,167 | 982,316 | -16.2 | (137,149) |
| Davao Region | 987,496 | 990,897 | -0.3 | (3,402) |
| SOCCSKSARGEN | 533,557 | 537,192 | -0.7 | (3,634) |
| Caraga | 379,994 | 407,656 | -7.3 | (27,662) |
| BARMM | 611,593 | 741,249 | -21.2 | (129,656) |
| PHILIPPINES | 6,454,571 | 7,875,460 | -22.0 | 1,420,889 |

The regional and provincial production trends discussed in this section highlight the need to consider production analysis at the provincial than the regional level. Within regions, there were stark differences in coconut production trends across provinces where only one, or at most three provinces, had significant contributions to coconut production. To better reflect the realities in the field and to be able to conduct a more strategic regional planning, productivity per tree is better reported at the provincial level.

Best approximation of actual field scenarios will enable good planning and informed decision-making particularly on prioritizing strategies to increase and sustain farm productivity and income of coconut farmers.

**TABLE 3.63. REGIONAL COCONUT STATISTICS, RANKING AND PERCENT CONTRIBUTION TO NATIONAL PRODUCTION, PHILIPPINES, 2019**

| Region | Area (ha) | 2019 Rank | Number of bearing trees | 2019 Rank | Yield (nuts/tree/year) | 2019 Rank | Volume of production (MT) | | 2019 Rank | % Contribution to National Production |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Whole Nuts | Copra Terms* | | |
| CAR | 321 | 16 | 32,330 | 16 | 28 | 16 | 913 | 145 | 16 | 0.01 |
| Ilocos Region | 12,541 | 15 | 896,462 | 15 | 48 | 6 | 42,621 | 6,777 | 15 | 0.29 |
| Cagayan Valley | 15,382 | 14 | 1,409,665 | 14 | 52 | 5 | 72,634 | 11,549 | 14 | 0.49 |
| Central Luzon | 28,129 | 13 | 3,172,753 | 13 | 37 | 11 | 118,401 | 18,826 | 13 | 0.80 |
| CALABARZON | 485,197 | 1 | 57,316,062 | 1 | 29 | 15 | 1,643,479 | 261,313 | 4 | 11.13 |
| MIMAROPA | 222,984 | 8 | 17,454,125 | 10 | 45 | 7 | 791,121 | 125,788 | 9 | 5.36 |
| Bicol Region | 453,994 | 3 | 35,131,082 | 4 | 35 | 12 | 1,246,479 | 198,190 | 6 | 8.44 |
| Western Visayas | 128,512 | 11 | 9,619,477 | 12 | 53 | 4 | 513,397 | 81,630 | 11 | 3.48 |
| Central Visayas | 124,775 | 12 | 12,326,929 | 11 | 34 | 13 | 422,514 | 67,180 | 12 | 2.86 |
| Eastern Visayas | 329,620 | 6 | 35,516,095 | 3 | 32 | 14 | 1,123,802 | 178,685 | 8 | 7.61 |
| Zamboanga Peninsula | 454,387 | 2 | 39,113,614 | 2 | 45 | 8 | 1,746,949 | 277,765 | 3 | 11.83 |
| Northern Mindanao | 303,978 | 7 | 32,160,623 | 7 | 57 | 3 | 1,836,112 | 291,942 | 2 | 12.44 |
| Davao Region | 356,384 | 4 | 33,963,500 | 6 | 57 | 2 | 1,931,955 | 307,181 | 1 | 13.08 |
| SOCCSKSARGEN | 206,411 | 9 | 17,576,306 | 9 | 66 | 1 | 1,160,991 | 184,598 | 7 | 7.86 |
| Caraga | 196,774 | 10 | 17,918,789 | 8 | 44 | 9 | 781,884 | 124,319 | 10 | 5.30 |
| BARMM | 332,484 | 5 | 34,344,380 | 5 | 39 | 10 | 1,331,805 | 211,757 | 5 | 9.02 |
| PHILIPPINES | 3,651,873 | | 347,952,192 | | 44 | | 14,765,057 | 2,347,644 | | 100.00 |

*Consistent trend in seasonal yield fluctuations

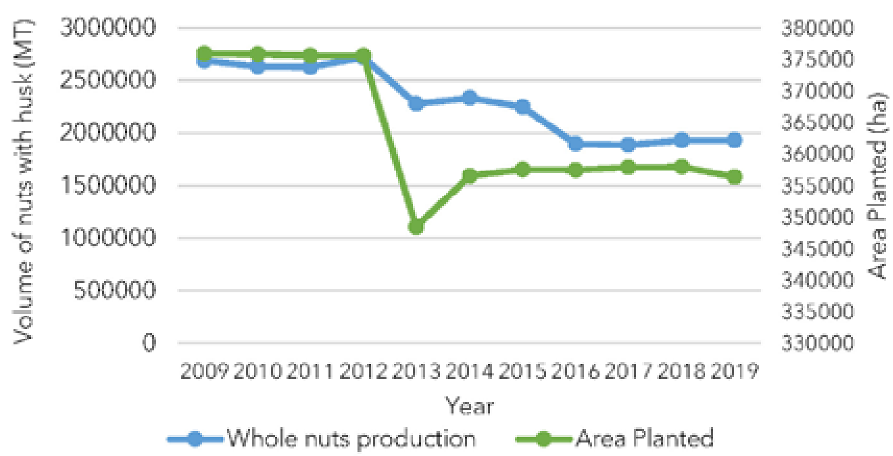
*Source: PSA*

# Davao Region Production Trend (2009-2019)

Davao Region has not yet recovered from two sharp production declines in 2013 and 2016. In 2019, the region had slid to 4th place in terms of coconut area with a net loss of 19,538 ha. In terms of coconut-bearing trees, the region went down to 6th place losing 5.8M bearing trees (Table 3.63). Figure 3.96 presents the nut production trend while Figure 3.97 presents the yearly growth trend in the provinces of Davao Region.

With approximately 2.7B nuts, Davao Region still maintained its position as the top coconut producer in 2019 despite significant losses in coconut area, number of bearing trees, and productivity per tree (from 68 nuts/tree in 2009 to 57 nuts/tree in 2019). Northern Mindanao trailed behind with 9.5M nuts. The semestral variation in yield was also not pronounced in Davao Region, with less than 1% difference between the first half and second half of the year (Table 3.62). Hence, supply was more predictable and reliable.

**FIGURE 3.96. VOLUME OF NUT PRODUCTION AND AREA PLANTED TO COCONUT IN DAVAO REGION, 2009–2019**




Basic source of data: PSA

From 2009 to 2019, Davao Region suffered seven years of zero to negative growth in nut production (i.e., 2010–2011, 2013, 2015–2017, and 2019). This situation is alarming since Davao Region is the country's top coconut producer. The overall production, area planted, and yield per tree were on a downward trend during those years. If the downward trend in production in Davao Region continues and the damaged areas are not replanted or replaced, the national production will contract and semestral yield variation will be more pronounced, threatening as well the reliability of supply. Continuing and upscaled rehabilitation and replanting of coconut areas in high-producing provinces of Davao Region are particularly critical for the long-term sustainability of coconut production and the industries dependent on it.

### TABLE 3.64. COCONUT REGIONAL AND PROVINCIAL STATISTICS, DAVAO REGION, 2019

| Province | Area (ha) | Number of Bearing trees | Yield (nuts/ tree/ year) | Volume of production (nuts MT) | Volume of production (copra MT) | % Regional Contribution |
|---|---|---|---|---|---|---|
| Davao del Norte | 37,421 | 3,422,591 | 62 | 211,770 | 33,671 | 11 |
| Davao del Sur | 33,896 | 3,485,191 | 63 | 218,404 | 34,726 | 11 |
| Davao Oriental | 144,596 | 13,839,105 | 47 | 657,323 | 104,514 | 34 |
| Compostela Valley | 44,950 | 3,191,450 | 57 | 181,877 | 28,918 | 9 |
| Davao City | 32,410 | 3,536,048 | 72 | 255,932 | 40,693 | 13 |
| Davao Occidental | 63,111 | 6,489,115 | 63 | 406,649 | 64,657 | 21 |
| Davao Region | 356,384 | 33,963,500 | 57 | 1,931,955 | 307,181 | 13%[a] |

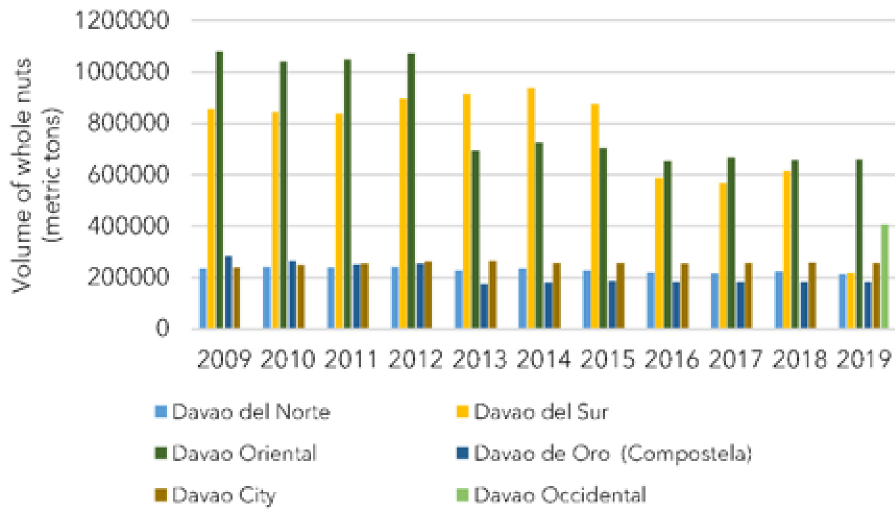
[a]*National production*

*Basic source of data: PCA*

### FIGURE 3.97. COCONUT PRODUCTION GROWTH RATE IN DAVAO REGION, 2009–2019


Basic source of data: PSA

## FIGURE 3.98. PROVINCIAL NUT PRODUCTION GROWTH RATE IN DAVAO REGION, 2009–2019




Note: Davao Occidental data before 2019 was included in Davao del Sur
Basic source of data: PSA

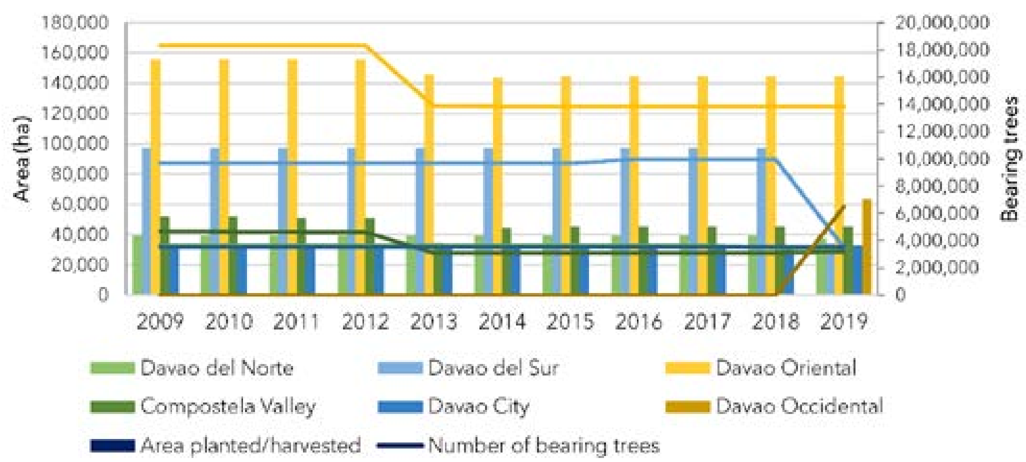
Category 5 Super Typhoon Bopha (Pablo) in 2012 was the strongest tropical cyclone that hit Mindanao. The typhoon caused massive losses in many areas along its path, specifically in Davao Region and Caraga Region where the most severe damages were incurred. Davao Region lost almost 6M bearing trees particularly in Davao Oriental and Compostela Valley. The province of Davao Oriental reported a 40% loss both in coconut production and hectarage while Compostela Valley lost 33% and 52% of their coconut production and areas,respectively (www.reliefweb.int). Both provinces have not recovered from these losses until 2019 (Figure 3.98).

Davao Oriental, Davao del Sur, and Davao Occidental contributed about 65% to the regional production of Davao Region (Figure 3.98 and Table 3.64). Davao Oriental and Davao del Sur contributed 34% and 32%, respectively, while Davao Occidental contributed 21% to the regional production in 2019.

Without further loss in area and number of trees, the decline in nut production in the region persisted because of the severe and prolonged El Niño that lasted for 18 months between February 2015 and July 2016. This phenomenon severely affected 16 of the country's 18 regions, with strongest impact in Mindanao that affected 27 provinces. (DA

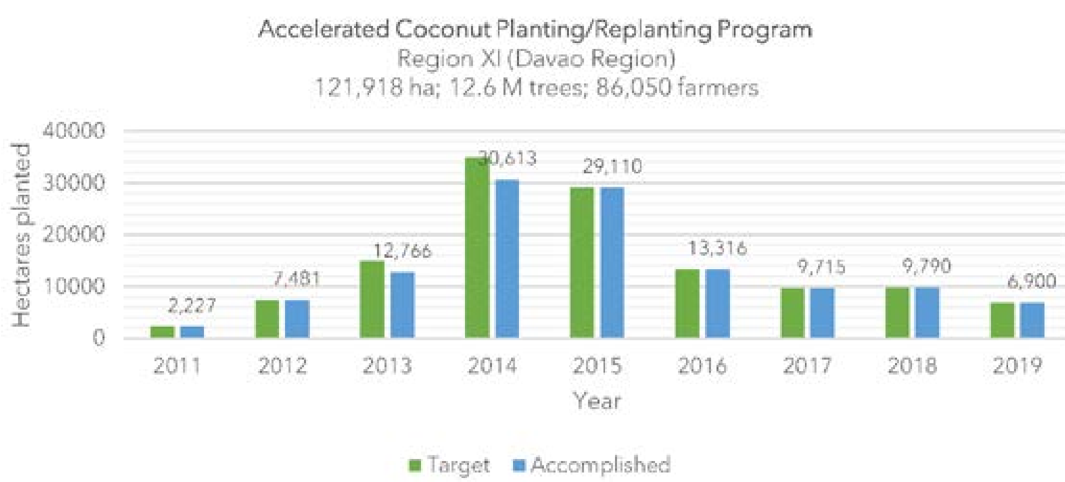
July 2016). In Davao Region, the major producers—Davao Oriental and Davao del Sur—were severely affected. Davao Sur and Davao Occidental were more severely hit by the El Niño, and have also not fully recovered their production volume by 2019 (Figure 3.98).

**FIGURE 3.99. COCONUT AREA PLANTED/HARVESTED AND NUMBER OF BEARING TREES IN DAVAO REGION, 2009–2019**




Basic source of data: PSA

**FIGURE 3.100. TARGETS AND ACCOMPLISHMENTS OF THE ACCELERATED COCONUT PLANTING/REPLANTING PROJECT OF PCA IN DAVAO REGION, 2011–2019**




Basic source of data: PSA

This concern has been addressed by PCA's planting and replanting program that reported significant accomplishments from 2011 to 2019. A total of almost 122,000 ha were planted/replanted with 12.6M seedlings, benefiting 86,050 farmers in the region. This figure is almost 32% of the total area in the region in 2009 (Figure 3.100).

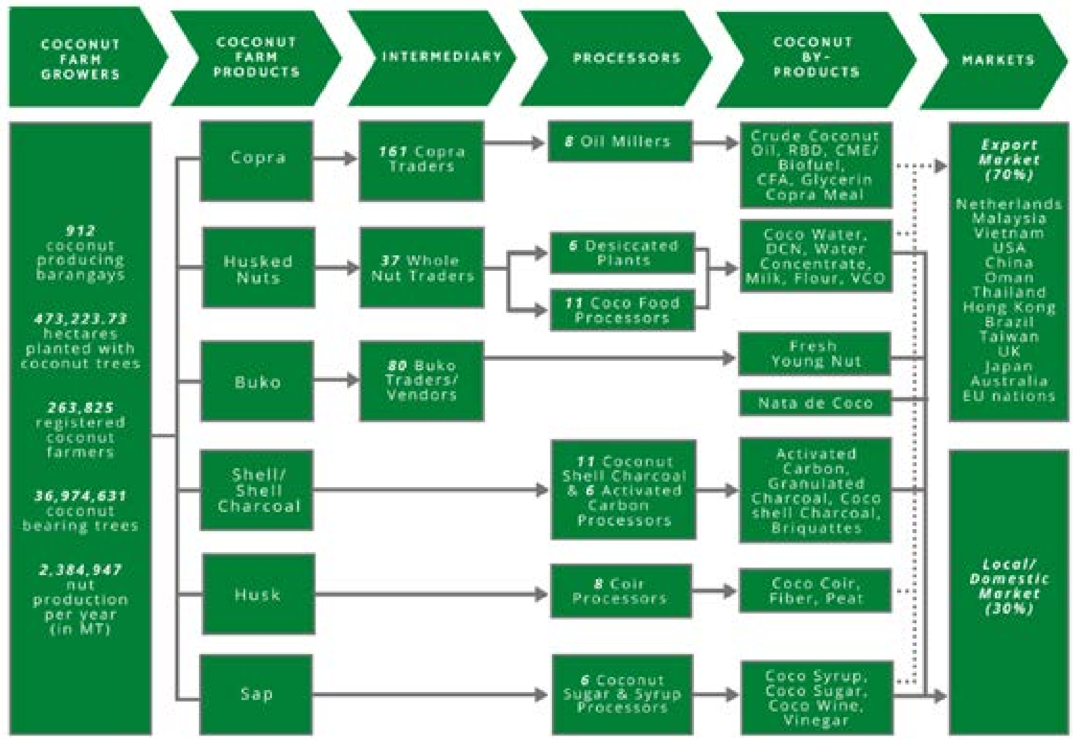
Of the total accomplishments, 4.4M seedlings were planted in Davao Oriental, 2.5M in Davao del Sur/Davao Occidental (2019), and 2.1M in Compostela Valley (Davao de Oro). Assuming that survival rate is at 75%, the coconut trees planted should offset all losses in coconut hectarage incurred by the region; however, this recovery was not reflected in the 2019 data of the PSA. According to the data, Davao Oriental is still short by 11,300 ha from its hectarage in 2012 and Compostela Valley, by 6,200 ha.

Davao Region has a total land area of 473,223 has apportioned for coconut (Figure 3.101). There are only about 912 coconut-producing barangays in Davap. Although this number appears to be small, it already represents 78% of the entire barangays in the Region. Given the vast land allotted to coconut and a small number of barangays, on average, the landholdings for coconut per barangay is roughly more than 500 has compared with other regions that have an estimated 80 to 325 has of land. There are 263,825 coconut farmers that can be the source of the raw materials to the processors via copra, matured nuts, and buko intermediaries. These farmers must be protected with comprehensive insurance packages from the national government.

Predominant in the place are coco shell charcoal producers, desiccators, coco food processors, oil millers, coir, and coco syrup companies. Around 70% of the goods produced in the region are destined for export. The improvement in farm production is crucial to the region as there are several competing uses from multitudes of processors. Similar to Region X, expansion of farmlands is beneficial for Davao Region due to the high suitability of the land for coconut plantation and its present high productivity rate.

Davao Region has a widespread growth in the coconut industry. Hence, every node in the value chain must be carefully evaluated. Interventions laid out in Chapter VIII would matter for every player in the value chain segment. To highlight a few, the proposed Farmer-Owned White Copra Central (FWCC) and Farmer- Owned Copra Buying Station (FCBS) would resolve the need to involve the farmers in the trading and processing sectors. This intervention would also help stabilize the supply of nuts to large companies. Some of the weaknesses of the industry, as pointed out in the roadmap, are lack of

**FIGURE 3.101. PRODUCT FLOW MAP OF THE COCONUT INDUSTRY IN DAVAO REGION, 2021**




Source: PCA Region XI, 2019

trainings or expertise on value- adding, low farm production and productivity due to senility and poor agricultural practices, weak organizational capacities of farmers' organizations, farmers limited access to financing, poor or inconsistent quality of copra, among others (PCA Region XI, 2019). To address these weaknesses, the following interventions are proposed: training on new value-adding technologies, expansion of hybridization and fertilization program, provision of incentives for farmers in adopting Good Agricultural Practices (GAP), support to farmer organizations securing certification for GAP, capacity building of coconut farmers' organizations, and special financing window for farmers' organizations.

The data reflected by the PSA is much lower than the PCA data: this discrepancy in reporting calls for data reconciliation and harmonization. The PCA Regional Coconut Statistics (2019) reported 2.38B nuts harvested from about 37M bearing trees.

The COCOFIRM Program Team recommends the regular monitoring of the survival and field performance of the new plantings. Assessment of the survival rate, particularly of those planted the year before and during the severe El Niño of 2015–2016, would be harsh for the seedlings planted in more than 50,000 ha at that time, as well as the 43,000 young palms planted in the previous two years. Surviving palms planted from 2011 to 2014, totaling 51,000 ha should start to be productive in 2019, and surviving palms that were planted until 2019 are expected to be productive by 2024. Yield performance of these young coconut populations would be important in projecting yield beyond 2024. Applying GAP to already highly productive and suitable areas will further increase yield levels.

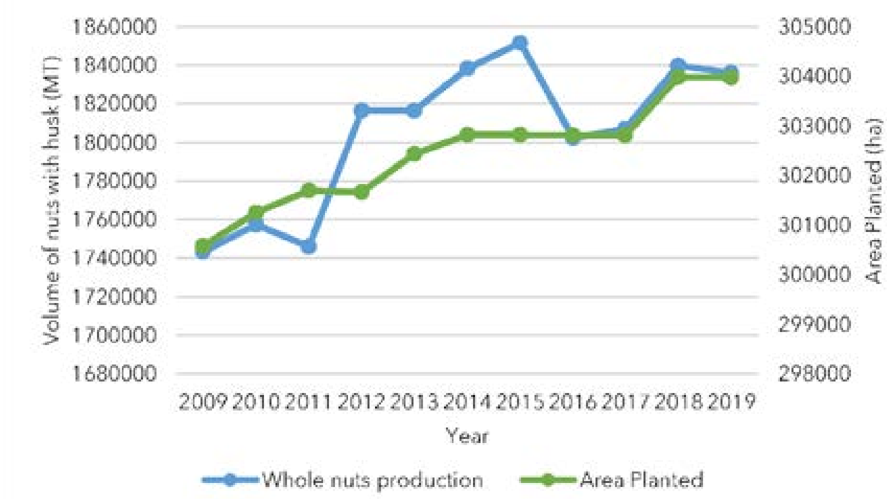
Prioritizing hybrid planting in owner-tiller farms (coconut ARCs) in Davao Region, with additional criteria on climate hazards assessment and mitigation (e.g., identifying source of supplemental irrigation), will significantly contribute to future-proofing the sustained growth of the coconut industry.

## Northern Mindanao Production Trend (2009-2019)

Northern Mindanao contributed 12% to the national coconut production. Three of the five provinces namely, Lanao del Norte, Misamis Oriental, and Misamis Occidental equally contributed about 30% each to the region's total production.

From 2009 to 2019, the region increased its coconut area by 3,400 ha (Figure 3.102). While production was reduced by approximately 3% in 2016 and 2017, presumably due to the impact of the 18 months of El Niño in 2014–2015, the upward trend to recovery has already started but never reached the high level of production in 2015.

**FIGURE 3.102. VOLUME OF WHOLE NUT PRODUCTION AND AREA PLANTED TO COCONUT IN NORTHERN MINDANAO, 2009–2019**




Note: The net change in area planted is not consistent with PCA's report of accomplishment in their planting /replanting program

From 2011 to 2019, the PCA reported planting/ replanting of 28,341.4 ha of coconut area (with 3,273,177 seedlings) in the region. This area is equivalent to less than 2% of the coconut hectarage in 2011. According to data provided in the regional roadmap, about 13% of the trees (4.8M) were senile. Although slow, consistent year- by-year planting/ replanting program can offset the reported 353,401 trees cut from 2011 to 2019, but still inadequate in replacing senile trees. Nonetheless, at 75% survival of newly planted trees, minus the losses from cutting and converted farms, there should be about 17,600 ha of young coconut populations that are expected to be productive by the year 2024.

The total number of farmers expected to be given social protection is 153,050 (Figure 3.105). Farms covered 1,355 coconut-producing barangays or around 66% of the entire scope of Region X. There are still areas for expansion as identified in the regional roadmap although land-use conversion is recognized as a threat. Given that the land of Northern Mindanao is classified as highly suitable for coconut plantation, it pays off to plant and replace senile trees with hybrid varieties. The establishment of coconut seed farms per province is envisioned in the future together with the identification of suitable fertilizers location-wise (PCA Region X, 2019).

**FIGURE 3.103. VOLUME OF WHOLE NUT PRODUCTION PER PROVINCE IN NORTHERN MINDANAO, 2009–2019**

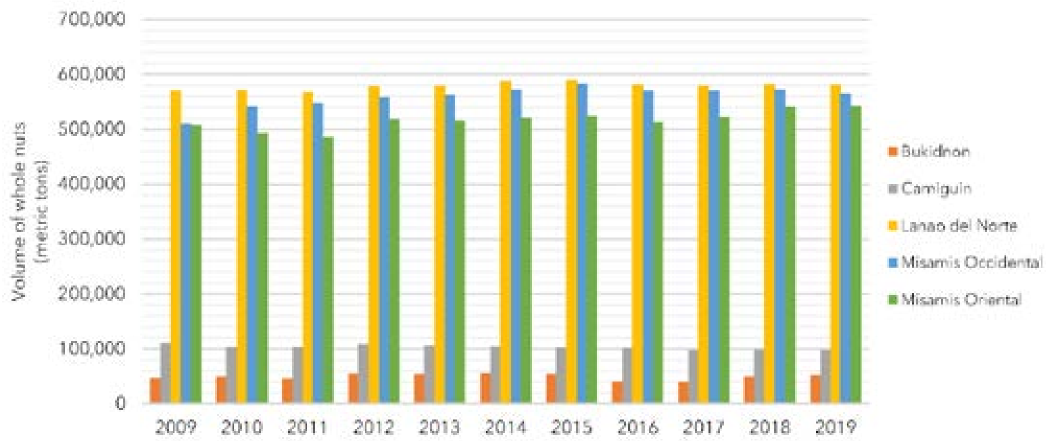
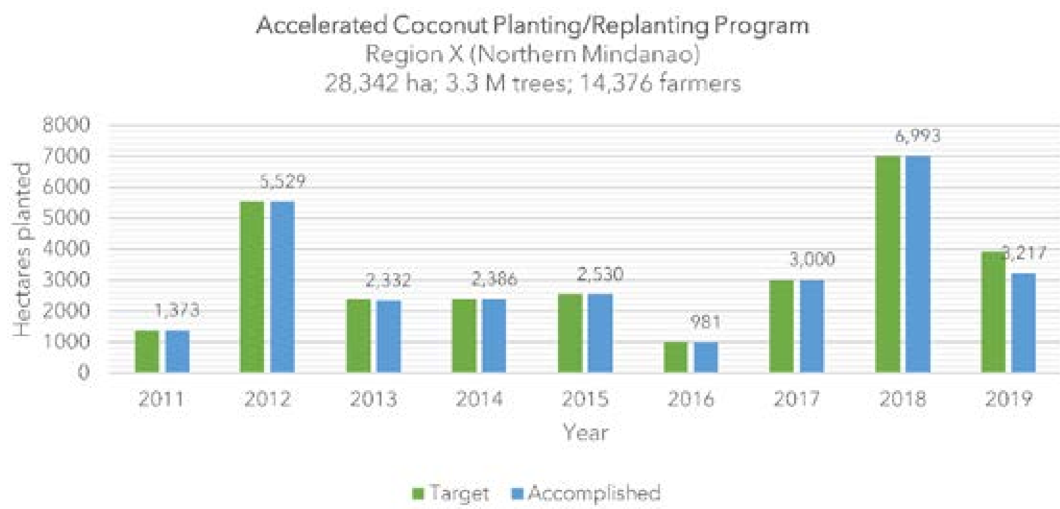



**FIGURE 3.104. TARGETS AND ACCOMPLISHMENT OF PLANTING/REPLANTING PROGRAM OF PCA IN NORTHERN MINDANAO, 2011–2019**

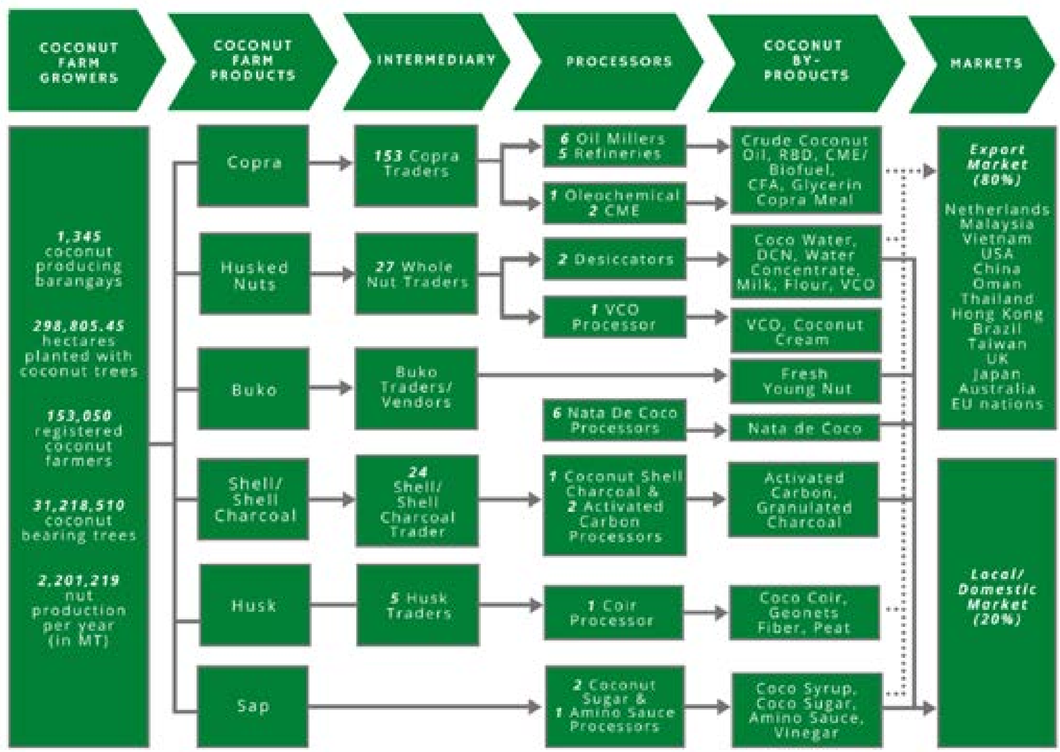



Copra and whole nuts are commonly traded in the region but husk traders also exist, and coco shell traders are more prevalent. From the coco farms, nuts are distributed to different processors through these traders. Well-known and huge oil millers, refineries, and oleochemical companies that require an extremely large number of nuts are well-established in the region. These oleochemical and oil companies are the top export earners in the region. Nata de coco producers are also numerous in the place. Operating plants for VCO, DCN, coco sugar, activated carbon, coco shell charcoal, coco coir, and amino acid are found in this region. Coconut products are the number one exports in the region among all other commodities. For coconut, Northern Mindanao is highly dependent on exports (80%) rather than on domestic sales (PCA Region X, 2019).

Similar to other regions, the establishment of FWCC and FCBS would benefit several processors in the area. The interventions in Northern Mindanao would be similar to those in Region IV in the case of coconut oil or refineries while nata de coco must also be given emphasis. The regional roadmap endorsed the following: the setting of floor price (of what) which is essential to the farmers, availability of efficient processing machinery, the budget allocation of the different levels of government units, and market enhancement of the emerging non-traditional coconut products (PCA Region X, 2019).

There was a 16% difference in nut production between the first half of the year and the second half with July-December having the higher yield for a difference of about 137M nuts (Table 3.62). Despite this yield difference, the provinces of Northern Mindanao—particularly Lanao del Norte, Misamis Occidental, and Misamis Oriental—could be reliable sources of feedstocks due to their high and more or less stable yields in 2009–2019. These provinces were apparently less severely affected by the typhoons and El Niño compared with other regions/provinces in Mindanao. These are the provinces that should be given priority in area expansion with hybrids and selected OPVs, and in the application of GAP and intercropping, where viable.

## FIGURE 3.105. PRODUCT FLOW MAP OF THE COCONUT INDUSTRY IN NORTHERN MINDANAO, 2021




Source: PCA Region X, 2019

## TABLE 3.65. COCONUT REGIONAL AND PROVINCIAL STATISTICS, NORTHERN MINDANAO, 2019

| Province | Area (ha) | Number of Bearing trees | Yield (nuts/ tree/ year) | Volume of production (nuts MT) | Volume of production (copra MT) | % Regional Contribution |
|---|---|---|---|---|---|---|
| Bukidnon | 9,500 | 893,000 | 57 | 51,157 | 8,134 | 2.8 |
| Camiguin | 14,867 | 2,015,770 | 48 | 97,234 | 15,460 | 5.3 |
| Lanao del Norte | 77,571 | 8,535,810 | 68 | 580,501 | 92,300 | 31.6 |
| Misamis Occidental | 97,631 | 10,604,732 | 53 | 565,150 | 89,859 | 30.8 |
| Misamis Oriental | 104,409 | 10,111,311 | 54 | 542,071 | 86,189 | 29.5 |
| Northern Mindanao | 303,978 | 32,160,623 | 57 | 1,836,112 | 291,942 | 12[a] |

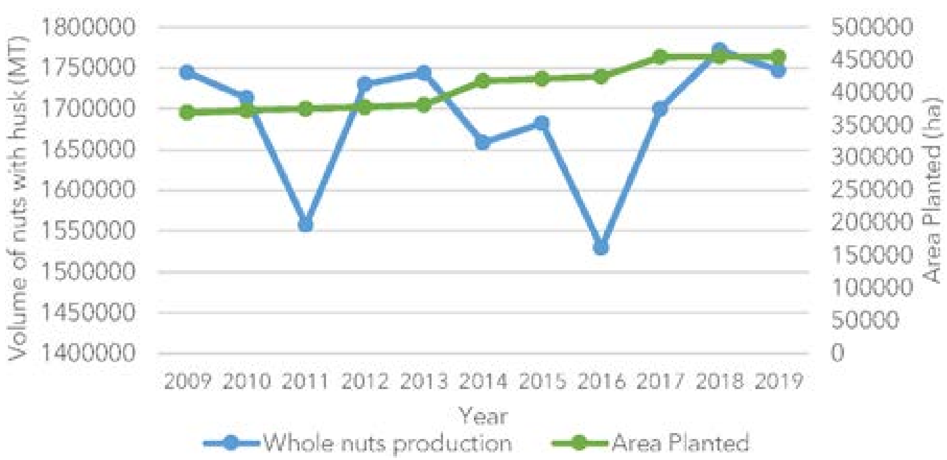
[a]*National production*

# Zamboanga Peninsula Production Trend (2009-2019)

Zamboanga has consistently increased its coconut hectarage year after year. From 2009–2019, coconut occupied about 454,000 ha, an increase of 85,375 ha from 2009. This was consistent with PCA's planting/replanting program which reported an accomplishment of 86,700 ha planted with 9.2M seedlings and benefiting 53,000 farmers.

The volume of production was highly fluctuating with a significant reduction in 2010–2011, 2013, and 2016. These fluctuations were presumably caused by El Niño (2009; 2014–2015) and by the typhoon(s) in 2013. Recovery after each decline was immediate, and by 2019, the region has already regained its 2009 level of production. The total volume of production was saved by the increased production in Zamboanga del Norte.

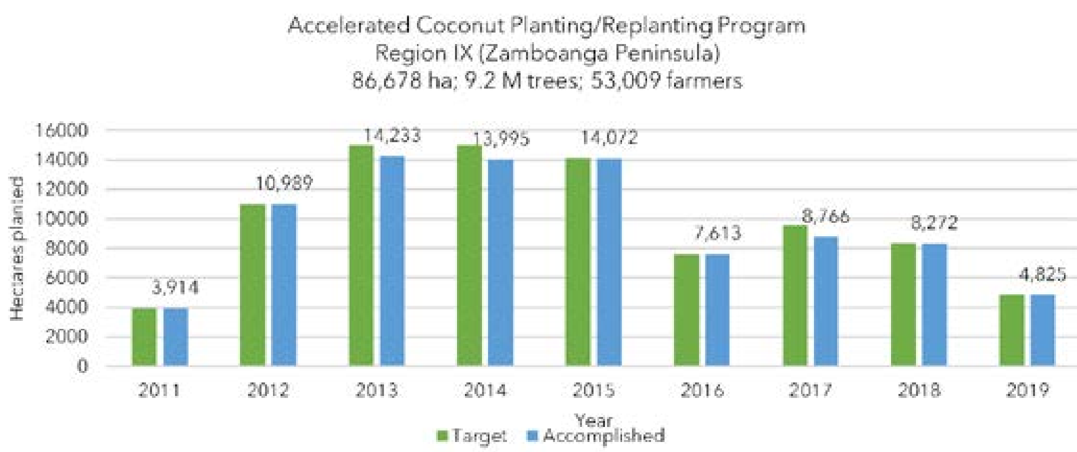
**FIGURE 3.106. VOLUME OF WHOLE NUT PRODUCTION AND AREA PLANTED TO COCONUT IN ZAMBOANGA PENINSULA, 2009–2019**




Basic source of data: PSA

Two provinces, Zamboanga del Norte and Zamboanga del Sur, contributed 76% of the regional production. Regional fluctuation was heavily affected by the changes in the volume of production in these two provinces. Zamboanga del Norte, despite the external shocks and risks, was even able to surpass its 2009 nut production by almost 103M MT, reaching almost 840M MT. Zamboanga del Sur, on the other hand, had a net loss of 76M MT. Zamboanga Sibugay's production was fairly constant while Zamboanga City had a net loss of 43.6M MT over the same period.

**FIGURE 3.107. TARGETS AND ACCOMPLISHMENTS OF THE ACCELERATED COCONUT PLANTING/REPLANTING PROJECT OF PCA IN ZAMBOANGA PENINSULA, 2009–2019**

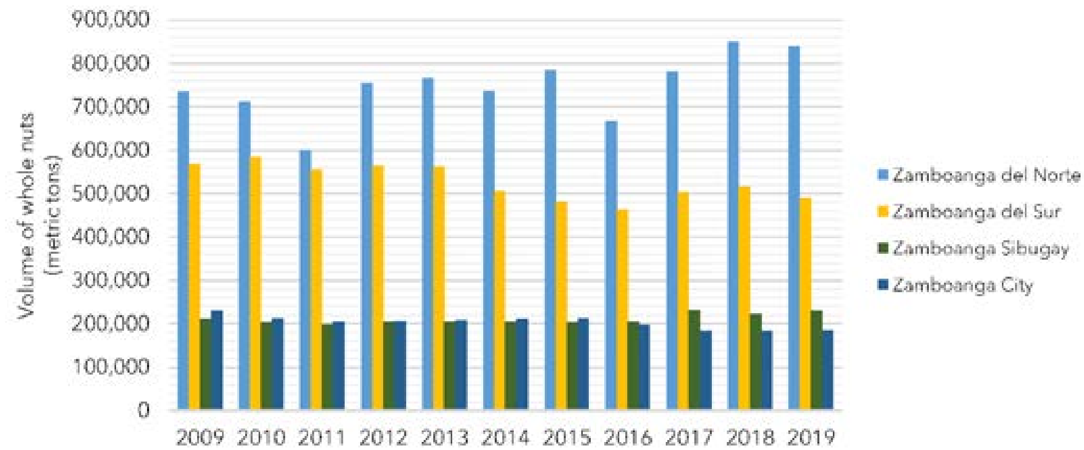



Basic source of data: PSA

There was a small variation in yield in Zamboanga Peninsula between the first half of the year and the second half, indicating a more reliable supply. Unlike in most other regions (other than CAR), the yield during January–June was higher by about 2% compared with the yield in July–December.

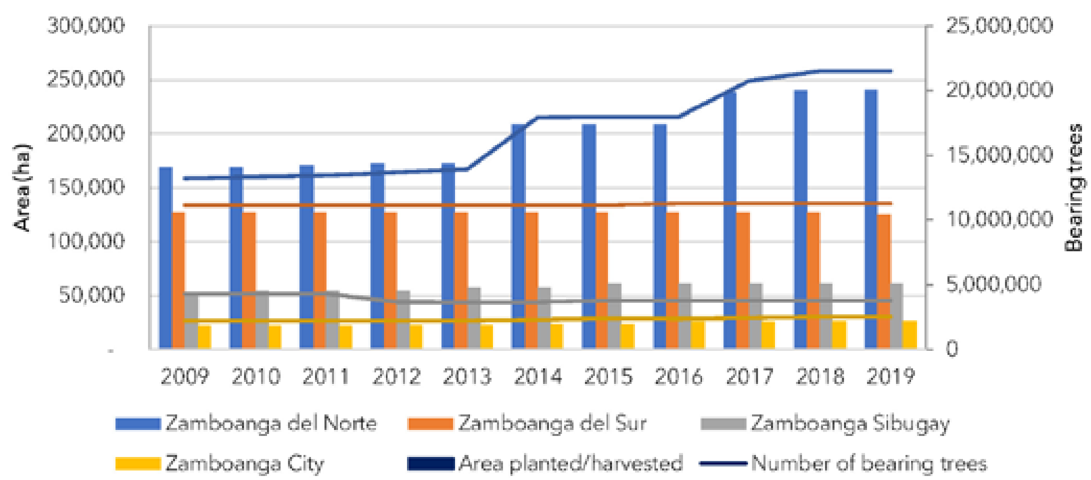
Ironically, Zamboanga del Norte and Zamboanga del Sur, the two provinces with the highest coconut hectarage, had the lowest yield of 39 nuts per tree/year and 44 nuts per tree/year, respectively. In contrast, the two minor coconut-producing provinces had above average yields of 61 nuts per tree/year for Zamboanga Sibugay and 74 nuts per tree/year for Zamboanga City.

## FIGURE 3.108. VOLUME OF WHOLE NUT PRODUCTION PER PROVINCE IN ZAMBOANGA PENINSULA, 2009–2019




Basic source of data: PSA

## FIGURE 3.109. COCONUT AREA PLANTED/HARVESTED AND NUMBER OF BEARING TREES PER PROVINCE IN ZAMBOANGA PENINSULA, 2009–2019



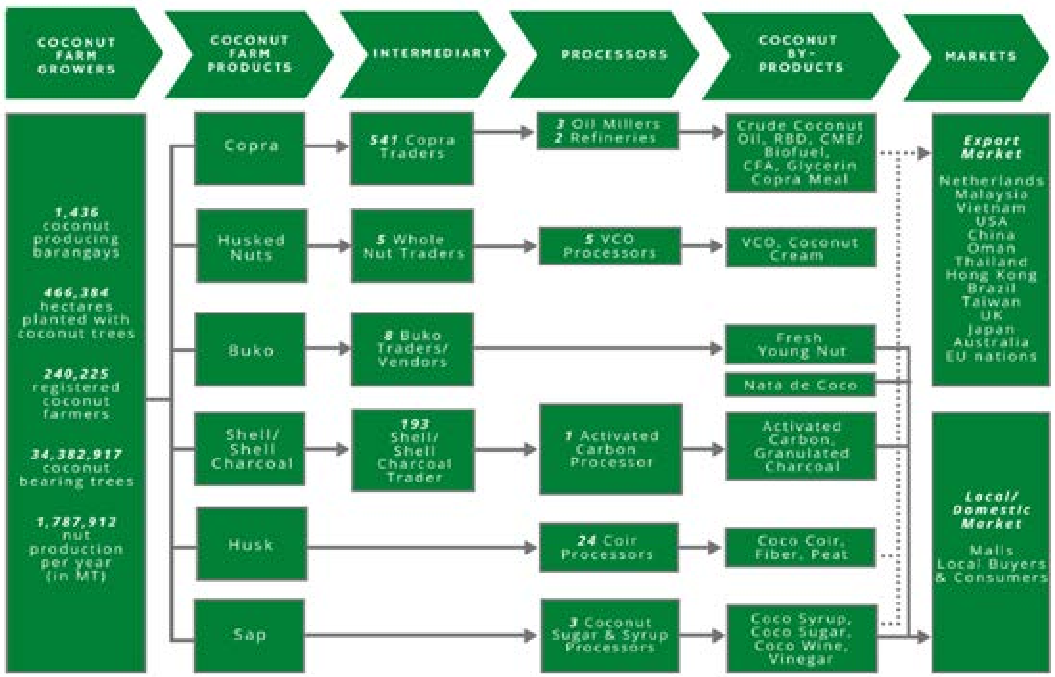

Basic source of data: PSA

The portion of coconut farmers to the total employment in Zamboanga Peninsula is more than a tenth (11%) of the region. These 240,225 farmers must be provided with social protection. Barangays with coconut trees constitute 75% of the villages and an estimated 10% of the nation's bearing coconut trees. The land of Zamboanga Peninsula is classified as highly suitable for coconut growing. Its coconut productivity is close to the national average, that is, 45 nuts per year.

Coir processors are the most predominant in Zamboanga Peninsula followed by VCO and oil millers. Coco sugar, activated carbon, and refineries are also present in the area. Similar to Eastern Visayas, the establishment of community-based processing plants, on-wheels coconut husks chipping machines, and coco coir rubberizing plant is recommended for the coir industry to flourish. The concerns on value adding, high operational cost, and limited capitalization in coir industry can be addressed through skills development, upgrading of value-adding technologies, construction of secondary roads, financial assistance in getting certifications, adoption of productivity and quality enhancing technologies, installation of mechanical equipment, and provision of financing program. Strategic planting can maximize the full benefits of planting and replanting in the area. Due to the presence of oil millers and VCO plants in the area, a coconut variety full of meat can be adopted, while a variety with thick husks can also be planted to accommodate the coir processor's needs.

In 2019, Zamboanga Peninsula contributed 12% to the national production, of which 48% was supplied by Zamboanga del Norte with a below-average provincial yield. Zamboanga del Sur supplied 28% with about half the hectarage and number of trees of Zamboanga del Norte. Surviving trees planted from 2009–2014 should have started producing nuts by 2019, and by 2024, the surviving trees of the 9.2M planted up to 2019 should all be productive. These populations of young trees, 60% of which were planted in Zamboanga del Norte and Zamboanga del Sur, should be managed using good and sustainable agricultural practices to achieve high yields. Zamboanga Sibugay and Zamboanga City, where suitable expansion areas are available, should be prioritized for planting, replanting hybrids, selecting OPVs, and good and sustainable agricultural practices.

## FIGURE 3.110. PRODUCT FLOW MAP OF THE COCONUT INDUSTRY IN ZAMBOANGA PENINSULA, 2019




Source: PCA Region IX, 2019

## TABLE 3.66. COCONUT REGIONAL AND PROVINCIAL STATISTICS, ZAMBOANGA PENINSULA, 2019

| Province | Area (ha) | Number of Bearing trees | Yield (nuts/ tree/ year) | Volume of production (nuts MT) | Volume of production (copra MT) | % Regional Contribution |
|---|---|---|---|---|---|---|
| Zamboanga del Norte | 240,898 | 21,521,413 | 39 | 838,703 | 133,354 | 48 |
| Zamboanga del Sur | 125,739 | 11,289,400 | 44 | 491,528 | 78,153 | 28 |
| Zamboanga Sibugay | 61,178 | 3,781,260 | 61 | 230,196 | 36,601 | 13 |
| Zamboanga City | 26,572 | 2,521,541 | 74 | 186,523 | 29,657 | 11 |
| Zamboanga Peninsula | 454,387 | 39,113,614 | 45 | 1,746,949 | 277,765 | 12[a] |

[a]National production

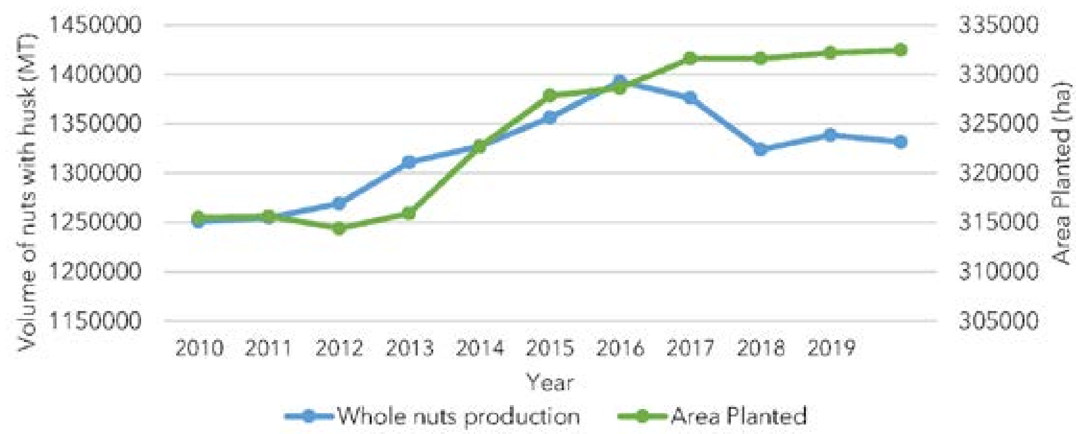
*Basic source of data: PSA*

# BARMM (Bangsamoro Autonomous Region in Muslim Mindanao) Production Trend (2009–2019)

BARMM is a promising area for coconut. Production trend showed a consistent increase in area planted with a net increase of about 17,000 ha from 2009 to 2019. The region produced 1.3B nuts in 333,000 ha in 2019. Maguindanao contributed 57% to the total nut production in BARMM. There was seasonality in the production trend with about 21% higher yield in the second half of the year compared with the first half (January–June) (Table 3.62).

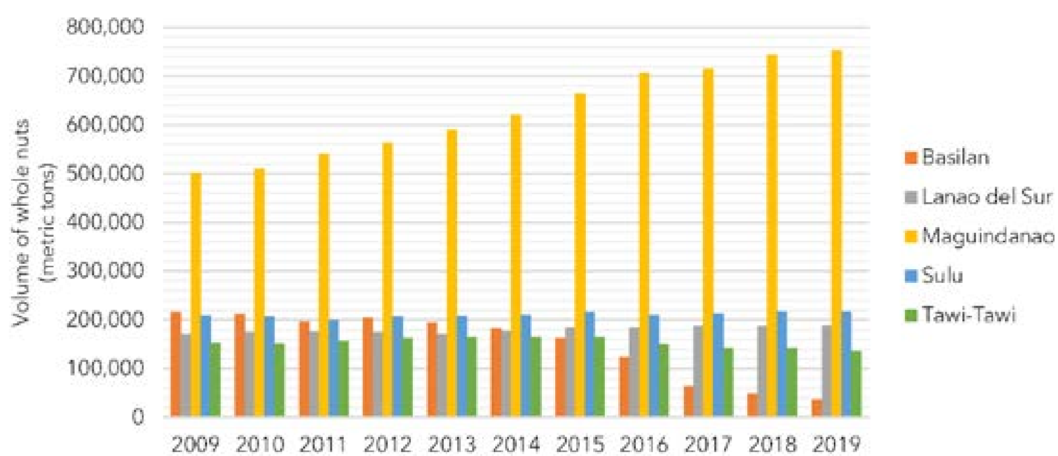
Maguindanao had the highest computed yield among the provinces in the country at 72 nuts/tree/year or about 57% of the total regional production (Table 3.67). With 10.5M bearing trees, Maguindanao should be prioritized for promoting and incentivizing farmers to practice GAP or organic production. Meanwhile, Sulu and Lanao del Sur are 2nd and 3rd to the highest regional contribution to production at 16% and 14%, respectively. The production trends of the three BARMM provinces showed a continuous increase from 2009 to 2019. Maguindanao also has the highest yield among all provinces at 72 nuts/tree/year, and with young bearing palms from the increased plantings from 2010 to 2019, adoption of GAP will further increase the province's volume of production.

**FIGURE 3.111. VOLUME OF WHOLE NUT PRODUCTION AND AREA PLANTED TO COCONUT IN BARMM, 2009–2019**




Basic source of data: PSA

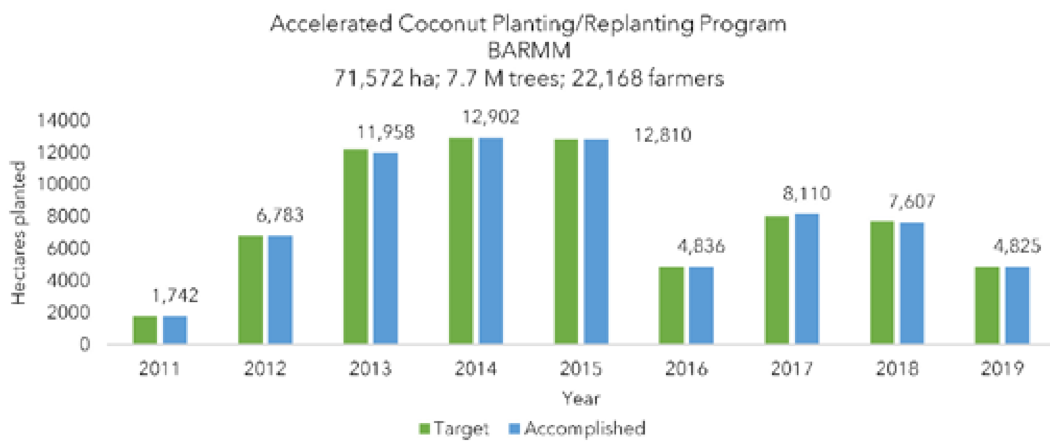
**FIGURE 3.112. VOLUME OF WHOLE NUT PRODUCTION PER PROVINCE OF BARMM, 2009–2019**




Basic source of data: PSA

The trend in coconut production in the region suggests that the region was able to persist despite the series of typhoons and the onset of El Niño in 2015–2016. Where areas with owner-tillers are available, expanding hybrid planting in Maguindanao is promising.

**FIGURE 3.113. TARGETS AND ACCOMPLISHMENTS OF THE ACCELERATED COCONUT PLANTING/REPLANTING PROJECT OF PCA IN BARMM, 2009–2019**




Basic source of data: PSA

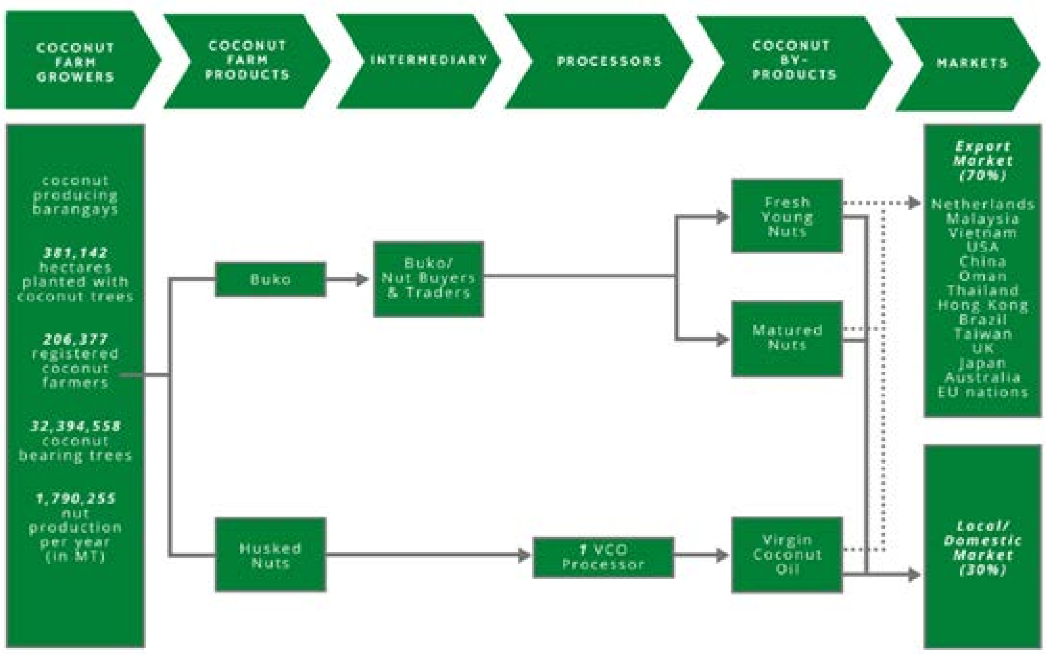
Analysis at the provincial level provides a better insight into the variability of the environment within the region, thus statistics at the regional level may not be reflective of the realities therein.

The coconut resources in Bangsamoro region consist of 21 M coconut-bearing trees planted in 283,018 has of land. These farms are being operated by 138,784 registered farmers located in 1,202

barangays in five provinces of the region. These farmers are expected to receive social protection from the Coco Levy Funds. The provinces in Bangsamoro are classified as highly suitable for coconut planting. The COCOFIRM Program recommends that the hybrid varieties be used for planting and replanting in this region to improve its average yield of 39 nuts/tree/year, which is below the national average of 44 nuts/tree/year.

Coconut products are in the form of fresh young nuts and matured nuts that reach the buyers in unprocessed form. There are several traders but there is only one processor (VCO) in the region. These goods are transported both for domestic and foreign markets. Since VCO is an emerging industry, a variety that is characterized by the thickness of meat is an appropriate one for the farmers. Interventions that may be suitable aside from enriching the production side would be entrepreneurship programs, market development, and financing programs to spur the growth of coconut enterprises in the region. More so, the development of the processing sector is highly recommended through the provision of capital and accessible and affordable loans, shared facilities programs, establishment of village-level integrated coconut processing technologies, skills development, and training on new value-added technologies. Other forms of support include capacity building for farmer's groups, establishment of road networks in remote barangays and electricity, infrastructure development such as transportation, communication or bridges that would ease the connection of the dispersed provinces in the region. The budget should be allocated for diversification and fertilization of small farms and for additional staff at the PCA XIV BARMM for extension services.

## FIGURE 3.114. PRODUCT FLOW MAP OF THE COCONUT INDUSTRY IN BARMM, 2021




Source: PCA BARMM, 2019

## TABLE 3.67. COCONUT REGIONAL AND PROVINCIAL STATISTICS, BARMM, 2019

| Province | Area (ha) | Number of Bearing trees | Yield (nuts/ tree/ year) | Volume of production (nuts MT) | Volume of production (copra MT) | % Regional Contribution |
|---|---|---|---|---|---|---|
| Basilan | 63,000 | 6,185,713 | 6 | 37,746 | 6,002 | 3 |
| Lanao del Sur | 46,381 | 4,599,100 | 41 | 187,567 | 29,823 | 14 |
| Maguindanao | 113,046 | 10,513,217 | 72 | 752,611 | 119,665 | 57 |
| Sulu | 70,000 | 8,400,000 | 26 | 217,091 | 34,517 | 16 |
| Tawi-Tawi | 40,057 | 4,646,350 | 29 | 136,791 | 21,750 | 10 |
| BARMM | 332,484 | 34,344,380 | 39 | 1,331,805 | 211,757 | 9.2[a] |

[a]*National production*
*Basic source of data: PSA*

PCA reported to have planted/replanted 71,572 ha in BARMM with 7.7M seedlings and benefiting 22,168 farmers from 2009 to 2019; 40% of these seedlings were planted in Maguindanao. About 391, 852 trees were reported cut under RA 8084, and no coconut farm applied for conversion in 2009–2019. Nut production during the first half of the year was consistently lower than in the second half by about 21% or 130,000 MT.

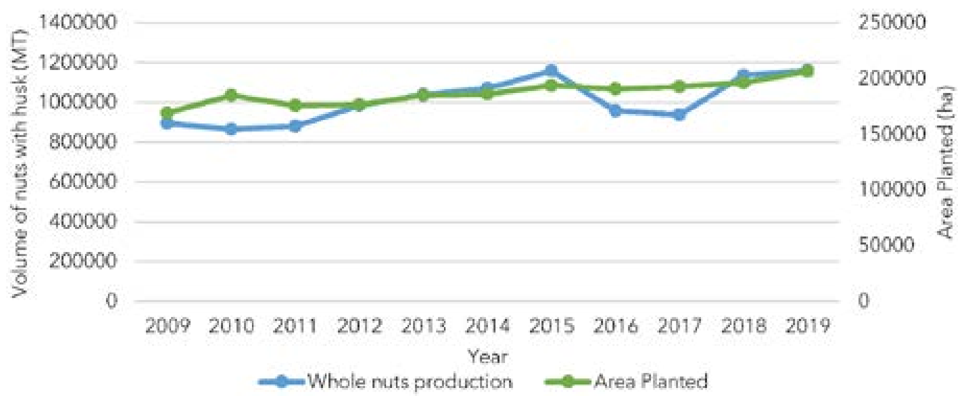
# SOCCSKSARGEN Production Trend (2009–2019)

Production trend showed a consistent increase in area planted with a net increase of about 37,000 ha from 2009 to 2019. The region produced 1.16B nuts in 206,400 ha in 2019 (Figure 3.115). SOCCSKSARGEN

contributed 8% to the national nut production (Table 3.62). Unlike most regions, SOCCSKSARGEN was a stable supplier of nuts with less than 1% difference in yield between the first and second half of the year.

Sarangani dominated the coconut production in the region, contributing an estimated 48% to the total regional production. Sultan Kudarat came second, despite having the lowest number of bearing trees in the region. The province was able to contribute 20% to the regional production due to its high yield per tree. North Cotabato, which has the 2nd largest number of bearing trees, contributed 16%. The province also has the lowest yield per tree in the region at 48 nuts/tree per year. South Cotabato contributed the lowest (15%).

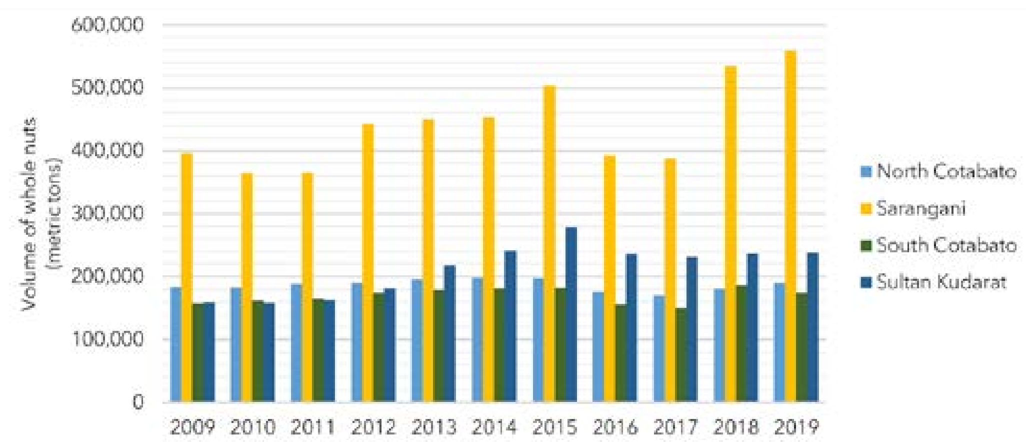
**FIGURE 3.115. VOLUME OF WHOLE NUT PRODUCTION AND AREA PLANTED TO COCONUTS IN SOCCSKSARGEN, 2009–2019**




Basic source of data: PSA

Heavy dependence on Sarangani as the major contributor to regional production is a particular concern because it was severely affected by El Niño events of 2009 and 2015–2016 that caused a sharp yield decrease in the succeeding two years (Figure 3.116).

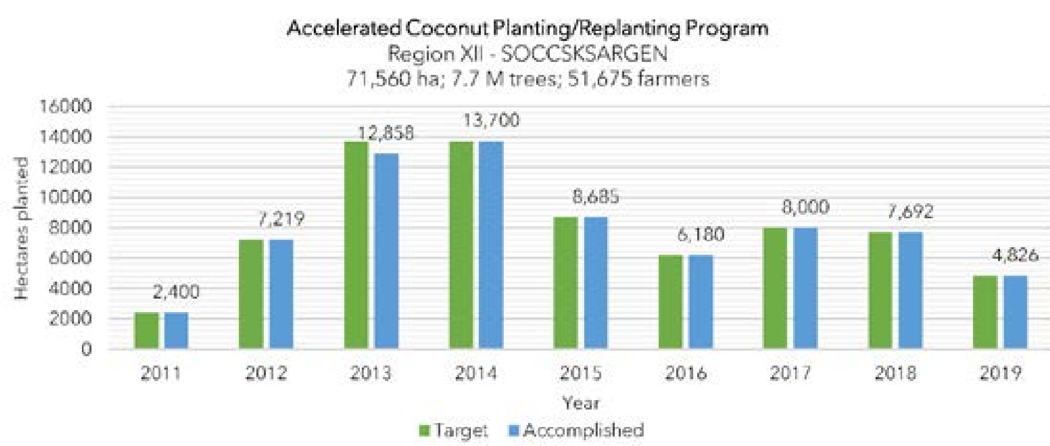
## FIGURE 3.116. VOLUME OF WHOLE NUT PRODUCTION PER PROVINCE OF SOCCSKSARGEN, 2009–2019




Basic source of data: PSA

SOCCSKSARGEN has the highest computed yield among all regions in the country at 66 nuts/tree/year. All four provinces have above-average yields with Sultan Kudarat recording the highest among all the provinces at 95 nuts per tree. This high yield indicates a potential expansion area for coconut production.

## FIGURE 3.117. TARGETS AND ACCOMPLISHMENTS OF THE ACCELERATED COCONUT PLANTING/ REPLANTING PROJECT OF PCA IN SOCCSKSARGEN, 2009–2019

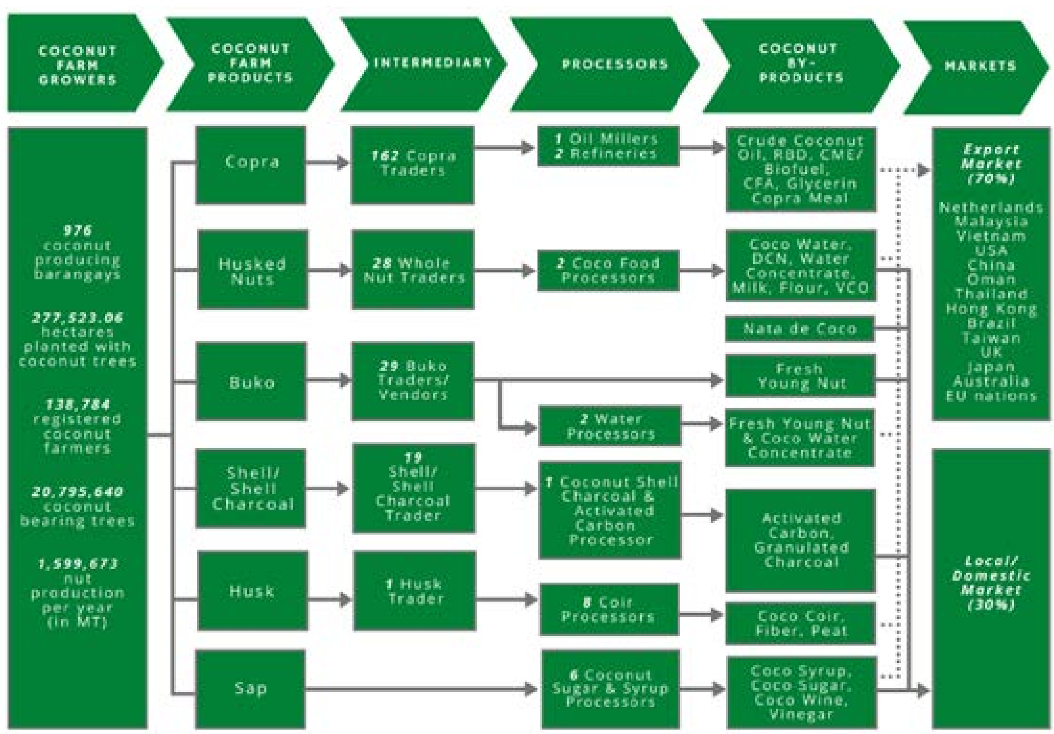



Basic source of data: PCA

PCA planted/replanted more than 71,500 ha with 7.7M seedlings from 2009–2019, benefiting 51,675 farmers in SOCCSKSARGEN. These accomplishments covered more than 137,000 trees that were cut under RA 8084 and the 240 ha that applied for land conversion in 2009–2019. However, only about 50% of this accomplished planting/replanting was reflected in the 2019 PSA statistics with a net increase of 31,000 ha. The survival rate and field performance of these young plantings should be regularly monitored, as the discrepancy in data suggested only about 50% survival rate.

Figure 3.118 illustrates the flow of coconut products in SOCCSKSARGEN. Its 967 barangays in the four provinces that produce coconut, cover 277,523 has of coconut plantation with 20.8 M bearing trees. The 138,784 registered farmers can produce coco farm products that are bought and sold by several intermediaries in the region. These farmers must be included in the provision of social protection through the Coconut Levy Funds.

**FIGURE 3.118. PRODUCT FLOW MAP OF THE COCONUT INDUSTRY IN SOCCSKSARGEN, 2021**




Source: PSA and PCA Region XII, 2019

The region has charcoal and husk traders that are not visibly present in other regions. Well-known manufacturers of coconut products—such as coco sugar, coco coir, DCN, coconut oil, VCO, coco water—are located in this region.. Seventy percent of the products are traded internationally to various countries. Since there are many coco sugar enterprises, the utilization of dwarf variety for planting would be appropriate to those areas. For coco coir, the strategies would be similar to the ones enumerated in Region VIII. Weaknesses of the coconut industry highlighted in the Region 12 roadmap are: uncoordinated field operations that result in untimely harvesting and low-quality product, lack of capital and mechanization, limited value-added operations in the farm and production, limited support for processing, rising number of senile trees, inadequate infrastructure for manufacture and transport, inadequate funds for smallholders, limited program for the empowerment of small farm groups, lack of enthusiasm among the youth to engage in coconut farming, and lack of social protection to the farmers. Strategies to tackle these concerns are product standardization like support for certification, financing program for the capital, infrastructure development program, planting and replanting program of HYVs, capacity building of coconut farmers' organizations, and comprehensive social protection for farmers that include scholarships for their children.

### TABLE 3.68. COCONUT REGIONAL AND PROVINCIAL STATISTICS, SOCCSKSARGEN, 2019

| Province | Area (ha) | Number of Bearing Trees | Yield (Nuts/ Tree/ Year) | Volume of Production (Nuts MT) | Volume of Production (Copra MT) | % Regional Contribution |
|---|---|---|---|---|---|---|
| North Cotabato | 48,800 | 3,942,300 | 48 | 189,251 | 30,091 | 16 |
| Sarangani | 95,000 | 8,624,347 | 65 | 559,402 | 88,945 | 48 |
| South Cotabato | 32,283 | 2,508,025 | 70 | 174,480 | 27,742 | 15 |
| Sultan Kudarat | 30,328 | 2,501,634 | 95 | 237,858 | 37,819 | 20 |
| SOCCSKSARGEN | 206,411 | 17,576,306 | 66 | 1,160,991 | 184,598 | 8 |

*[a]National production*

*Basic source of data: PCA*

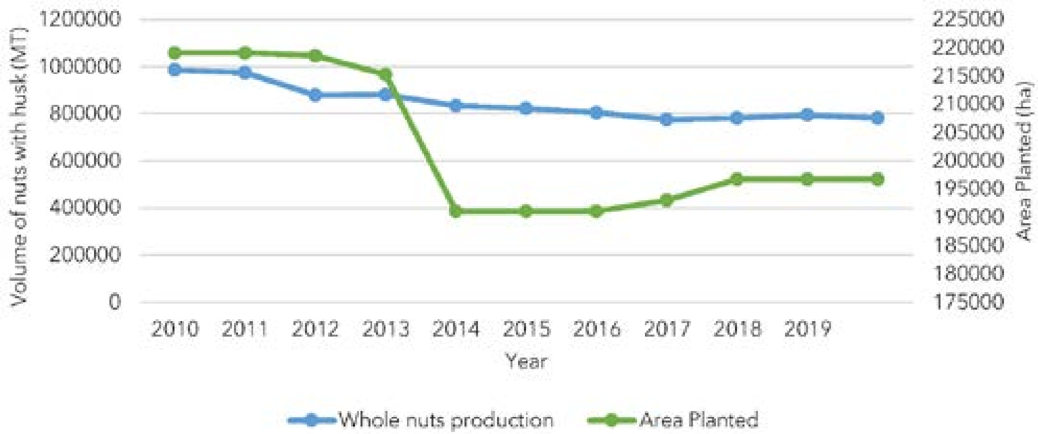
Surviving trees planted from 2009 to 2014 are projected to be productive by 2019 and all surviving trees planted until 2019 should be productive by 2024. Hence, increase in production is expected within the coming years due to the high yield potential of the region coupled with good management. Further, to improve regional production, supplemental irrigation sources, when viable, should be tapped specifically for suitable sites in Sarangani province.

# CARAGA Region Production Trend (2009-2019)

Caraga contributed 5% to the national coconut production. Average yield per tree was 44 nuts per year. The region has been devastated by super typhoon Bopha in 2012, and lost more than 24,000 ha coconut plantations. Recovery was slow until 2019 when the coconut hectarage was still 18,500 ha short of the 2013 level (Figure 3.119). However, production decline was not as steep as the reduction in area, and this could be attributed to the high contribution of Surigao del Sur (53%) to the regional production. Moreover, the province was not affected by typhoon Bopha.

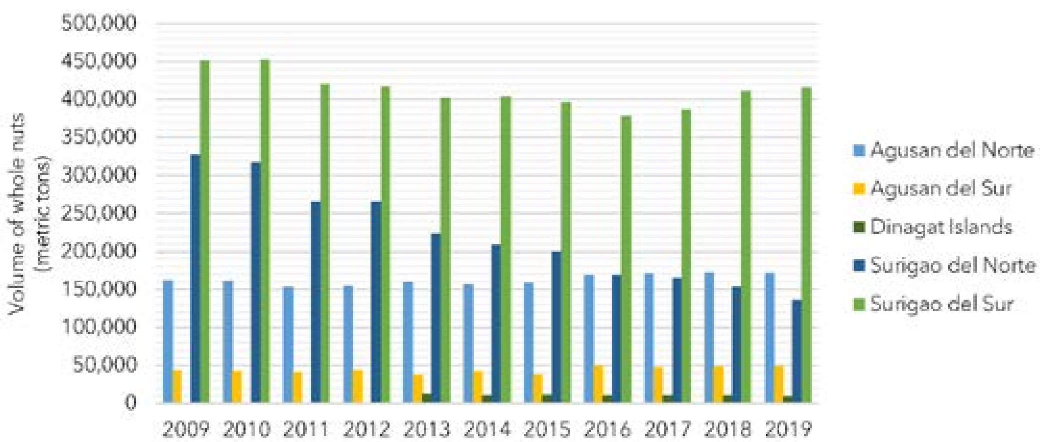
Production of Agusan del Norte, which contributed 22% to the region, was apparently also not impacted by the typhoon. Meanwhile, the province of Surigao del Norte, which contributed 18% to regional production in 2019, used to be a major production area. From 2010, it had a declining trend in production that was aggravated by Typhoon Bopha in 2012 and decreased the coconut production by 14,400 ha. The downward trend in production continued until 2019, with a net decrease of 0.85 B nuts over the past 10 years. Part of the decline could be due to the separation of Agusan del Norte's data from that of the Dinagat islands, starting 2013.

## Figure 3.119. Volume of whole nut production (MT) and area planted to coconuts (ha) in CARAGA, 2009–2019




Basic source of data: PSA

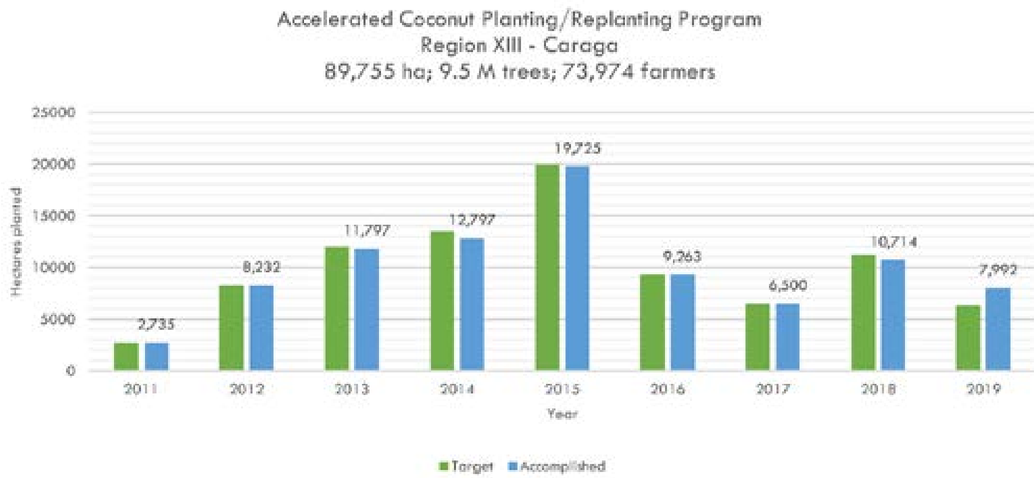
## Figure 3.120. Volume of whole nut production per province, Caraga Region, 2009–2019




Basic source of data: PSA

There was an average of 7.3% difference in production between the first half of the year and the second half, with higher yield in the latter that amounted to about 17.6M nuts.

**FIGURE 3.121. TARGETS AND ACCOMPLISHMENTS OF THE ACCELERATED COCONUT PLANTING/ REPLANTING PROJECT OF PCA IN CARAGA, 2009–2019**

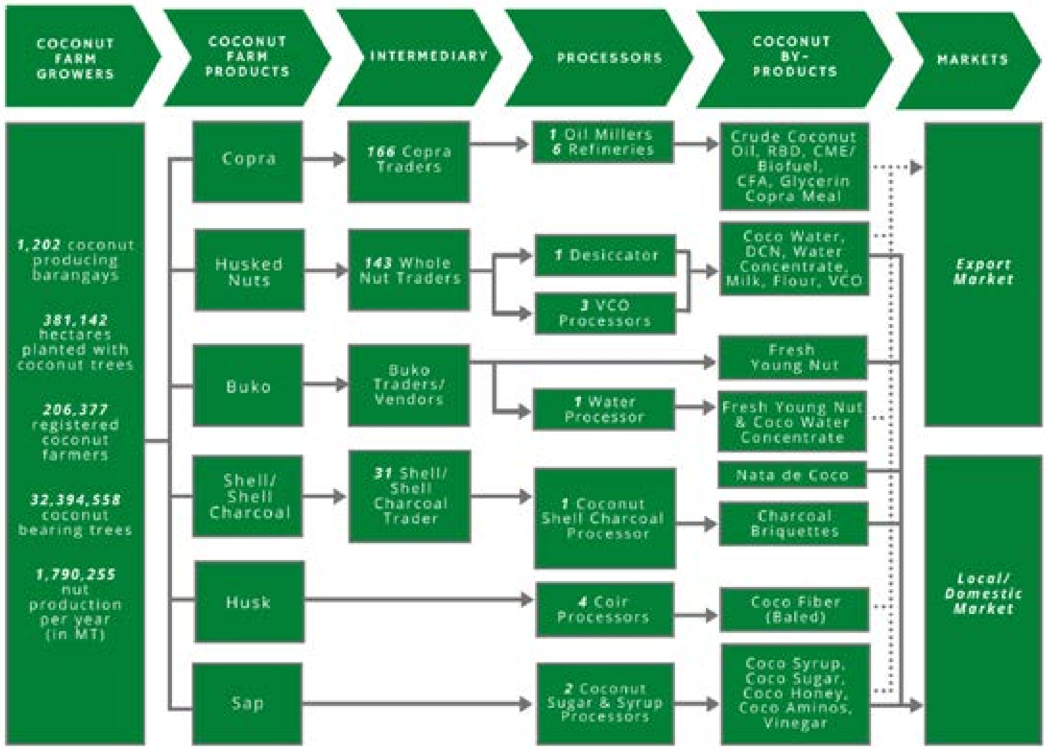



Basic source of data: PCA

Figure 3.122 shows the product flow of coco farm products in Caraga. A total of 1,202 barangays out of 1,311 are engaged in coconut farming. With the Coconut Levy Act recently signed by President Duterte, funds for social protection shall be made available to a total of 206,377 farmers in Region XIII. The entire region is highly suitable for coconut planting with a yield that is equal to the national average of 44 nuts/tree/year.

Copra buyers are spread across the provinces of Caraga, with Surigao del Sur having the largest number while whole nut buyers are plenty in Agusan del Norte and none in Dinagat Islands. A significant number of charcoal traders are found in the region and they are highly concentrated in Surigao del Sur. These traders then supply the farm products to existing manufacturers in the area. Refineries are evident in the place while at least one processor for each coconut product was observed. Aside from refineries, VCO and coir producers are prominent. Strategic planting of coconut variety with thick meat is advised for their respective location. Products that are marketable in the region are coconet, coconut coir-based organic fertilizer (CCBOF), VCO, desiccated, and coco-based pastry. Interventions mentioned in Region VIII for coir production also apply to Caraga. For VCO-related interventions, please refer to the discussion for Region VI.

## FIGURE 3.122. PRODUCT FLOW MAP OF THE COCONUT INDUSTRY IN CARAGA REGION, 2021




Source: PCA Region XIII, 2019

## TABLE 3.69. COCONUT REGIONAL AND PROVINCIAL STATISTICS, CARAGA REGION, 2019

| Province | Area (ha) | Number of Bearing trees | Yield (nuts/ tree/ year) | Volume of production (nuts MT) | Volume of production (copra MT) | % Regional Contribution |
|---|---|---|---|---|---|---|
| Agusan del Norte | 35,400 | 3,582,656 | 48 | 171,618 | 27,287 | 22 |
| Agusan del Sur | 14,885 | 1,500,610 | 32 | 48,684 | 7,741 | 6 |
| Dinagat Islands | 4,600 | 373,650 | 24 | 8,916 | 1,418 | 1 |
| Surigao del Norte | 60,729 | 5,909,050 | 23 | 136,820 | 21,754 | 18 |
| Surigao del Sur | 81,160 | 6,552,823 | 63 | 415,846 | 66,120 | 53 |
| Caraga | 196,774 | 17,918,789 | 44 | 781,884 | 124,319 | 5.3 |

*National production*

*Basic source of data: PCA*

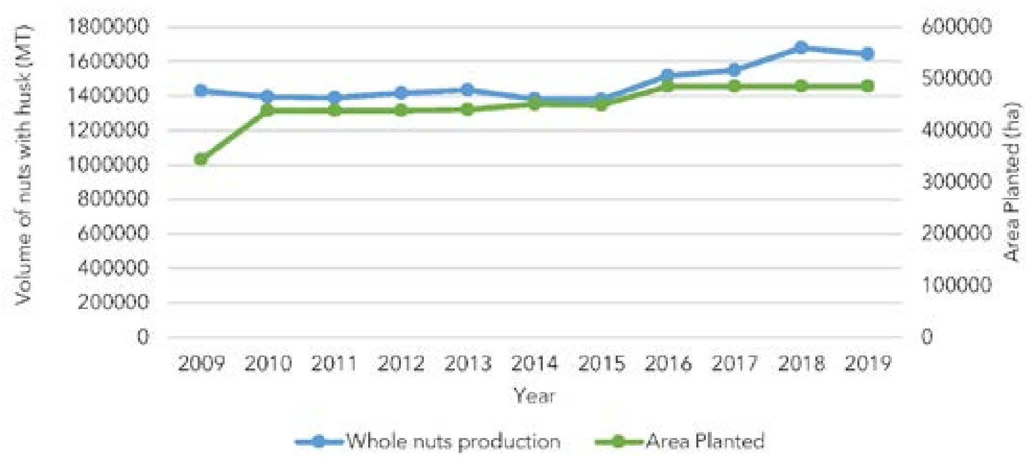
There were more than 89,000 ha planted/replanted with 9.5M seedlings that benefited 74,000 farmers in the region from 2009–2019. Thirty percent of the areas that were planted/ replanted can be found in Surigao del Sur. Coconut seedlings planted on or before 2014 are projected to start bearing by 2019, while all surviving plants planted up to 2019, are projected to be productive by 2024. Yield fluctuations during El Niño events can be mitigated by good production management and establishment of irrigation systems.

## CALABARZON Production Trend (2009–2019)

CALABARZON is the fourth top producer of nuts at 1.6M MT in 2019, a net increase of 0.2 M MT from 2009. CALABARZON also contributed 56.5% to the total increase in coconut area in the country. From 5th place in 2009, the region ranked 1st in 2019 with a coconut hectarage of 485,197 ha.


Coconut production in the region had a net increase of 14.9% from 2009 to 2019 despite the decline in coconut production in 2010–2011, 2014–2015, and 2019.

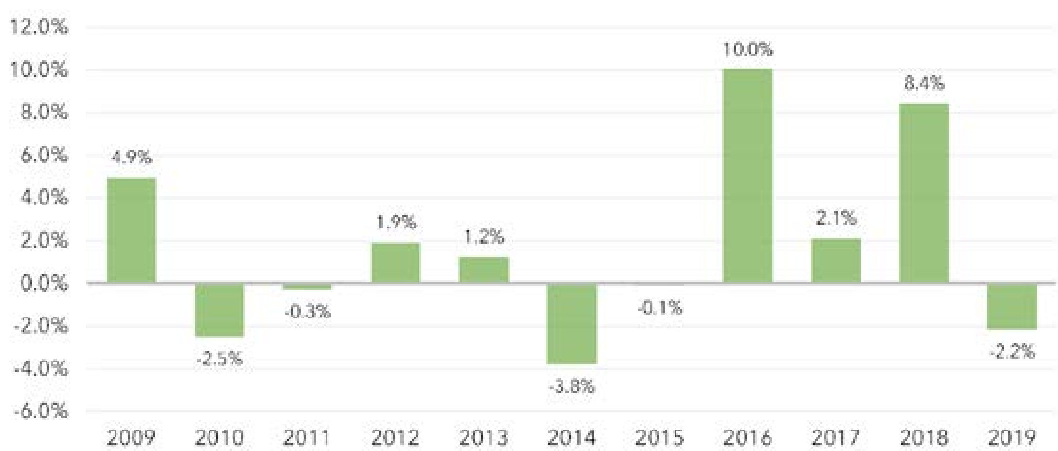
## FIGURE 3.123. VOLUME OF WHOLE NUT PRODUCTION AND AREA PLANTED TO COCONUT IN CALABARZON, 2009–2019




Basic source of data: PSA

Based on PSA data, CALABARZON registered double digit expansion in 2010 (95,105 ha), 2014 (10,460 ha), and 2016 (36,303 ha). However, the data did not reflect the replanting/planting accomplishment of PCA for those years. PSA (2021) data suggests that planting/replanting totaled 141,000 ha, equivalent to 41% of the area in 2009. On the other hand, PCA's planting/replanting program recorded only a total of 95,202 since 2010–2019. The data of PSA is inconsistent with the planting/replanting accomplishment of PCA. This finding suggests that these massive plantings were done independently outside the PCA program.

## FIGURE 3.124. CALABARZON COCONUT PRODUCTION GROWTH RATE, 2009–2019



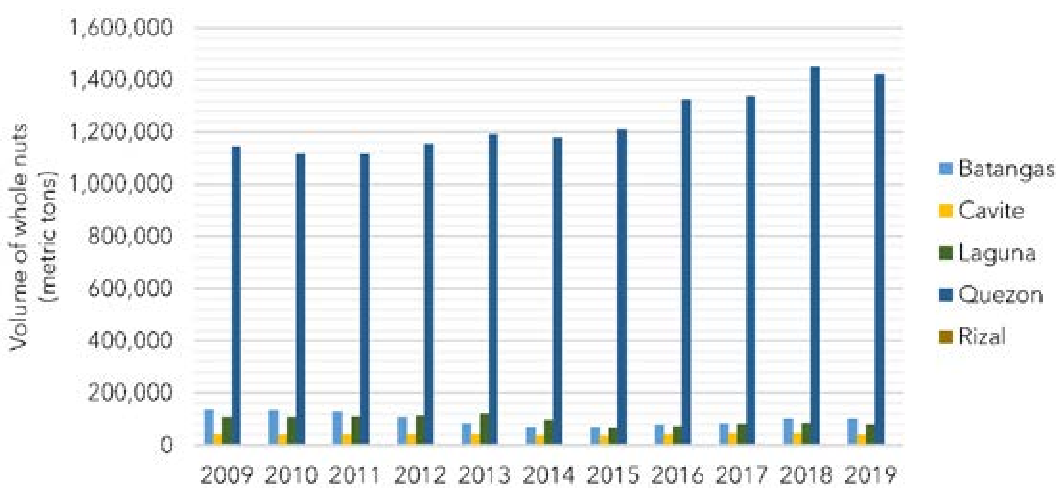

Basic source of data: PSA

## FIGURE 3.125. TARGETS AND ACCOMPLISHMENTS OF THE ACCELERATED COCONUT PLANTING/REPLANTING PROJECT OF PCA IN CALABARZON, 2009–2019


Basic source of data: PCA

The magnitude of increase in planting/replanting might have masked the logging and land conversion in the region. PCA recorded 632 processors/traders and 83 dealers operating in CALABARZON (PCA Region IV 2020). Accounting for the extent of logging and conversion of coconut lands to other uses is important in planning and prioritization of programs.

## FIGURE 3.126. VOLUME OF COCONUT PRODUCTION BY PROVINCE, CALABARZON (2009–2020)




Basic source of data: PSA

Coconut production per province in 2009 to 2019 showed that Quezon province supplied a relatively incredible amount of over 86.5% or 1.4M metric tons of the total volume of coconuts produced in the region. Severe infestation of the exotic coconut scale insect Aspidiotus rigidus (cocolisap), due to an outbreak in CALABARZON in 2013–2014, affected 2.6 M nut-bearing coconut trees (PCA, 2019), and contributed to the decline in coconut production. PSA (2015) data, also indicated that about 2,200 ha were lost in 2015, presumably due to the effects of the cocolisap and Typhoon Glenda (2014). Typhoon Glenda, which hit the country and the region in July 2014, was also credited to have contributed to the reduction and eventual resolution of the cocolisap outbreak in CALABARZON.

There was distinct seasonality of yield in CALABARZON, with the third quarter production being twice as much as that of the first and second quarters. In addition, the third quarter production was 30% higher than that in the fourth quarter. Yield gap analysis will determine the causes and possible management interventions and recalibration of priority areas to narrow this gap.

The continuing increase in coconut hectarage buffered the region's volume of production against the onslaught of multiple climate-related events (typhoons and El Niño) and the devastation from cocolisap. PCA reported 95,204 ha planted/replanted in CALABARZON benefiting 46,510 farmers from 2010 to 2019 (Figure 3.125).

Accuracy and harmonization of coconut statistics between PSA and PCA are important for planning and implementation of strategic programs. Based on PSA data, CALABARZON had three years of massive planting/replanting in 2010, 2014, and 2016. Surviving trees planted before 2016 would already have been productive by 2019; cumulatively, all surviving trees planted up to 2016 should be productive by 2021. However, nut productivity per year continued to decline that resulted in CALABARZON becoming the lowest yielder among regions. As stated earlier, yield gap analysis could identify constraints that can be strategically addressed.

## TABLE 3.70. COCONUT REGIONAL AND PROVINCIAL STATISTICS, CALABARZON, 2019

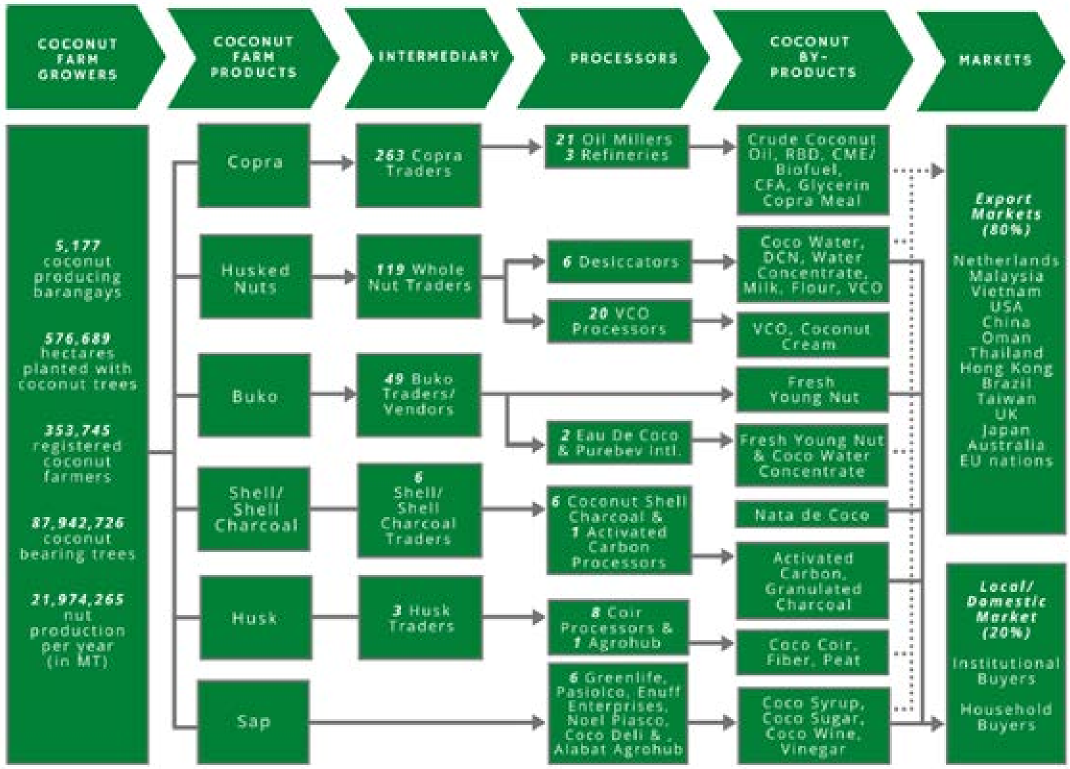
| Province | Area (ha) | Number of Bearing trees | Yield (nuts/ tree/ year) | Volume of production (nuts MT) | Volume of production (copra MT) | % Regional Contribution |
|---|---|---|---|---|---|---|
| Batangas | 36,305 | 3,800,000 | 27 | 100,710 | 16,013 | 6 |
| Cavite | 13,607 | 1,146,333 | 34 | 38,808 | 6,170 | 2 |
| Laguna | 59,980 | 3,590,150 | 22 | 80,266 | 12,762 | 5 |
| Quezon | 375,021 | 48,752,781 | 29 | 1,422,880 | 226,238 | 87 |
| Rizal | 284 | 26,798 | 30 | 815 | 130 | 0 |
| CALABARZON | 485,197 | 57,316,062 | 29 | 1,643,479 | 261,313 | 11[a] |

*[a]National production*

*Basic source of data: PCA*

The CSI (cocolisap) problem, which caused localized—but severe—damage to particular areas in CALABARZON, did not significantly affect the region's coconut production. This CSI problem may have been probably masked by the increased coconut hectarage and number of bearing trees, but could have contributed to further decline in yield per tree in CALABARZON. Aside from the cocolisap problem, typhoons also repeatedly affected the coconut stands. Productivity losses take years to recover. As deducted from the PSA data, the trees lost due to the effects of super typhoons Pablo and ST Haiyan, even in major production areas, had not yet recovered and yield had not gone back to previous levels.

## FIGURE 3.127. PRODUCT FLOW MAP OF THE COCONUT INDUSTRY IN CALABARZON & MIMAROPA, 2021




Source: PSA and PCA Region IV, 2019

In future implementation of the planting/replanting program, the criteria for prioritizing areas of high potential yield (i.e., high suitability and low risk) could be recalibrated to identify areas for planting/replanting of hybrids and selected OPVs. The program should also consider the commitment of farmers and organizations to apply sustainable coconut management practices recommended by PCA.

With good management of the young population of trees planted/replanted, which comprised about 28% of the coconut area in 2009, (and barring disasters that will severely reduce yield per tree or worse, reduce the number of bearing trees) the productivity of CALABARZON should pick up significantly and sustainably. The surviving palms in 56,000 ha that were planted from 2010 to 2014 should have started producing nuts in 2019; cumulatively, the surviving palms planted until 2019, totaling 95,000 ha are projected to be already productive by 2024. Monitoring the survival and field performance of this young coconut population is an important input in projecting the future regional production. Continuing planting and replanting programs could mitigate the effects of frequent and extreme climate events.

## Bicol Region Production Trend (2009–2019)

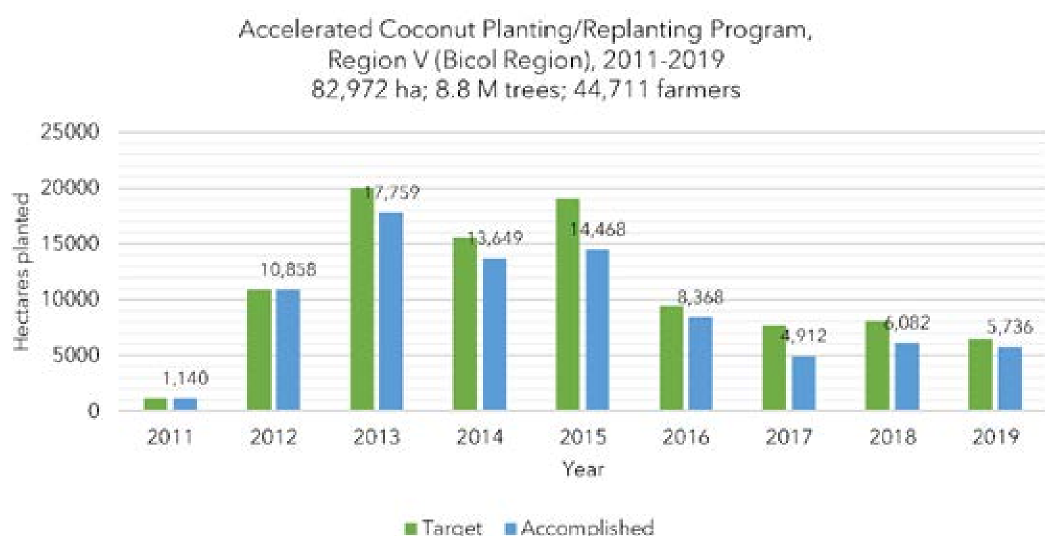

From 2009 to 2019, the Bicol Region lost its prominence as the leader in coconut hectarage and has gone down to 6th place in terms of volume of nut production. The region has only contributed 8.4% to the national coconut production. While the region continued to slowly expand its production area, its volume of production fluctuated and declined considerably from 2013 to 2017 due to various external shocks and risks such as strong typhoons and drought.

About 275,000 trees were cut in the region from 2009–2019. Bicol Region also has a high number of senile/unproductive trees; hence, planting and replanting was needed to sustain further increase in the region's production capacity. From 2011 to 2019, about 83,000 ha has been planted to more than 8.8M trees, benefiting more than 477,000 farmers. Assuming 75% survival, these young plantations will comprise about 14% of the total area planted to coconut in the Bicol region. By 2024, all surviving trees would have been productive. Given good management, coconut production in the region is expected to pick up further in the future.

**FIGURE 3.128. VOLUME OF WHOLE NUT PRODUCTION AND AREA PLANTED TO COCONUT IN BICOL REGION, 2009–2019**


Basic source of data: PSA

**FIGURE 3.129. TARGETS AND ACCOMPLISHMENTS OF THE ACCELERATED COCONUT PLANTING/REPLANTING PROJECT OF PCA IN BICOL REGION, 2009–2019**

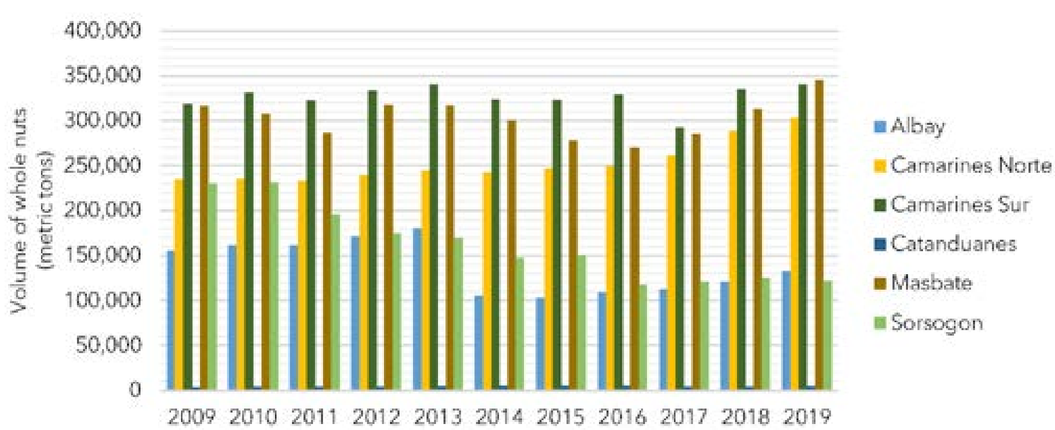



Basic source of data: PCA

Camarines Sur, Masbate, and Camarines Norte were the three largest producers in the Bicol Region, contributing almost 80% to the regional production. Camarines Sur, with the largest area planted to coconut and the consistent top producer since 2009, lost its top place to Masbate in 2019. Production of Sorsogon from 2011 has plummeted to only 53% of its productivity in 2009. Similarly, Albay 's production in 2019 was only 73% of its production in 2013. Sorsogon and Masbate, starting 2017, and Camarines Norte from 2014, have consistently increased their production up to 2019, despite having lesser coconut hectarage than Camarines Sur. Camarines Sur had the greatest number of senile trees, estimated to be around 35% (estimated from coconut area at 100 trees per ha and number of bearing trees) in 2019. Despite this, Camarines Sur is the only province in Bicol Region with an average productivity of 44 nuts per tree. All other provinces had below average productivity per tree, ranging from 13-43 nuts per tree (Table 3.71).

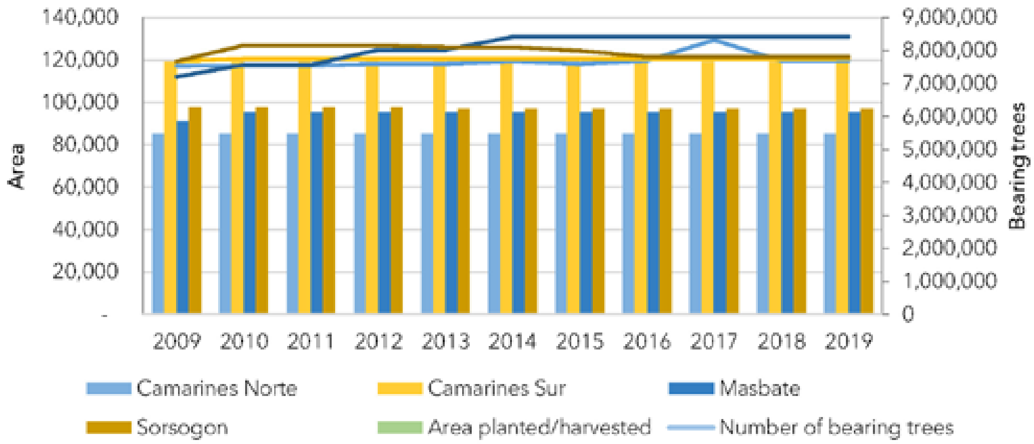
The Bicol Region has a vast array of coconut plantations comprising 453,994 has, a total of 301,268 farmers and over 35 M coconut bearing trees. The region is able to produce several farm products like copra, husked nuts, buko, shell charcoal, and sap (Figure 3.132). This huge number of farmers should avail of the social protection from the Coco Levy Funds. The productivity of coconut trees in Bicol Region is relatively lower at 35 nuts per year. More hybrid varieties are needed for planting and replanting to raise yield. Land in Bicol is classified as highly suitable for coconut, except for Camarines Sur and Masbate which are categorized only as suitable.

**FIGURE 3.130. VOLUME OF WHOLE NUT PRODUCTION PER PROVINCE, BICOL REGION, 2009–2019**




Basic source of data: PSA

## FIGURE 3.131. COCONUT AREA PLANTED/HARVESTED AND NUMBER OF BEARING TREES IN BICOL REGION, 2009–2019




Basic source of data: PSA

## TABLE 3.71. COCONUT REGIONAL AND PROVINCIAL STATISTICS, BICOL REGION, 2019

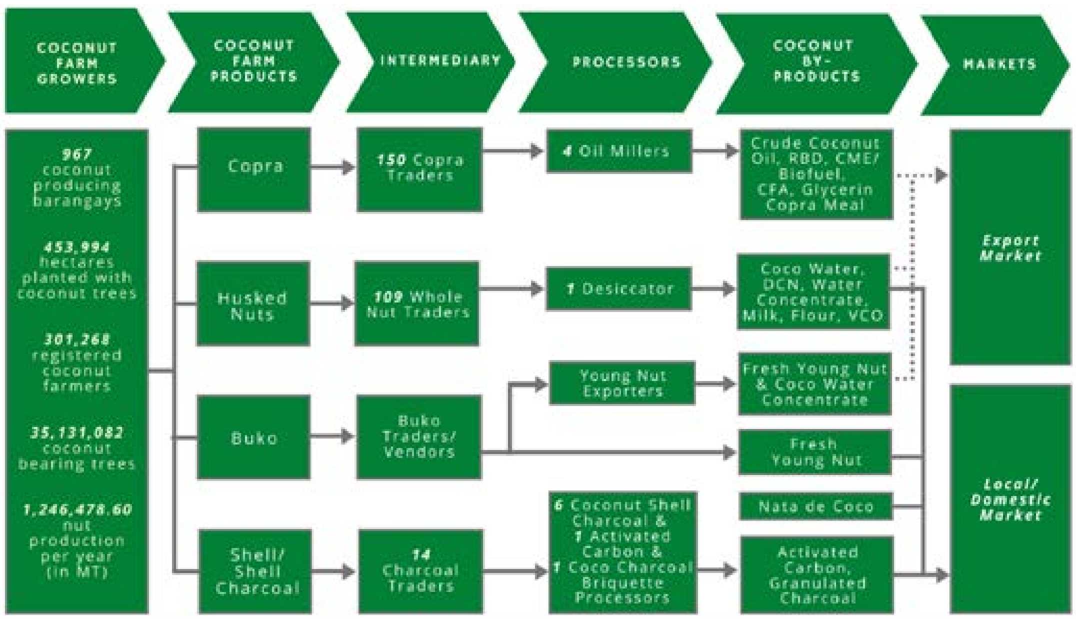
| Province | Area (ha) | Number of Bearing trees | Yield (nuts/ tree/ year) | Volume of production (nuts MT) | Volume of production (copra MT) | % Regional Contribution |
|---|---|---|---|---|---|---|
| Albay | 41,007 | 3,075,525 | 43 | 132,755 | 21,108 | 11 |
| Camarines Norte | 85,405 | 7,700,000 | 39 | 302,735 | 48,135 | 24 |
| Camarines Sur | 119,044 | 7,760,270 | 44 | 340,132 | 54,081 | 27 |
| Catanduanes | 15,756 | 352,951 | 13 | 4,597 | 731 | 0 |
| Masbate | 95,629 | 8,424,866 | 41 | 344,434 | 54,765 | 28 |
| Sorsogon | 97,153 | 7,817,470 | 16 | 121,826 | 19,370 | 10 |
| Bicol Region | 453,994 | 35,131,082 | 35 | 1,246,479 | 198,190 | 8.4[a] |

*[a]National production*

*Basic source of data: PCA*

Hundreds of registered traders are found in the region such as copra traders and whole nut buyers. A considerable number of charcoal traders is also present in Bicol Region. Charcoal processing plants are the most prevalent: six charcoal processors , one for activated carbon, and one for coco shell briquettes. There are only a handful of other processors: four oil millers, one desiccator, and one activated carbon manufacturer. The high number of charcoal processors are indicative of the growing demand for the product and a thriving charcoal industry. Interventions and strategies pertaining to charcoal industry may be given emphasis in Region V. Constraints identified in the SWOT analysis for charcoal industry are: poor road network, small and widely dispersed coconut farms that produce very small volume of coco shell charcoal, the involvement of many conduits and intermediaries, lack of government regulation on coconut shell charcoal exportation, few shipping lines, and high freight cost. Measures to address these concerns are: establishment of farmer-owned White Copra Centrals, construction of charcoal granulating facility, building of more activated carbon plants, and construction of paved road network. To fast track the growth of the industry, interagency collaboration can be done for (1) better implementation of regulations related to coconut industry, such as development of new initiatives for new legal issuances, and (2) registration of coconut manufacturing companies and exporters of coconut products for better penetration into the global markets.

**FIGURE 3.132. PRODUCT FLOW MAP OF THE COCONUT INDUSTRY IN BICOL REGION, 2021**



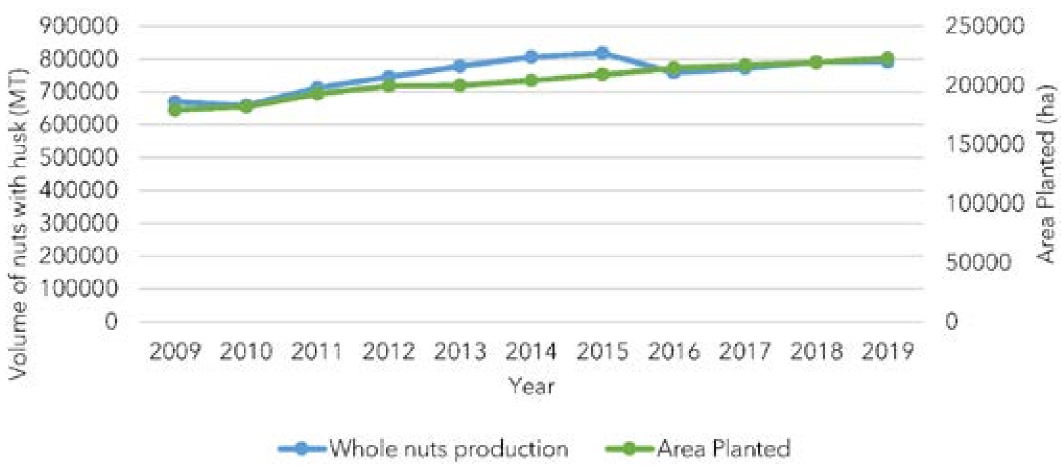

Source: PSA and PCA Region V, 2019

# MIMAROPA Production Trend (2009–2019)

The islands of MIMAROPA contributed only 5.5% to national coconut production but recorded an increasing trend in both planted areas and volume of production from 2009 to 2019. Net increase in area was 43,600 ha with a corresponding net increase in production of 122M MT despite the decline in 2016, presumably due to the effect of severe El Niño (2015–2016).

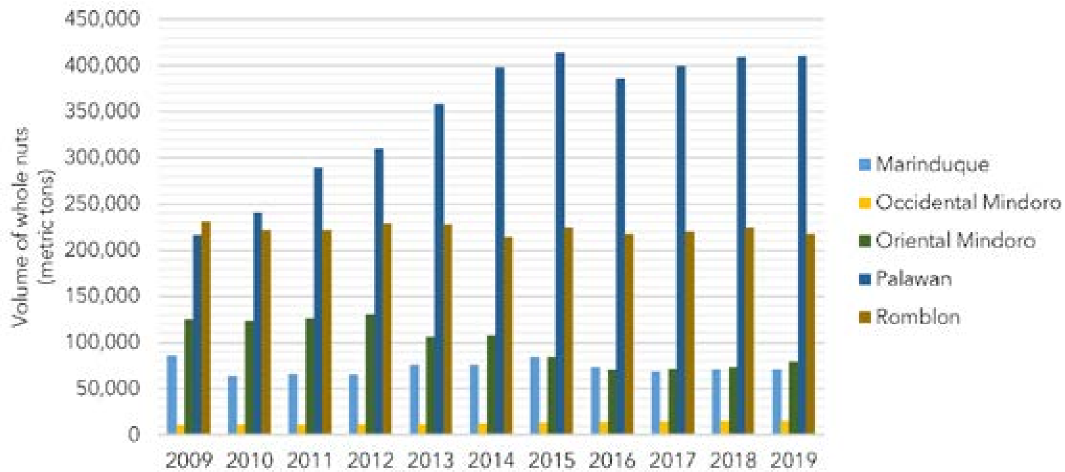

Significant increase in regional coconut production came from Palawan with a net increase of 194M MT between 2009 and 2019, despite the decrease in 2016 from which production has yet to fully recover.

**FIGURE 3.133. VOLUME OF WHOLE NUT PRODUCTION AND AREA PLANTED TO COCONUT IN MIMAROPA, 2009–2019**




Basic source of data: PSA

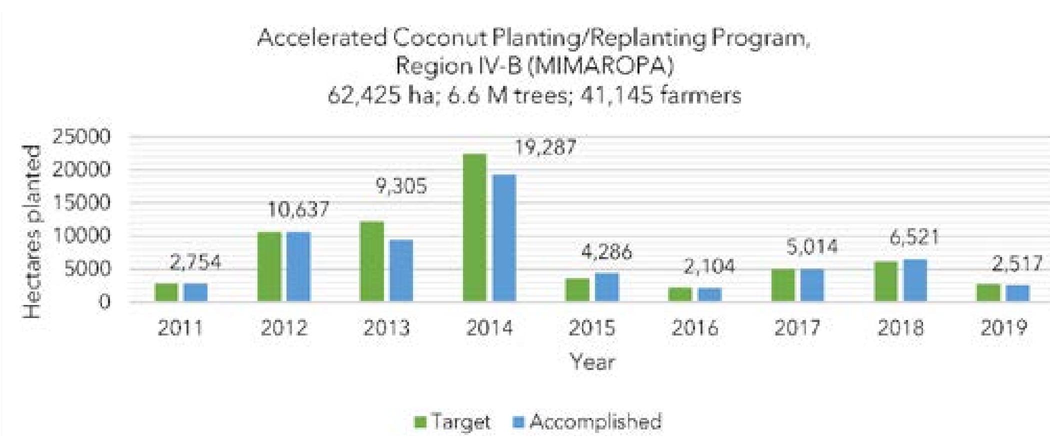
**FIGURE 3.134. VOLUME OF WHOLE NUT PRODUCTION PER PROVINCE, MIMAROPA, 2009–2019**




Basic source of data: PSA

A total of 62,425 ha consisting of over 6.6 M trees were planted/replanted under the PCA program from 2010 to 2019. These areas comprised about 28% of the coconut hectarage in 2019. Assuming 75% survival rate, about 47,000 ha young coconut populations will all be productive by 2024, further increasing the production volume of MIMAROPA.

**FIGURE 3.135. TARGETS AND ACCOMPLISHMENTS OF THE ACCELERATED COCONUT PLANTING/ REPLANTING PROJECT OF PCA IN MIMAROPA, 2009–2019**




Basic source of data: PSA

Coconut productivity in MIMAROPA was highly variable. Palawan and Occidental Mindoro had a high productivity of 79 and 70 nuts/tree/year, respectively, while the rest of the provinces had below average yields : Romblon (36 nuts/tree/year), Oriental Mindoro (28 nuts/tree/year), and Marinduque (22 nuts/tree/year). Palawan accounted for 52% of MIMAROPA's coconut production while Romblon was far second contributing 27%. About 54% of the trees (over 3.5M) planted from 2010 to 2019 were in Palawan. Surviving trees planted until 2014 will start to be productive by 2019 and all trees planted until 2019 will all be productive by 2024. Given good management, and pending any disaster that could topple these trees in MIMAROPA, coconut production in the region is expected to increase significantly.

## TABLE 3.72. COCONUT REGIONAL AND PROVINCIAL STATISTICS, MIMAROPA, 2019

| Province | Area (ha) | Number of Bearing trees | Yield (nuts/ tree/ year) | Volume of production (nuts MT) | Volume of production (copra MT) | % Regional Contributio n |
|---|---|---|---|---|---|---|
| Marinduque | 34,112 | 3,181,896 | 22 | 70,972 | 11,285 | 9 |
| Occidental Mindoro | 1,772 | 213,200 | 70 | 14,904 | 2,370 | 2 |
| Oriental Mindoro | 32,514 | 2,775,385 | 28 | 78,493 | 12,480 | 10 |
| Palawan | 98,250 | 5,175,350 | 79 | 409,833 | 65,163 | 52 |
| Romblon | 56,336 | 6,108,294 | 36 | 216,918 | 34,490 | 27 |
| MIMAROPA | 222,984 | 17,454,125 | 45 | 791,121 | 125,788 | 5.5[a] |

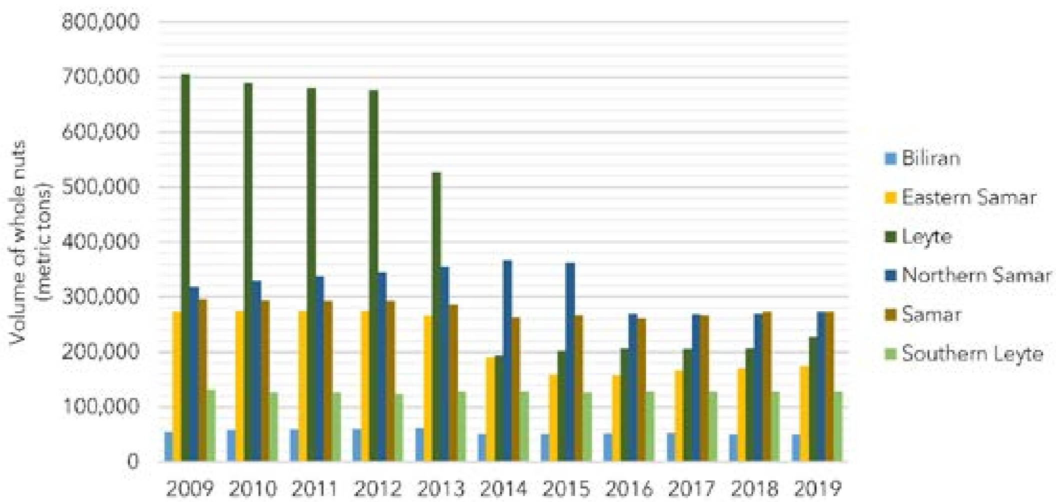
*[a]National production*

*Basic source of data: PCA*

# Eastern Visayas Production Trend (2009–2019)

From 2009 to 2019, Eastern Visayas suffered a net loss of 36.76% in production, equivalent to 124.7M nuts or more than a third of its production of 1.78B nuts in 2009. Throughout the eleven-year period, Eastern Visayas lost 97,551 ha due to the historic super typhoon Haiyan (Yolanda) in November 2013. Just a year after, toward the end of 2014, Typhoon Ruby hit the region and damaged at least another 200,000 trees. Before ST Haiyan, the region was the 2nd highest nut producer in the country with about 2 B nuts. Eastern Visayas dropped from 2nd place in 2009 to 8th in 2019, with only about 55% production pre- Haiyan. In terms of coconut hectarage, the region had recovered only 7,570 ha by 2019. With a total coconut area of 329,620 ha, its ranking in coconut hectarage went down to 6th place in 2019. The provinces of Eastern Visayas, Leyte, and Eastern Samar were most severely affected by Haiyan. Northern Samar's production also contracted from 2016 which, like the other two provinces, continued declining until 2018. This decline in production is presumably compounded by the impact of severe drought in 2015–2016.

**FIGURE 3.136. VOLUME OF COCONUT PRODUCTION BY PROVINCE, EASTERN VISAYAS, 2009–2019**

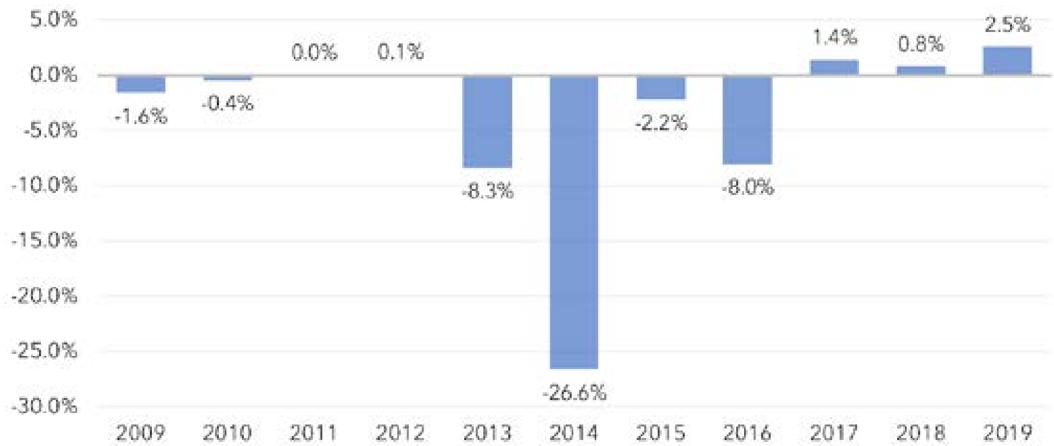



Basic source of data: PSA

Eastern Visayas, like CALABARZON, also exhibited a consistent pattern of yield seasonality with higher yield during the second half of the year compared with the first half (January–June), with 36% difference amounting to 171M nuts (Figure 3.62).

From 2009 until 2016, Eastern Visayas had negative to zero annual growth rate (Figure 3.137). Although the region has planted 89,972 ha equivalent to 8.8M trees, and benefiting about 44, 711 farmers in 2019, recovery was slow and the region was still unable to recover the trees lost to ST Haiyan.

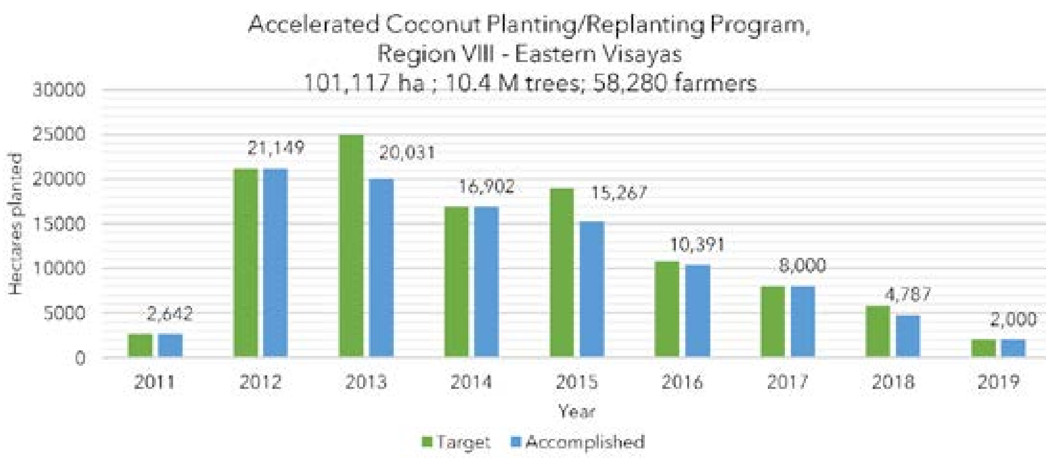
## FIGURE 3.137. EASTERN VISAYAS COCONUT PRODUCTION GROWTH RATE, 2009–2019




Basic source of data: PSA

Year after year, from 2012, the extent of planting/replanting in Eastern Visayas declined from more than 21,000 ha in 2012 (pre-Haiyan) to only 2,000 ha in 2019. Post-Haiyan targets for replanting were reportedly low.

## FIGURE 3.138. TARGETS AND ACCOMPLISHMENTS OF THE ACCELERATED COCONUT PLANTING/REPLANTING PROJECT OF PCA IN EASTERN VISAYAS, 2011-2019




Basic source of data: PCA

In 2019, Eastern Visayas contributed about 8% to the country's total nut production. Samar, Northern Samar, and Eastern Samar provinces contributed about 65% to the region's total production. Leyte contributed 20% to coconut production in the region, while Southern Leyte and Biliran contributed 11% and 4%, respectively. Samar and Southern Leyte had above average yields of 47 nuts/tree/year while the rest of the provinces had below average yield, pulling down the regional average to only 32 nuts/tree/year. Leyte, with the highest coconut hectarage and number of bearing trees, had the lowest yield of only 21 nuts/tree/year. Recovery of trees from multiple stresses takes time, but adopting good management practices, such as fertilization, has been proven to increase yield a year later.

The coconut area in Eastern Visayas covered around 29% of the entire region, which is classified as highly suitable for coconut planting. However, the yield of coconut trees in the region is somewhat low at 32 nuts/tree/year. The low yield could be due to the series of typhoons that beset the region but nonetheless, adoption of the appropriate hybrid variety for replanting would be worthwhile.

The coconut plantations cover 84% of the barangays in the region. This number signifies the importance of coconut to the community and the breadth of its awareness of the commodity. The 3,666 registered coconut farmers represent 13% of the total number of people employed in the region. This number is quite high considering that there are several occupational categories. These farmers must be covered with social protection.

It can be gleaned from the diagram that there is a towering number of copra traders (473), whole nut traders (131) and buko traders (50) present in Eastern Visayas. Furthermore, the number of coir processors and coco charcoal plants in the region is quite high. Interventions for these products are warranted. For charcoal producers, the interventions mentioned for Region V can be applied to Region VIII. In the case of coir production, the establishment of community-based integrated coconut husk processing plants, the provision of on-wheels coconut husks chipping machines, and the building of coco coir rubberizing plant for mattresses and hospital beds would all gear toward the development of the coir industry.

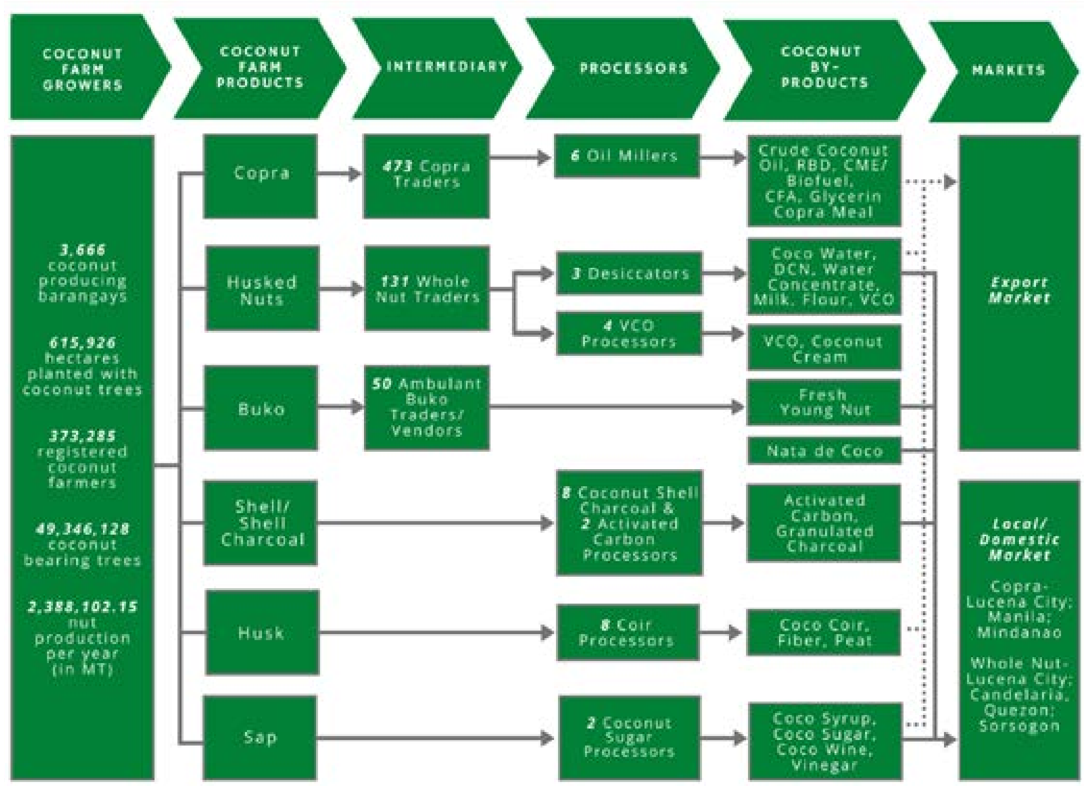
## TABLE 3.73. COCONUT REGIONAL AND PROVINCIAL STATISTICS, EASTERN VISAYAS, 2019

| Province | Area (ha) | Number of Bearing trees | Yield (nuts/ tree/ year) | Volume of production (nuts MT) | Volume of production (copra MT) | % Regional Contribution |
|---|---|---|---|---|---|---|
| Biliran | 20,998 | 1,874,200 | 26 | 48,785 | 7,757 | 4.3 |
| Eastern Samar | 48,372 | 4,753,600 | 37 | 174,534 | 27,751 | 15.5 |
| Leyte | 94,745 | 10,835,099 | 21 | 226,710 | 36,047 | 20.1 |
| Northern Samar | 84,255 | 9,480,360 | 29 | 272,527 | 43,332 | 24.2 |
| Samar | 49,100 | 5,841,640 | 47 | 273,392 | 43,469 | 24.3 |
| Southern Leyte | 32,150 | 2,731,196 | 47 | 127,855 | 20,329 | 11.3 |
| Eastern Visayas | 329,620 | 35,516,095 | 32 | 1,123,802 | 178,685 | 7.6[a] |

[a]*National production*

*Basic source of data: PCA*

## FIGURE 3.139. PRODUCT FLOW MAP OF THE COCONUT INDUSTRY IN EASTERN VISAYAS, 2021



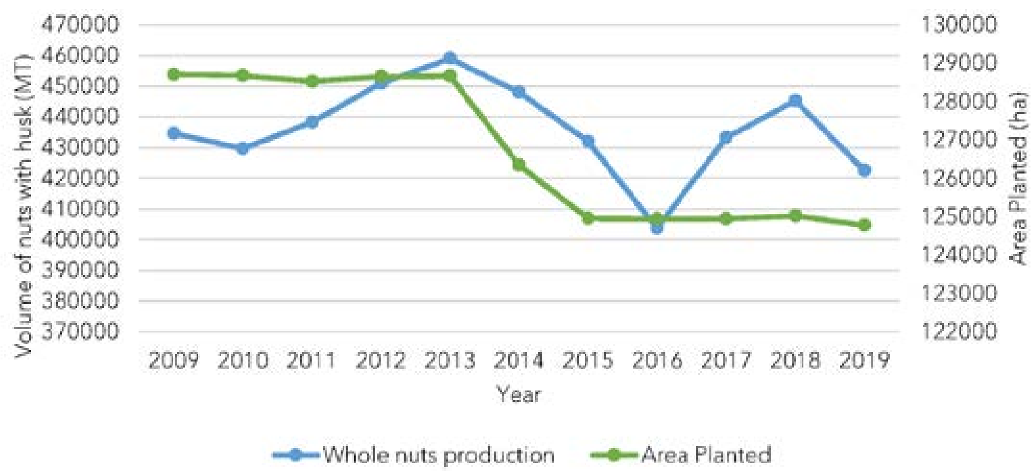

Source: PSA and PCA Region VIII, 2019

# Central Visayas Production Trend (2009–2019)

Central Visayas contributed only 3% to national coconut production (Table 63). The region was also severely devastated by Super Typhoons Haiyan (2013) and Ruby (2014), thus a net loss in coconut hectarage of 3,900 ha or 6% of its pre-Haiyan level by 2019. Volume of nut production also declined by a total of 12%, with reduction after each typhoon hit and even a year thereafter. Recovery was short-lived as production again declined steeply in 2019 (Figure 3.140).

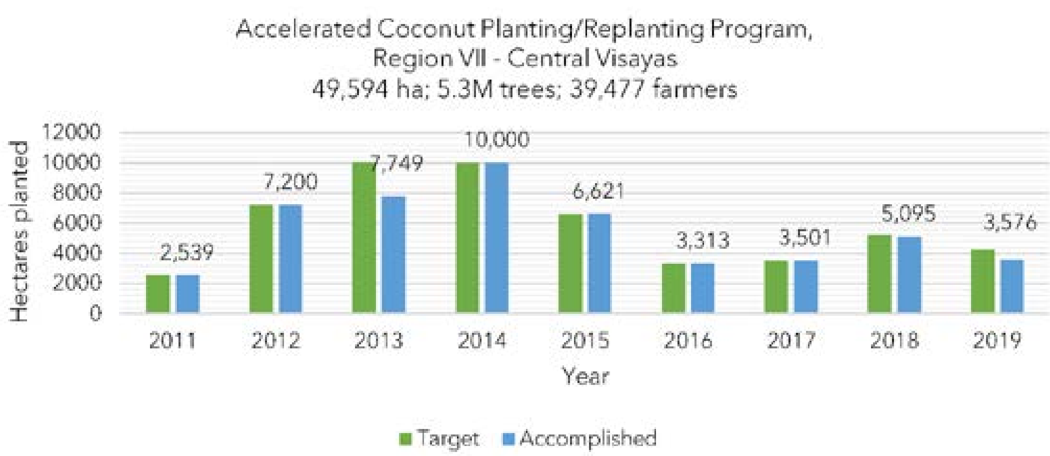
Another 101,000 trees were reported cut from 2009 to 2018 under RA 8048. Central Visayas had not yet fully recovered its lost coconut hectarage by 2019, posting a negative growth rate average of –3.1% over the past 11 years. This data is not consistent with the reported replanting/planting accomplishment of 49,594 ha, totaling 5.3M trees and benefiting 39,477 farmers (Figure 3.141). The area and number of trees replanted should have covered the losses 10 times over.

**FIGURE 3.140. VOLUME OF WHOLE NUT PRODUCTION AND AREA PLANTED TO COCONUT IN CENTRAL VISAYAS, 2009–2019**




Basic source of data: PSA

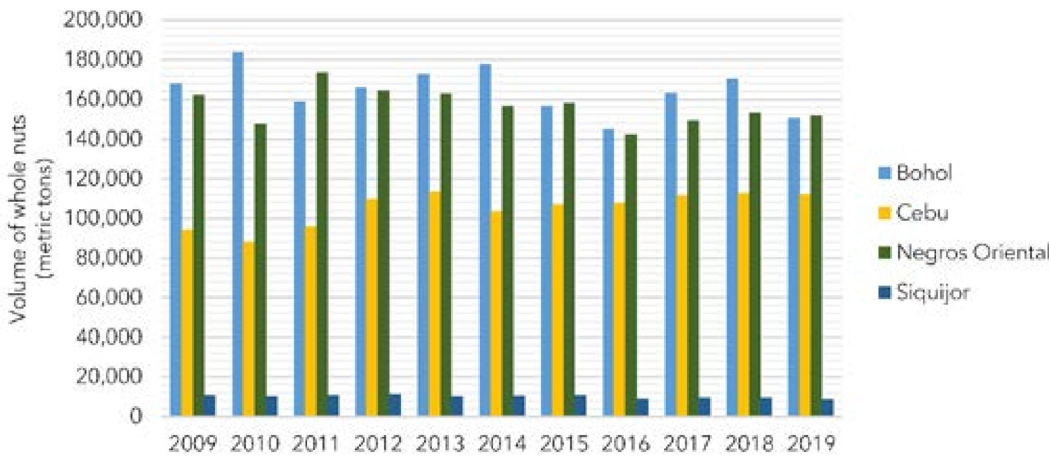
**FIGURE 3.141. TARGETS AND ACCOMPLISHMENTS OF THE ACCELERATED COCONUT PLANTING/REPLANTING PROJECT OF PCA**




Basic source of data: PCA

The yield fluctuations in the region, which follow that of Bohol, were particularly striking from 2014 to 2016 (25,000 MT) and in 2019 (20,000 MT).

**FIGURE 3.142. VOLUME OF WHOLE NUT PRODUCTION AND AREA PLANTED TO COCONUT IN CENTRAL VISAYAS, 2009-2019**




Basic source of data: PSA

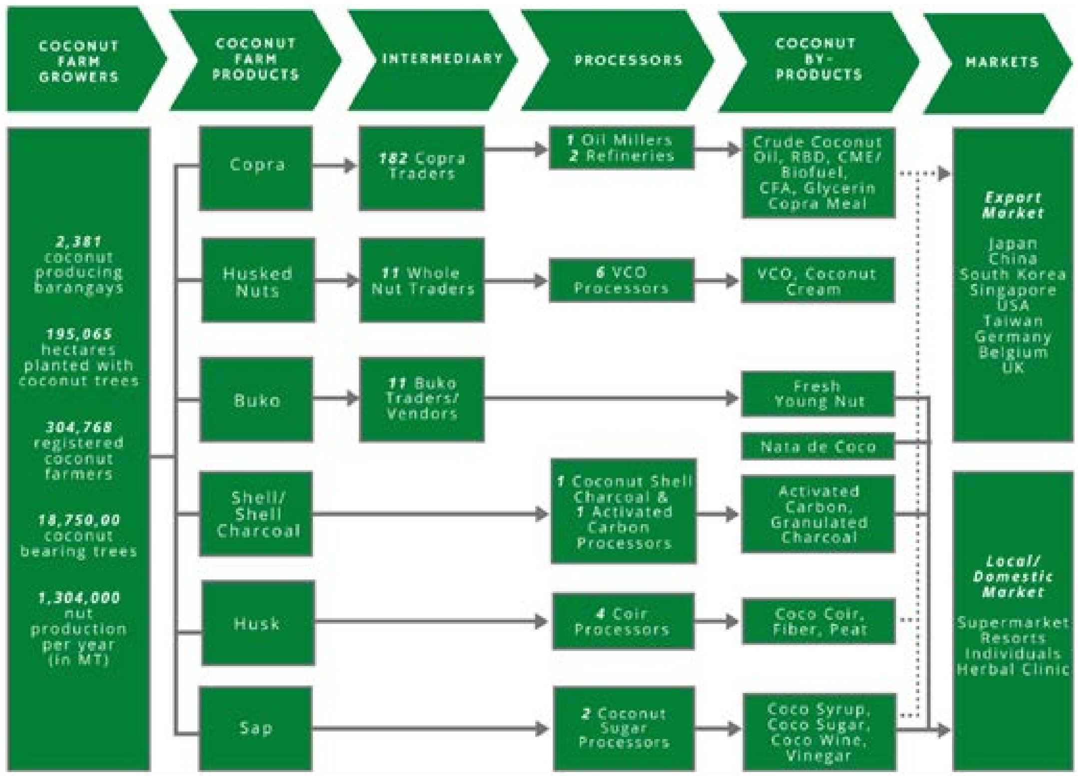
Bohol and Negros Oriental contributed 36% each to regional nut production while Cebu contributed another 26%. The island of Siquijor comprised only 2% of the regional production. With more than 5,000 ha and 366,000 trees, this island province can be a good site for an integrated coconut processing enterprise catering to the local market; However, the island still needs to increase its productivity per tree which was only 24 nuts/tree/year in 2019. It can be noted that the tree productivity in the region is below average, except in Negros Oriental. Bohol, with 4.7M bearing trees, and Cebu, with almost 3.9M bearing trees, have yields of only 32 nuts/tree/year and 29 nuts/tree/year, respectively.

Out of 3,003 total number of barangays in Central Visayas, 80% are engaged in coconut farming. The 304,768 farmers involved are expected to be given social protection from the Coco Levy Funds. These coconut farmers contribute around 6% to the total employment in Central Visayas. The land area devoted for coconut in Region VII accounts for 13% of the entire region. The region is generally categorized as suitable for coconut growing; however, every year an estimated 5% of bearing trees are becoming senile (PCA Region VII, 2019). Since the productivity in Central Visayas is low at 34 nuts per year, replacing the senile trees with hybrid varieties would be beneficial (Figure 3.74).

One hundred eighty-two (182) copra traders are involved in the product flow, with 11 traders each for whole nuts and for buko (Figure 3.143). The movement of commodities runs from the whole nut to several uses: the meat for CNO and VCO (on the side, flour is also produced); the husk for dust and coir; the shell for fashion accessories and charcoal, which is further used for activated carbon; and the sap for vinegar. These products reach the retailers, industrial users, and household users locally or are exported to foreign markets (PCA Region VII, 2019).

Oil millers and refineries that are operating in the area produce RBD, CME, biofuels, CFA, glycerin, and copra meal. Similar to Western Visayas, the lead processors in this region are those that produce VCO and coir (4), followed by coco sugar and refineries. There is also an activated carbon plant but the charcoal from the region cannot meet the company's requirements (PCA Region VII . Establishment of farmer-owned White Copra Centrals, charcoal granulating facility, and construction of paved road can be done to address the region's concerns. The regional roadmap also identified further strengthening of the market for VCO, flour, coir, dust, and vinegar. Proposed strategies for market and product development are: extensive market promotion program, expansion of the utilization of geotextile in construction and erosion control projects, institutionalization of the utilization of coco peat in fertilization, market facilitation, linkage and matching to increase market access, capacity building on market negotiation, and participation of SMEs in international trade fairs and exhibits.

## FIGURE 3.143. PRODUCT FLOW MAP OF THE COCONUT INDUSTRY IN CENTRAL VISAYAS, 2021




Source: PSA and PCA Region VII, 2019

## TABLE 3.74. COCONUT REGIONAL AND PROVINCIAL STATISTICS, CENTRAL VISAYAS, 2019

| Province | Area (ha) | Number of Bearing trees | Yield (nuts/ tree/ year) | Volume of production (nuts MT) | Volume of production (copra MT) | % Regional Contribution |
|---|---|---|---|---|---|---|
| Bohol | 35,338 | 4,679,329 | 32 | 150,474 | 23,925 | 36 |
| Cebu | 38,807 | 3,879,700 | 29 | 111,647 | 17,752 | 26 |
| Negros Oriental | 45,270 | 3,402,000 | 45 | 151,636 | 24,110 | 36 |
| Siquijor | 5,360 | 365,900 | 24 | 8,758 | 1,392 | 2 |
| Central Visayas | 124,775 | 12,326,929 | 34 | 422,514 | 67,180 | 2.8[a] |

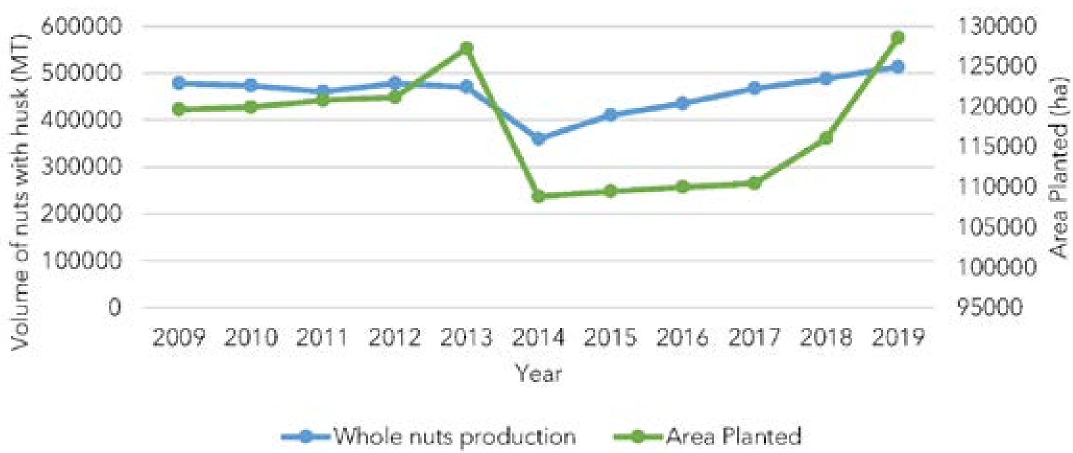
*[a]National production*
*Basic source of data: PCA*

# Western Visayas Production Trend (2009–2019)

Western Visayas contributed 3.5% to national coconut production. Similar to other regions in the Visayas, coconut hectarage and production were affected by the Super Typhoons Haiyan and Ruby. Recovery of production was immediate and the increasing trend continued, surpassed pre-Haiyan level by 2018, and further rose in 2019. There was slow recovery of lost hectarage until 2017 after which the increase was significant and by 2019 already surpassed the pre-Haiyan area.

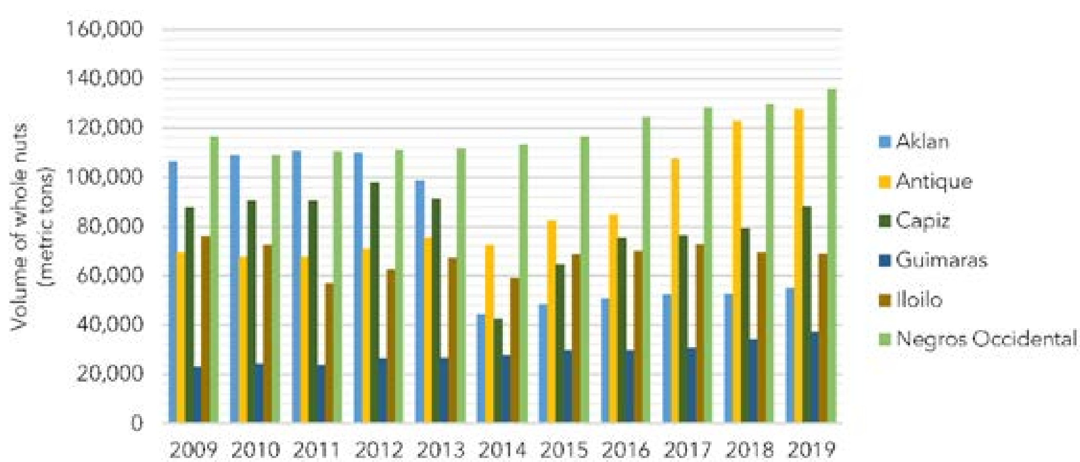
The region lost 18,413 ha of coconut plantations to Haiyan. Aklan and Capiz were the most severely affected provinces which lost more than half of their respective coconut areas in 2014. These provinces had not recovered until 2019 (Figure 3.145). Recovery of production to pre-Haiyan level was reached in 2018 and can be attributed to Negros Oriental which escaped the devastation of Haiyan and was able to consistently increase its production until 2019. Dramatic recovery in Antique was also recorded, which by 2016 already surpassed its pre-Haiyan production. The province has recovered and increased its coconut hectarage by 8,849 ha for a total of 128, 512 ha from 2009 to 2019, at an average growth rate of 7.40%.

**FIGURE 3.144. VOLUME OF WHOLE NUT PRODUCTION AND AREA PLANTED TO COCONUT IN WESTERN VISAYAS, 2009-2019**




Basic source of data: PSA

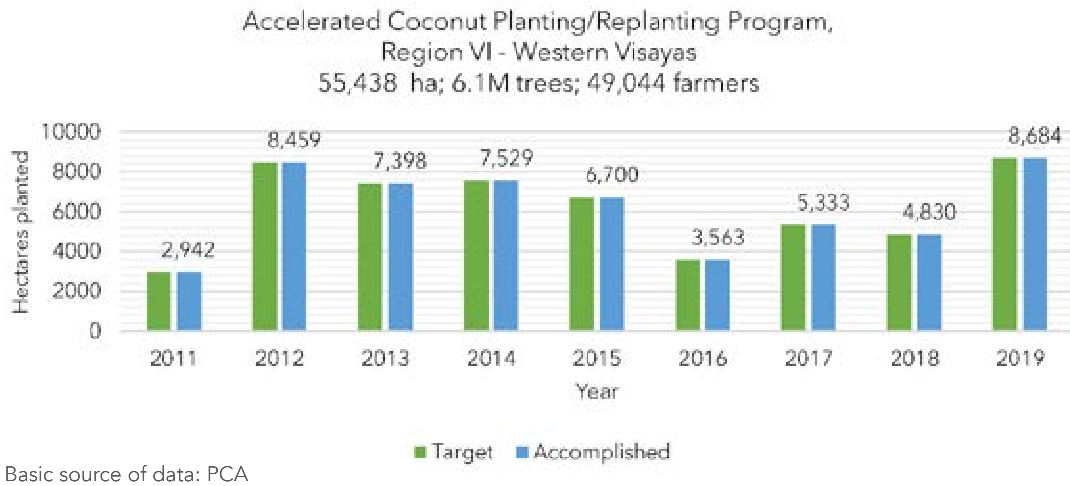
**FIGURE 3.145. VOLUME OF COCONUT PRODUCTION BY PROVINCE, WESTERN VISAYAS, 2009–2019**




Basic source of data: PSA

The continuing planting/replanting program before ST Haiyan has already accomplished about 19,000 ha. This accomplishment could have affected the fast recovery of the provinces that were not as severely devastated by ST Haiyan.

**FIGURE 3.146. TARGETS AND ACCOMPLISHMENTS OF THE ACCELERATED COCONUT PLANTING/REPLANTING PROJECT OF PCA IN WESTERN VISAYAS, 2011–2019**



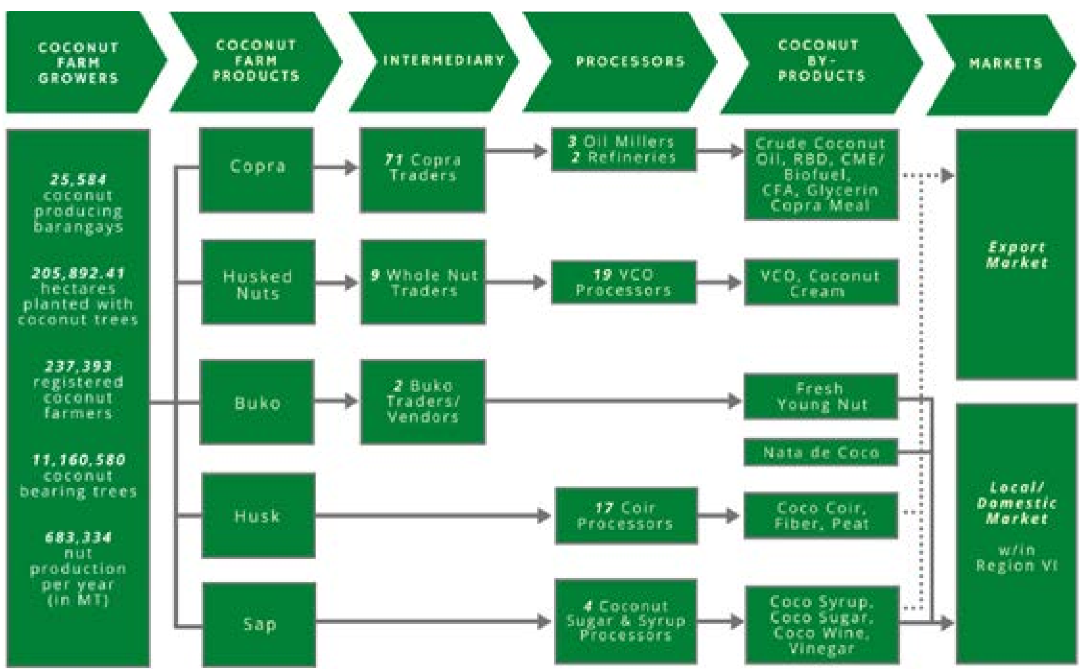

Basic source of data: PCA

Negros Occidental and Antique contributed 50% to the regional volume of production. Meanwhile, Capiz, Iloilo, and Aklan produced another 40%, while 7% was produced on the island of Guimaras, the least producer with 8,810 ha and more than 676,000 bearing trees. Among the regions in Visayas, Western Visayas is the only region with above average productivity per year at 53 nuts/tree/year, ranging from 52 nuts per tree to 62 nuts/tree/year in five provinces, except in Aklan whose yield per tree is only 38 nuts/tree/year (Table 3.75).

Figure 3.147 presents the product flow map of Western Visayas. A total of 2,584 barangays are involved in coconut planting. This number represents 64% of the total number of barangays, which means more than half of the communities in the locality depend on coconut. A total of 237,393 farmers must be covered with social protection in the area. Lands in Western Visayas are classified as suitable to highly suitable areas. The productivity of coconuts in this region at 53 nuts/tree/year is comparatively higher than the national average.

Traders in Western Visayas are not as numerous as in other regions. The major players in the area are VCO producers and coir processors. Oil millers and coco sugar manufacturers also exist in the area. Greater attention must be given to boost these nontraditional products which are characterized by niche market, small scale operation, and inefficiency of technology. Issues and problems in NTCPs can be addressed via market facilitation and linkage, research and product diversification to widen the base to other markets. Some to pump-prime the industry are: financial assistance in getting organic certification, adoption of quality enhancing technologies, and provision of incentives for adopting the use of centrifuge in VCO extraction. Provision of dwarf variety for coco sugar is recommended. Strategic planting can also be implemented in areas as deemed necessary and appropriate for different coconut products. More varieties that provide meat are recommended for VCO producers in the area while varieties with thicker husks are suggested for coir processors in respective places.

**FIGURE 3.147. PRODUCT FLOW MAP OF THE COCONUT INDUSTRY IN WESTERN VISAYAS, 2021**




Source: PSA and PCA Region VI, 2019

### TABLE 3.75. COCONUT REGIONAL AND PROVINCIAL STATISTICS, WESTERN VISAYAS, 2019

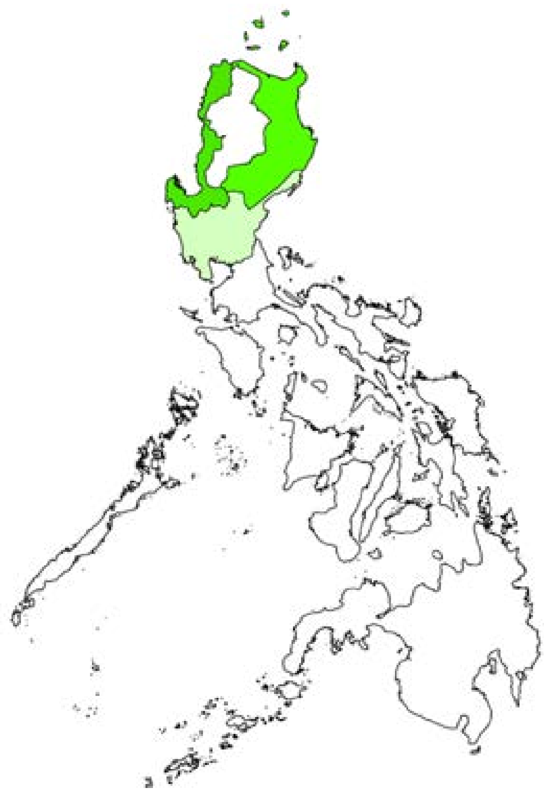
| Province | Area (ha) | Number of Bearing trees | Yield (nuts/ tree/ year) | Volume of production (nuts MT) | Volume of production (copra MT) | % Regional Contribution |
|---|---|---|---|---|---|---|
| Aklan | 17,530 | 1,437,460 | 38 | 55,102 | 8,761 | 11 |
| Antique | 29,669 | 2,280,000 | 56 | 127,798 | 20,320 | 25 |
| Capiz | 14,230 | 1,423,005 | 62 | 88,401 | 14,056 | 17 |
| Guimaras | 8,810 | 675,900 | 55 | 37,180 | 5,912 | 7 |
| Iloilo | 14,285 | 1,195,646 | 58 | 68,985 | 10,969 | 13 |
| Negros Occidental | 43,988 | 2,607,466 | 52 | 135,931 | 21,613 | 26 |
| Western Visayas | 128,512 | 9,619,477 | 53 | 513,397 | 81,630 | 3.5[a] |

*[a]National production*

*Basic source of data: PCA*

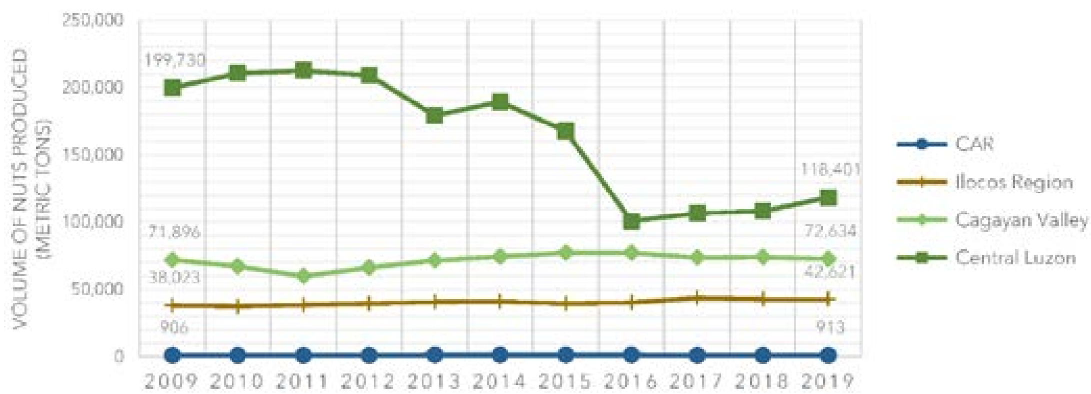
The quick recovery of Western Visayas compared with Central and Eastern Visayas is recommended for further study.

# CAR, Cagayan Valley, Ilocos Region, and Central Luzon Production Trend (2009–2019)



Cagayan Valley, Cordillera Administrative Region (CAR), Ilocos Region, and Central Luzon are considered minor production areas and were analyzed together since they belong to one PCA region. Together, they supplied only 1.6% to the national coconut production. Nut production trends differed in the four regions; Central Luzon, the largest producer among them, had a net decrease of 81M MT from 2009 to 2019. The three other regions had slight increases in production over the same period. The steep and lingering decline starting 2015 was most likely due to the severe El Niño in 2015–2016 (Figure 3.148).

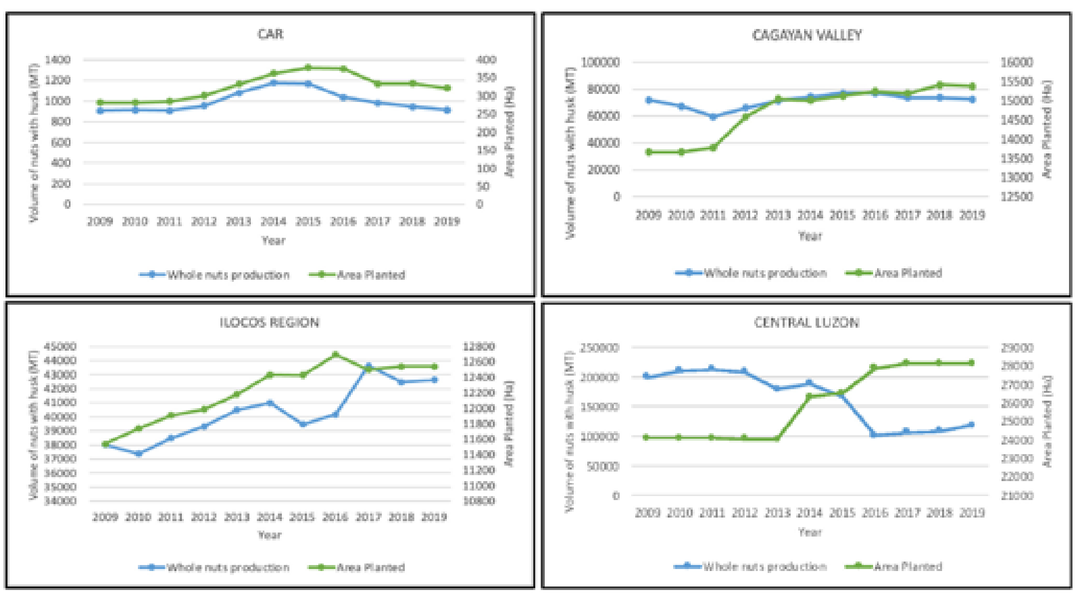
## FIGURE 3.148. VOLUME OF NUT PRODUCED IN CAR, CAGAYAN VALLEY, ILOCOS REGION, AND CENTRAL LUZON, 2009–2019




Basic source of data: PSA

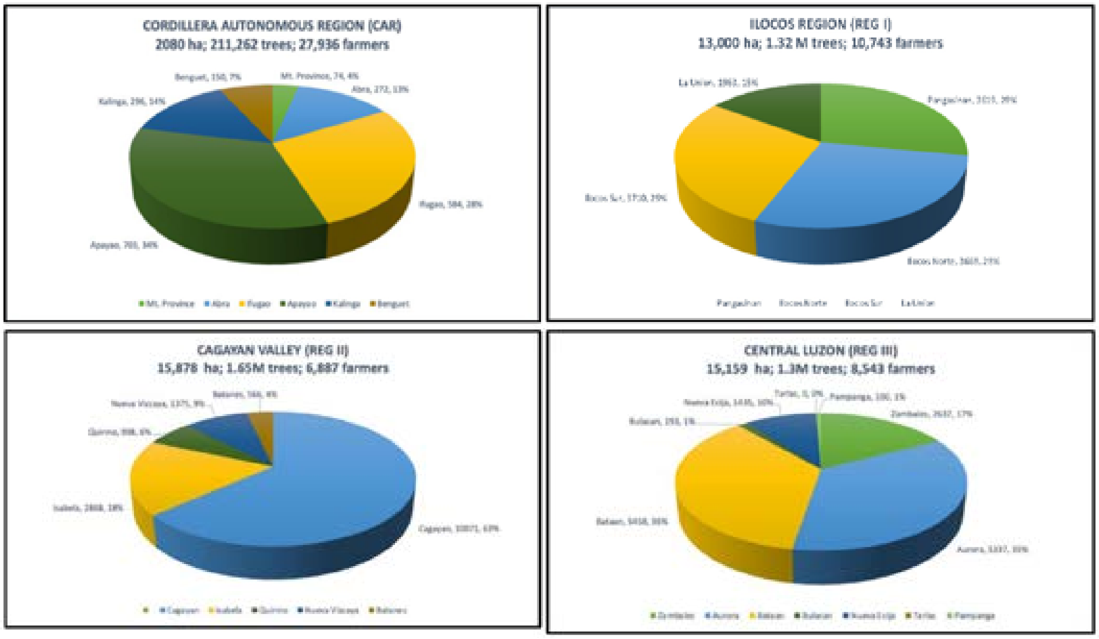
Except in Central Luzon, the volume of nut production more or less followed the trend in coconut hectarage. Additionally, despite the sharp increases in coconut areas, Central Luzon's production still contracted sharply (Figure 3.149).

## FIGURE 3.149. VOLUME OF WHOLE NUT PRODUCTION AND AREA PLANTED TO COCONUT IN CAR, CAGAYAN VALLEY, ILOCOS REGION, AND CENTRAL LUZON, 2009–2019




Basic source of data: PSA

## FIGURE 3.150. AREA REPLANTED/ PLANTED BY PCA PROGRAM IN CAR, CAGAYAN VALLEY, ILOCOS REGION, AND CENTRAL LUZON FROM 2009 TO 2019




Basic source of data: PCA

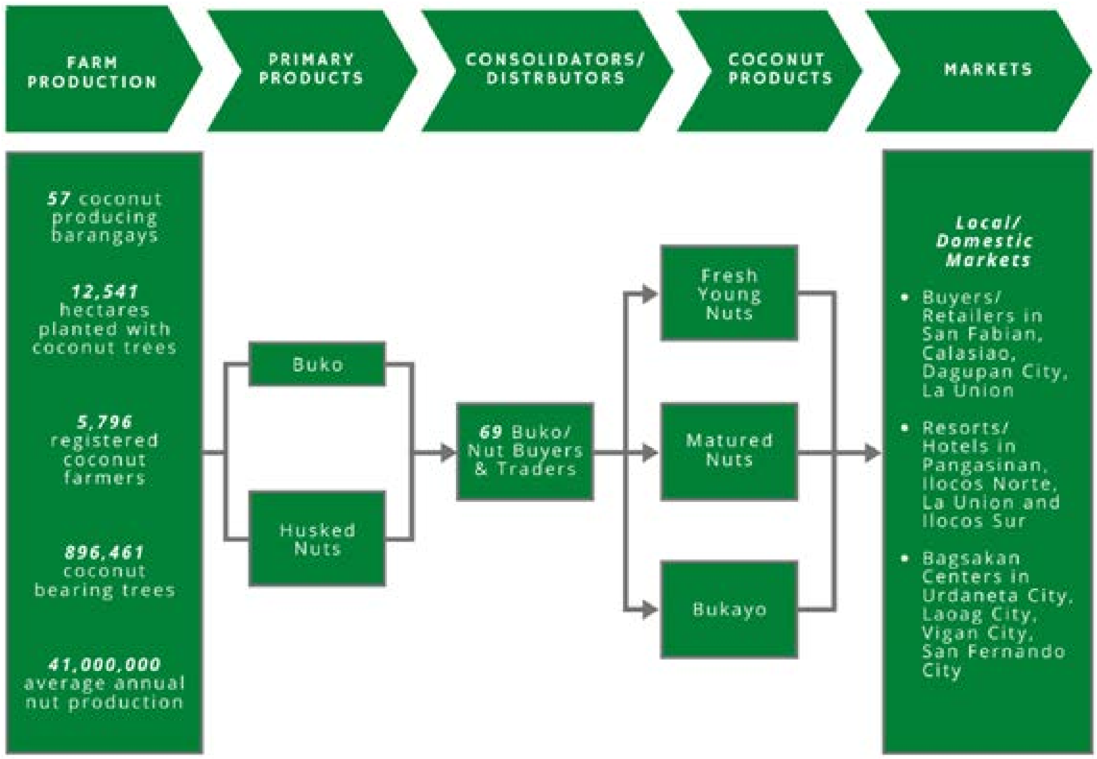
From 2010 to 2019, about 16,000 ha were planted/replanted in Cagayan Valley, 15,100 ha in Central Luzon, and 13,000 ha in Ilocos Region. The planting/replanting program had benefited over 6,800 farmers in Cagayan Valley, 8,500 in Central Luzon, and about 11,000 farmers in Ilocos Region. Lastly, CAR's 2,080-ha farmlands were planted/replanted and benefited almost 28,000 farmers.

The data of PCA and PSA need to be reconciled and harmonized , as the area reported to have been replanted by PCA is more than six times the coconut hectarage in CAR in 2019, a little more than 100% of the coconut area in Cagayan Valley, Ilocos Region, and almost twice that of Central Luzon.

The Ilocos Region has a total land area of 12,541 has devoted to coconut which is only 1% of the region's total land area. Hence, there is still a large agricultural and potential area for coconut land. Fifty- nine percent of the total coconut area is in Pangasinan. With the remaining vast amount of land in Ilocos region, the development of new and existing land can aid in supplying raw materials to cover the rising demand. Based on the regional roadmap of Ilocos Region, coconut production has to be increased five times more to meet the demand. Strategic location of a centralized coconut plantation is recommended in a rather dispersed nature of planted area in the region (PCA Regions I,II,III & CAR, 2019). The whole area of the Ilocos Region has suitable land for coconut farming. The Accelerated and Strategic Planting and Replanting Program, bundled with fertilizer support for two years, can be expanded. Though the magnitude of land per province has been identified and projected, the limiting factor is the supply of good seedlings for planting. One provincial nursery is already built in Pangasinan, but more seed farms may be established for expansion. The average productivity of the nut is 49 nuts/tree/year, which is greater than the national average of 44 nuts/tree/year (PCA Region I, II, III, and CAR). Planting and replanting a hybrid variety of coconut would still be beneficial. A total of 5,796 registered coconut farmers in Ilocos Region is expected to be given social protection from the Coco Levy Funds.

Figure 3.151 shows that the nuts produced by the farmers are collected by the consolidators who transfer them to the distributors and then to the retailers. A total of 69 consolidators and distributors are present in the area. There are nine producers of bukayo. Calamay and “tupig” are some of the other coconut- based products produced in the area. Ten percent of the population in the region consumes coconut but the potential market can be enlarged to cater to tourists in the area. Since Ilocos Region is a tourist destination, it pays off to engage in coconut enterprises, such as VCO, coco sugar and coconut water, that are appealing to local and foreign tourists. The existing bukayo industry can also be enriched through entrepreneurship and Upgrading Training and other related programs for MSMEs.

**FIGURE 3.151. PRODUCT FLOW MAP OF THE COCONUT INDUSTRY IN ILOCOS REGION, 2019**



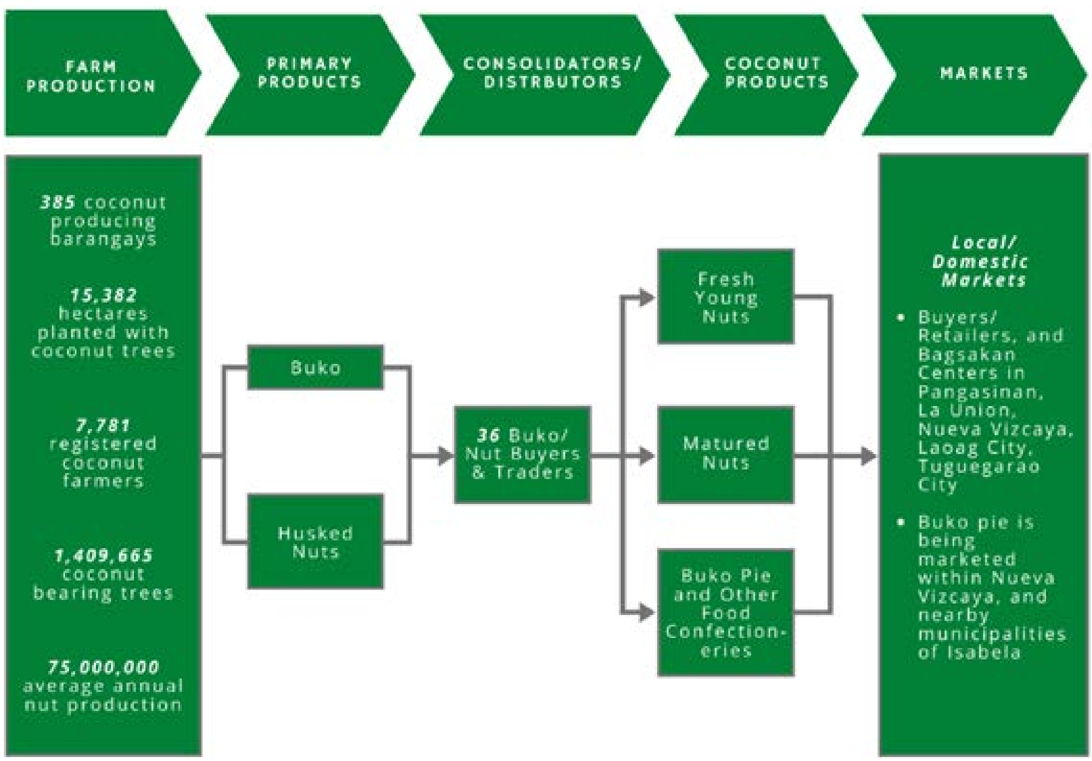

Source: PSA and PCA Region I, 2019

Similar to Ilocos Region, Cagayan Valley has minimal land allocated to coconut, i.e., 0.6% of the entire region. Coconut productivity is 52 nuts/tree/year, which is higher compared to other regions. There is a total of 7,781 farmers in the region. With the Coco Levy Act, these farmers are expected to be given social protection by the government. Farm products in this region are young and mature nuts but there are also two producers that specialize in the production of buko pie and other confectioneries. Thirty-six coconut traders are part of the product flow. The movement of products follows the same pattern as that of Region I and the goods are being sold locally in nearby towns and provinces. Strategies and interventions for Region II are similar to

Ilocos region, such as strategic planting or farm production expansion. This strategy is fitting not only because of idle tracts of land that can be utilized for planting but also because the land in Region II is classified as 'suitable' for coconut which implies high productivity of the area. Provision of good quality seeds or more seed farm development is warranted since only one seed farm was found. According to PCA Region II, the region's coconut production must increase by 72% to meet the market demand. A proportionate increase in the budget allocated to coconut production in Cagayan Valley must be realized.

Since coconut enterprises are scanty and at the nascent stage, the existing coconut-based product business, e.g. buko pie and other confectioneries, can be boosted through skills development program, training and capacity building, and entrepreneurship program and promotion. Introduction of nontraditional products such as VCO, coco sugar, and coco water in the region would also capture more market from local and foreign travelers.

**FIGURE 3.152. PRODUCT FLOW MAP OF THE COCONUT INDUSTRY IN CAGAYAN VALLEY REGION, 2021**




Source: PSA and PCA Region II, 2019

## TABLE 3.76. COCONUT REGIONAL AND PROVINCIAL STATISTICS, CAR, 2019

| Province | Area (ha) | Number of Bearing trees | Yield (nuts/ tree/ year) | Volume of Production (nuts MT) | Volume of Production (copra MT) | % Regional Contribution |
|---|---|---|---|---|---|---|
| Abra | 65 | 6000 | 32 | 192 | 30 | 21 |
| Apayao | 88 | 9000 | 32 | 284 | 45 | 31 |
| Benguet | 9 | 750 | 21 | 16 | 2 | 31 |
| Ifugao | 22 | 2830 | 62 | 174 | 28 | 2 |
| Kalinga | 88 | 8500 | 12 | 106 | 17 | 12 |
| Mountain Province | 49 | 5250 | 27 | 141 | 22 | 15 |
| CAR | 321 | 32330 | 28 | 913 | 145 | 0.01[a] |

[a]*National production*

*Basic source of data: PCA*

## TABLE 3.77. COCONUT REGIONAL AND PROVINCIAL STATISTICS, ILOCOS REGION, 2019

| Province | Area (ha) | Number of Bearing trees | Yield (nuts/ tree/ year) | Volume of Production (nuts MT) | Volume of Production (copra MT) | % Regional Contribution |
|---|---|---|---|---|---|---|
| Ilocos Norte | 2771 | 133765 | 43 | 5807 | 923 | 14 |
| Ilocos Sur | 1146 | 124247 | 39 | 4793 | 762 | 11 |
| La Union | 1257 | 44450 | 59 | 2620 | 417 | 6 |
| Pangasinan | 7367 | 594000 | 49 | 29402 | 4675 | 69 |
| Ilocos Region | 12541 | 869462 | 48 | 42621 | 6777 | 0.29[a] |

[a]*National production*

*Basic source of data: PCA*

## TABLE 3.78. COCONUT REGIONAL AND PROVINCIAL STATISTICS, CAGAYAN VALLEY, 2019

| Province | Area (ha) | Number of Bearing trees | Yield (nuts/ tree/ year) | Volume of production (nuts MT) | Volume of production (copra MT) | % Regional Contribution |
|---|---|---|---|---|---|---|
| Batanes | 711 | 51195 | 11 | 558 | 89 | 1 |
| Cagayan | 6821 | 705008 | 47 | 32843 | 5222 | 45 |
| Isabela | 5518 | 485453 | 59 | 28839 | 4585 | 40 |
| Nueva Vizcaya | 1482 | 129620 | 61 | 7844 | 1247 | 11 |
| Quirino | 850 | 38389 | 66 | 2550 | 406 | 4 |
| Cagayan Valley | 15382 | 1409665 | 52 | 72634 | 11549 | 0.49[a] |

[a]*National production*

*Basic source of data: PCA*

## TABLE 3.79. COCONUT REGIONAL AND PROVINCIAL STATISTICS, CENTRAL LUZON, 2019

| Province | Area (ha) | Number of Bearing trees | Yield (nuts/ tree/ yr) | Volume of production (nuts MT) | Volume of production (copra MT) | % Regional Contribution |
|---|---|---|---|---|---|---|
| Aurora | 26198 | 2977940 | 38 | 111676 | 17757 | 94 |
| Bataan | 859 | 106492 | 36 | 3880 | 617 | 3 |
| Bulacan | 246 | 23500 | 25 | 583 | 93 | 0 |
| Nueva Ecija | 142 | 10600 | 79 | 839 | 133 | 1 |
| Pampanga | 50 | 3350 | 66 | 222 | 35 | 0 |
| Tarlac | 278 | 13750 | 43 | 588 | 93 | 0 |
| Zambales | 358 | 37121 | 17 | 613 | 97 | 1 |
| Central Luzon | 28129 | 3172753 | 37 | 118401 | 18826 | 0.8[a] |

[a]*National production*

*Basic source of data: PCA*

Only one province dominated coconut production in the Ilocos Region, with Pangasinan contributing 69%, and Aurora in Central Luzon supplying 94%. In Cagayan Valley, Cagayan (45%) and Isabela (40%) contributed 85% to the regional coconut production. Coconut productivity differed across regions and within provinces in the region. Cagayan Valley, except for Batanes, had above average productivity per tree in four provinces ranging from 47 nuts/tree/year to 66 nuts/tree/year. In CAR, Ifugao had a computed average of 62 nuts/tree/ year from only 2,800 bearing trees. In Ilocos Region, La Union had 59 nuts/tree/year and Pangasinan, 49 nuts/tree/year. In Central Luzon, Nueva Ecija produced 79 nuts/tree/year from only 10,600 bearing trees while Pampanga, with only 3,350 bearing trees, yielded 66 nuts/tree/year.

# Analysis for Processing: Domestic and International

## Coconut Oil

- **CARGILL, INC.** Cargill, Inc. has two subsidiaries operating in Southeast Asia that are manufacturing crude coconut oil, namely, Cargill Philippines and Cargill Indonesia (https://www.cargill.ph). Cargill, Inc. started doing business in the Philippines in 1947 when the vegetable oil division started buying copra for export to the United States. It was Cargill's first office in Asia. Cargill Philippines now employs over 950 people throughout the country. The company's primary offices are in Taguig City (headquarters), Bulacan, Batangas, Laguna, and General Santos City, with several satellite offices in strategic locations all over the Philippines. The company owns and operates a copra crushing plant in General Santos City that produces crude coconut oil and copra meal for domestic and export markets. Construction of the facility was completed in January 1991 and its operation began in the same year to source and process copra to produce crude coconut oil. Since then, the plant consistently operates at one of the highest utilization rates in the Philippine coconut oil milling industry (i.e., 171,000 MT/year) using the mechanical, full press oil extraction technology. Cargill also operates several copra buying stations in the country to supply its crushing capacity in General Santos City. The company's copra buying stations are in Puerto Princesa and Brooke's Point, Palawan; Tagbilaran, Bohol; Sogod, Leyte; Davao City; Mati, Davao Oriental; Pagadian City, Davao del Sur; and Isabela City, Basilan.

In Indonesia, Cargill, Inc. recently expanded its copra crushing facility in Amurang, some 60 km southwest of Manado, the capital of North Sulawesi. This facility produces coconut oil and copra meal mainly for export and houses bulk storage tanks for lauric oils with a capacity of 31,000 MT.

Cargill Inc. runs copra collection stations and crushing plants in both the Philippines and Indonesia. This company has assisted, and continues to assist, small coconut farmers to improve their livelihood and secure certification for their produce according to the Sustainable Agriculture Network (SAN) of the Rainforest Alliance by training them on the use of sustainable farming practices. The company establishes farmers' field schools that teach smallholder farmers agricultural best practices, provides them access to farm inputs, and assists them in forming cooperative organizations to build their collective capacity and strengthen their communities.

- **WILMAR INTERNATIONAL LIMITED.** Wilmar International Limited, founded in 1991 and headquartered in Singapore, is currently Asia's leading agribusiness group (https://wilmar- international.com and https://www.bloomberg.com). Some of Wilmar's business activities include oilseed crushing and edible oils refining. Wilmar Edible Oils Philippines, Inc., a subsidiary of Wilmar International Limited, was founded in 2007 to manufacture and export high-quality crude coconut oil, copra cake, refined bleached oil (cochin oil), and refined bleached deodorized oil. . The company—with its head office located in Makati City—has a total of 113 employees working in its processing plants in Gingoog City, Misamis Oriental and Roxas, Zamboanga del Norte. The company is the second-largest manufacturer of crude coconut oil and the top producer of refined coconut oil in the country and in the world. The company's aggregate oil milling capacity is 261,000 MT (i.e., 165,000 MT in its oil mill in Zamboanga del Norte and 96,000 MT in its oil mill in Misamis Oriental). Its aggregate refining capacity is 196,000 MT (i.e., 100,000 MT in its oil refinery in Zamboanga del Norte and 96,000 MT in its oil refinery in Misamis Oriental). The company maintains strict quality standards. Although the coconut oil products undergo refining, bleaching, and deodorizing, the company utilizes modern technologies and refines coconut oil under optimal conditions so that losses of the desirable components in

RBD coconut oil are minimized. Wilmar International Limited secured the following certifications: FSSC 22000, HACCP, Halal, ISO 14001, ISO 9001: 2018, Kosher, and OHSAS 18001.

- **GRANEXPORT MANUFACTURING CORPORATION.** Granexport Manufacturing, one of the Coconut Industry Investment Fund Oil Mills Group (CIIF OMG), is the biggest single copra processing plant in the world. The company has the capacity to crush 270,000 MT of copra per year (https://www.ciif.ph). Its 10-ha plant in Kiwalan, Iligan City, Misamis Occidental was established in 1974. Its products include crude coconut oil, copra pellets, cochin oil, and refined bleached deodorized oil. The plant is equipped with a pier that accommodates vessels up to 65,000 deadweight tons for loading finished products and unloading copra feedstock. On average, 80% of the group's produce are exported abroad while the balance is sold in the domestic market. The company's processing plant/coconut oil products are ISO 9001 (QAS International), Halal, FDA, SK, ISPS and US FDA accredited.
- **PRIMEX GROUP OF COMPANIES**. Currently, with six factories manufacturing crude coconut oil, the Primex Group of Companies has the largest total annual capacity of 504,000,000 MT of crude coconut oil and 63,000 refined oil (https://primexcoco.com). The Primex Group of Companies' coconut oil mills are as follows: Primex Coco Product in Candelaria, Quezon; Globe Coco Products Manufacturing Corp. in Legaspi, Albay; Catarman Oil Mill in Northern Samar; Tacloban Oil Mills Inc. in Tolosa, Leyte; Dipolog Oil Mills Inc. in Roxas, Zamboanga del Norte; and New Davao Oil Mills Inc. in Panacan, Davao City. All the six coconut oil processing facilities of the Primex Group of Companies are strategically located in areas where coconut trees are naturally abundant. Situated in six different locations all over the Philippines, the Primex Group of Companies is currently one of the largest users of coconut as raw material in the world. The Primex Group of Companies secured the following certifications: USDA Organic, Organico Brasil, EU Organic, Korea Organic, BRC, JAS EcoCert, Halal, Kosher, Fair Trade, and Naturland.

  Among its plants, the coconut processing plant of Prime Coconut Products, Inc. in Candelaria, Quezon has the smallest rated capacity for crude coconut oil production at 45,000 MT per year since the factory's main product is desiccated coconut. The factory also produces extra virgin coconut oil and coconut milk powder. The coconut milk powder production facility has an annual capacity of 3,000 MT. This factory combines state-of-the-art equipment with high dairy standard and quality systems.

Operating since 1995, Globe Coco Products of Legazpi, Albay is one of the main Primex processing centers for crude coconut oil. Its coconut oil processing plant utilizes 14 expellers. The plant of the Globe Coco Products Manufacturing Corp. produces 90,000 MT of crude coconut oil per year.

The Catarman Oil Mills Inc. in Northern Samar is the newest coconut oil processing plant of the Primex Group of Companies. Utilizing 12 expellers, this plant can produce 54,000 MT of crude coconut oil per year. Aside from its own private port, the Catarman plant is also equipped with its own power generation system.

Located just 25 kilometers from the City of Tacloban, Leyte, the Tacloban Oil Mills Inc. was established in 2006 with a plant capacity of 90,000 MT per year. Operations of the plant consist mainly of processing crude coconut oil for export and for the local market.

The coconut oil processing plant of Dipolog Oil Mills Inc. in Dipolog City, Zamboanga del Norte has a rated capacity of 135,000 MT/year. Both the Tacloban Oil Mills Inc. and Dipolog Oil Mills Inc. have their own private port and motor vessels to expedite the transport of raw materials to the plant.

The New Davao Oil Mills Inc. was established in July 2001 to cater to the crude coconut oil and refined coconut oil demand in the local and foreign markets. Utilizing 16 Anderson Super Duo expellers, this plant has the capacity to manufacture 90,000 MT of crude coconut oil and to refine 63,000 MT of coconut oil per year. The plant is strategically located in Panacan, Davao and exports its finished products to the USA, People's Republic of China, and Europe.

## Desiccated Coconut

- **FRANKLIN BAKER CO.** Franklin Baker Co., a private company operating in the Philippines, is the world's leading supplier of desiccated coconut products (i.e., granulated and special cuts of desiccated coconuts, golden toasted and tender, fresh, sweetened desiccated coconuts) (https://www.franklinbaker.com). Franklin Baker's three manufacturing plants—located in San Pablo City, Laguna and Sta. Cruz, Davao del Sur— are renowned for producing the highest quality desiccated coconut products. Franklin Baker Co. has the largest aggregate desiccated coconut production capacity at 61,000 MT. Its coconut processing plant in Sta. Cruz, Davao del Sur has a rated capacity of 45,000 MT of desiccated coconut while its facility in San Pablo City, Laguna has a lower rated capacity at 16,800 MT of desiccated coconut. The company procures coconuts from different provinces in Mindanao. The company's desiccated coconut products are shipped to over 50 countries worldwide across the United States, South America, Europe, Middle East, Africa, and Asia Pacific. Franklin Baker Co. is the leading and preferred supplier of desiccated coconut to major food manufacturers and confectionery/bakery producers in the United States—such as Kraft Foods, Hershey's, Kellogg's, General Mills and Nestle—accounting for close to 50% share of the total Philippine coconut exports to the USA. The company has three warehouse locations in the United States. It operates marketing offices in Memphis, Texas, USA, and Northolt in the United Kingdom. The company's retail brand is "Baker's Coconut".

Franklin Baker Co. company focuses on quality attributes such as cut uniformity, consistency, degree of whiteness, moisture levels, sulfite content, and the absence of unwanted foreign materials. Above all else, the company's compliance to internationally recognized food safety standards related to microbiological levels in food products and GMP procedures commands its utmost attention. In pursuit of these exceptional standards, Franklin Baker employs several unique and industry best practices in its manufacturing processes and the use of specialized equipment to help ensure the high quality and safety of its desiccated coconut products. The company practices steam pasteurization of all the nuts it processes. Its pasteurization system offers significant benefits vs. the industry standard of using the thermal screw system which gives a rotating exposure to steam that is not constant, cannot be clearly monitored, and has the functional disadvantage of potential recontamination due to the presence of "cold spots" resulting in incomplete kill. In addition, the company's desiccated coconut plants have the capability to produce their own steam requirements and have backup generators to help prevent interruption in the company's manufacturing operations. Its high-care processing areas are supplied with filtered air that helps prevent the desiccated coconut products from exposure to airborne physical and microbial contaminants. The company utilizes a continuous blancher-dryer system to prevent post microbial contamination after pasteurization (blanching). Moreover, the company implements an extensive sampling plan by taking samples from each bag of product and combining these as a composite sample, subject to extensive microbiological testing. This sampling plan was adopted based on the US FDA & ICMSF (International Compendium of Microbiological Specifications for Foods). Nonfood contact surface areas are subjected to regular swabbing for pathogen testing, while food contact surface areas are sampled regularly and tested rigorously for indicator organisms. Surface swabs (ATP & microbiological) are taken before the start of operation on all food contact surface areas to validate compliance to cleaning and sanitization procedures. Deep wells and all water at points of use are sampled regularly for microbiological testing. Process and non-process water supplies are regularly tested for chlorine levels. Microbiological testing includes aerobic plate count, coliform group count, E. coli, molds, yeasts, Staphylococcus aureus, and Salmonella. To ensure the accurate and timely detection of Salmonella, Franklin Baker has adopted the use of rapid and highly sensitive PCR-based pathogen detection systems since 2000. These detection equipment amplify the target organism's DNA and can detect the presence of Salmonella within 26 to 28 hours from the start of analysis without the need for additional confirmation. The company also conducts audit-level testing on lipolytic activity. The company's standard operating procedure requires that all products be automatically quarantined. No product is released for shipment unless it receives documented and verified finished product clearance from the Quality Assurance Department. The company also conducts inspections of all container vans prior to use including their previous loads to ensure that each container van is free from leaks, pests, and odor. As a further measure to protect its products, the flooring of all container vans is lined with Kraft paper prior to product loading. This procedure was adopted to help mitigate the risk of odor and moisture migration inside the container van.

Owing to Franklin Baker's compliance with internationally recognized food safety standards related to microbiological levels in food products and GMP procedures the company has extensive third party certifications and accreditations for all its processing plants/products: USDA Organic, EU Organic, Non-GMO Project Verified, Fair Trade USA, British Retailers Consortium (BRC) Global Standard for Food Safety, Japanese Agricultural Standard System (JAS), ISO 9001:2000, ISO 22000 Food Safety Management System, HACCP (Hazard Analysis and Critical Control Points), FDA Philippines, GMA-SAFE, AB PAO Accredited Testing Laboratory, Kosher certified by OK Kosher Certification, and Halal certified by the Islamic Da'Wah Council of the Philippines. The company received an Award of Excellence and the 2016-2018 American Master of Taste and Gold Medal Endorsement for Superior Taste. The company's microbiology laboratories are now accredited to the ISO 17025 Laboratory Management System by the Philippine Accreditation Bureau. Franklin Baker Co. is a member of SEDEX, the supplier of Ethical Data Exchange. SEDEX provides member companies with a secure web-based platform for storing and sharing information on four key pillars: Health and Safety, Labor Standards, Business Ethics and Environment.

Other leading players in the global desiccated coconut market are the Primex Group of Companies, Superstar Coconut Products, Inc. (Philippines), Peter Paul Philippines Corporation (Philippines), PT Global Coconut (Indonesia), and CBL Natural Foods (Sri Lanka).

- **PRIMEX GROUP OF COMPANIES.** Primex is one of the leading desiccated coconut brands in the world (Primex op. cit.). The two member companies of Primex that produce high-grade quality desiccated coconut are Primex Coco Products, Inc. and Primex Coco Davao, Inc. These two companies have an aggregate production capacity of 50,000 MT per year. Primex Coco Products was established in 1991 in Candelaria, Quezon and presently, the rated capacity of its factory is 24,000 MT per year. The company now employs more than 1,500 employees. Primex Coco Products, Inc. is ISO:22000 FSMS, JAS EcoCert, and BRC certified and is duly accredited by most of the world's major confectioneries.

  Established in 2003 in Sta. Cruz, Davao del Sur, Primex Coco Davao started from a rated annual capacity of 13,000 MT of desiccated coconut. In a short period of time, the company's capacity has doubled to 26,000 MT per year. Primex Coco Davao Inc. is currently employing 1,800 employees. This makes Primex the fastest-growing desiccated coconut manufacturer in the world. The industrial plant is uniquely and specifically designed to meet international food standards, combining top-of-the-line and efficient structures, heavy-duty equipment, and advanced quality monitoring system. The company produces multi-graded desiccated coconut. The company's factory/product is ISO 22000 certified and its desiccated coconut products are Halal, Kosher, JAS EcoCert, BRC, USDA organic, EU organic, Korea organic, Organic Brasil, Fair Trade, and Naturland certified.

All the desiccated coconut products produced by the Primex Group of companies have a natural coconut flavor. They come in a variety of forms from chips, shredded, flakes, granules, and macaroons. All the company's desiccated coconut products passed through the two companies' meticulous quality checks which include metal detection and microbiological analysis. The Primex companies produce different variants of desiccated coconut—such as sweetened, toasted, and sweetened toasted; and also various cuts such as extra-fine, fine, and medium.

- **PETER PAUL PHILIPPINES CORPORATION**. Peter Paul Philippines Corp. was formerly a subsidiary of the US-based Peter Paul, Inc. of Naugatuck, Connecticut when it began operations in Candelaria, Quezon becoming one of the pioneering American companies in the country (https://www.peterpaul.com). It is now 100% Filipino-owned and has expanded its operation due to the increased demand for coconut products worldwide. Peter Paul Philippines Corp. is one of the largest firms producing desiccated coconut in the Philippines and in the world. It has two desiccated coconut factories with a total rated capacity of 44,000 MT per year. One factory is in Candelaria, Quezon, which has a rated capacity of 22,000 MT per year, mainly for export. The company's factory in Quezon employs 1,700 workers. The second factory is in Sorsogon, Sorsogon with a rated capacity of also 22,000 MT per year. Since its inception, Peter Paul Philippines Corp. has achieved and maintained its reputation for excellent quality coconut products. The company's desiccated coconut products are made from choice nuts and pass through stringent international certified process. Peter Paul Philippines Corp.'s production of desiccated coconut is an elaborate food processing system, with processes monitored at each control point by inspection and testing of each product. The implementation of the company's stringent standards is evidenced by its HACCP, ISO 9001, ISO 22000, GMP, and Organic certification (USDA and Europe) into its quality system. The company has also Halal, Fair Trade, and Kosher certification.

  Peter Paul Philippines Corp. is also a premier producer of other coconut-based products such as virgin coconut oil, coconut flour, coconut milk, coconut cream, coconut water, creamed coconut, and toasted chips. The company is one of the preferred global suppliers of coconut products. Peter Paul's products are exported to North and South America, Europe, other Asia countries, and the Middle East where the company maintains a substantial share in each of these markets. Peter Paul Philippines' customers for desiccated coconut have established household name brands in confectionery, cookie, and cereal industries. The company's desiccated coconut product line provides food manufacturers with an assorted array of different cuts. The different variants of desiccated coconut produced by the company are regular desiccated coconut, sweetened desiccated coconut, toasted desiccated coconut, and toasted long chips.

- **SUPERSTAR COCONUT PRODUCTS, INC.** Superstar Coconut Products Co., Inc. is a private manufacturer of coconut products based in the Philippines since 1992(https://superstar.coconut.com). Family managed, Superstar Coconut Products Co., Inc. operates two world-class desiccated coconut processing plants with an aggregate rated capacity of 48,000 MT per year. Its desiccated coconut processing plant in Candelaria, Quezon has a rated capacity of 22,000 MT per year while its desiccated coconut processing facility in Davao City has a rated capacity of 26,000 MT. The company has automated systems and top-notch machines and employs more than 2,000 skilled workers. Six different calibrated cuts of desiccated coconut are produced by the company to suit the needs of customers.

  The company has expanded its product line to include coconut milk powder, , coconut milk, coconut water, frozen coconut water concentrate, virgin coconut oil, coconut flour, and creamed coconut. Coconut milk powder found a strong market in Europe where fresh coconut milk is not readily available. The company's coconut products are BRC, USDA Organic, EU Organic, JAS, Halal, Kosher, and HACCP certified. Superstar Coconut Products Co., Inc. is one of the major suppliers of desiccated coconut to several companies all over the world.

- **PT GLOBAL COCONUT**. P T Global Coconut is a privately-owned company which was established in 2012 and is one of the leading manufacturers of desiccated coconut products (www.ptglobalcoconut.com). Its processing plant in North Sulawesi, Indonesia is equipped with an ultra-modern and eco-friendly production facility with a peak operating capacity of 250,000 nuts per day (B2B supplies). It is also equipped with the latest European food processing technologies from

Alfa Laval, aimed at producing the highest quality products for customers globally. The company's processing plant is Halal, ISO 22000, FSSC 22000, and KLBD Kosher certified. The company exports desiccated coconut to the People's Republic of China, Thailand, Vietnam, and the United States.

- **CBL NATURAL FOODS.** CBL Natural Foods, which has been operating for over 20 years in Sri Lanka, produces organic, finely grated, and medium-sized grated desiccated coconut with no added sugar, flavor, color, preservative, and additives using modern technology (https://www.cblnaturalfoods.com). The company's products are organic certified by Control Union, Star-Kosher certified, IFS food safety and quality standard certified by SGS International Certificate Services, JAS certified by Control Union, and LK BIO-149 Certified for the EU. In addition, the company has obtained ISO 22000 Quality Management System Certification awarded by the International Organization for Standardization, HACCP certification from MOODY International Holland, and Fair Trade certification. CBL Natural Foods' conformity to all international standards has enabled the company to export desiccated coconut to 45 countries.

## Coco Shell Charcoal

- **JACOBI CARBONS PHILIPPINES.** Jacobi Carbons Philippines, Inc., which was established in Villanueva, Misamis Oriental in 2012, has the world's largest coconut shell charcoal processing plant at 252,974 MT/year (https://qaphilippinescom>company). The company has modern rotary kilns and granulation equipment and also highly efficient dust collector that captures all dust inside the production area during processing. Jacobi Carbons Philippines, Inc. is engaged in purchasing coconut shell charcoal from local farmers that the company granulates to required sizes. The activated carbon facility of Jacobi Carbons Philippines uses bulk of the granulated coconut shell charcoal produced at the company's coco shell charcoal processing plant as raw material. Moreover, the company prepares the granulated coco shell charcoal for export to its affiliate companies in India, Vietnam, and Sri Lanka after a thorough quality control process. At an average shipment volume of

700–1000 MT weekly, these are being used to manufacture activated carbon of other affiliate companies.

- **BAKULAN NUSATRA**. Bakulan Nusatra whose main office is in Solo, Central Java is Indonesia's largest supplier of high-quality food grade coconut shell charcoal and coconut charcoal briquettes for shisha and barbeque (www.bakulan.nusantara.com and https://www.zoominfo.com>bakulan-). The company's capacity is 24,000 MT per year and it has 21 employees. The company has several refinery factories that collect thousands of tons of raw or burnt coconut shells directly from coconut farmers all over the Indonesian archipelago. For both natural and granulated charcoal processing, the company's uniquely designed, continuous one-line process cleans and sorts the coconut shell charcoal, removing any foreign materials or under burnt charcoal pieces. Then the coconut shell charcoal pieces move to the next step for granulation via conveyor belt. The company granulates coconut shell charcoal to any specification suitable for all activated carbon processes. The company has rotary dryers to dry the granulated coconut shell charcoal to put the moisture content down to the required level. The company packs granulated coconut shell charcoal in 20-kg polypropylene (PP) bags which are stacked on one-ton pellets and moved to a shipping container for export. In manufacturing coconut shell charcoal briquette, high-grade granulated coconut shell charcoal is turned into powder and molded into any shape or size depending on the customers' specifications. The company's coconut shell powder is fine as possible, less than 2mm, so all surfaces can ignite and burn evenly.

  Granulated coconut shell charcoal is Bakulan Nusatra's preferred form for coconut charcoal export. The company's main export destinations for granulated charcoal are activated carbon plants in the People's Republic of China and in Southeast Asian countries. The company also exports charcoal briquette to over 10 different countries. Each country has its own requirements for different characteristics of the charcoal briquette.

## Coco Shell Charcoal-based Activated Carbon

- **Haycarb PLC.** Haycarb PLC is one of the world's leading manufacturers and marketers of coconut shell charcoal-based activated carbon (https://www.haycarb.com). Accounting for over 16% of the global market share, the company has an annual capacity of over 50,000 MT of activated carbon. Haycarb PLC manufactures a complete range of standard, washed and impregnated granular activated carbon, powder activated carbon, and extruded pellet activated carbon for a full spectrum of applications in water treatment, air treatment, gold recovery, food and beverage industry, energy storage, and specialty applications. The company was established in 1973 and operates six coco shell charcoal-based activated carbon manufacturing locations in Sri Lanka, Thailand, and Indonesia. Haycarb PLC's first coco shell charcoal-based activated carbon processing plant, which was established in Madampe, Sri Lanka, commenced its operation with 900 MT per annum. The facility has now expanded to 10,500 MT per annum. The second coco shell charcoal-based activated carbon production facility of Haycarb is located in Badalgama, Sri Lanka. The facility expanded from 5,000 MT to 7,000 MT per annum. The company has set up a coco shell charcoal-based activated carbon processing plant in Indonesia with manufacturing capacity of over 6,500 MT per annum for the local market and another facility with production capacity of 3,600 MT for export. The company acquired the Shizuka plant in Thailand to further expand the Haycarb Group's presence in the country and to open new market segments in the region with enhanced capacity of 3,000 MT. Haycarb also put up a joint venture company called Carbokarn Co. Ltd. In Thailand. Carbokarn's extensive product range and technical services has enabled it to capture around 80% of the coco shell charcoal-based activated carbon market in Thailand across a wide range of applications. The company's coco shell charcoal-based activated plants supply a global sales network composed of marketing subsidiaries in USA (i.e., Haycarb USA, Inc.), United Kingdom (i.e., Eurocarb Products Limited), and Australia (Haycarb Holdings Australia). Haycarb Sri Lanka Head Office acts as the central coordinating center for the Haycarb Group.

Haycarb PLC places vital importance on process and quality control in its production systems. All Haycarb PLC's coco shell charcoal-based activated carbon manufacturing facilities situated in Sri Lanka, Thailand, and Indonesia are ISO 90001: 2008, National Sanitation Foundation (NSF), Standard Global Services (SGS), United Kingdom Accreditation Service (UKAS) Quality Management, Halal, and Kosher certified as well as have EU's Registration, Evaluation, Authorization and Restriction of Chemicals (REACH) Compliance, Food Chemical Codex Compliance and Prop 65 Compliance certificates. Haycarb PLC is also an American Water Works Association (AWWA) member and has won a silver award at the NCE (National Chamber of Exporters) Export Award 2020. The company has adopted UN Global Compact Principles on Sustainable Growth and its Sri Lankan operations are ISO 14001 certified.

Equipped with in-house R&D and engineering capabilities, the company also offers total solutions suited to its customers from activated carbon testing and product development, regeneration of spent activated carbon to designing and implementation of activated carbon-based environmental engineering systems.

- **JACOBI CARBONS GROUP**. Founded in 2016, Jacobi Carbons Group is a wholly owned subsidiary of Osaka Gas Chemicals Co. Ltd. and is a manufacturer of high-quality activated carbon using raw materials based on coconut shell charcoal, wood, and coal (www.jacobi.net>jacobi-history and https://www.jacobi.net>about). Jacobi Carbons Group is now the world's leading manufacturer of coco shell based-activated carbon which is used in purification processes including drinking and process water filtration, air and gas purification, recovery of precious metals and purification. The Group has 19 global subsidiaries and 14 wholly owned production sites around the world. Jacobi Carbons Group wholly owns and operates five (5) coconut shell charcoal-based activated carbon facilities in China, India, Sri Lanka, Vietnam, and the Philippines. Each Jacobi Carbons activated carbon facility operates modern, efficient processing equipment. Jacobi Carbons is an accredited organization meeting the rigid international standards (ISO 14001, ISO 45001, and ISO 9001) with local accreditations in the production, distribution, and administration points. Jacobi adopts strict quality assurance procedures to ensure that the company produces high quality activated carbon products.

  In 1987, Jacobi Carbons Group established its initial contacts in the People's Republic of China and rapidly developed the first major investment of any western company in the activated carbon business. In 2005, Jacobi Carbons established a new state-of-the-art, 100% wholly coconut shell charcoal-based activated carbon plant in Sri Lanka. The 5000-MT per year plant is the first major "Greenfield" expansion in the coconut shell charcoal-based activated carbon market in over 10 years. In 2008, Jacobi Sri Lanka expanded its capacity to a total of 9,000 MT per year. In 2009, Jacobi Carbons India opened what is to become the world's largest coconut shell charcoal-based activated carbon in Coimbatore, India with an annual capacity of 16,000 MT per year, propelling Jacobi to be in the top spot in the world coconut shell charcoal-based activated carbon market. In 2011, Jacobi Carbons had put up a coconut shell-based activated carbon plant in Vietnam which is exporting 400 loads of coconut shell charcoal-based activated carbon per year. In 2015, Jacobi Carbons opened its newest coco shell charcoal-based activated carbon production facility in Villanueva, Misamis Oriental in the island of Mindanao, Philippines, adding an additional 20,000 MT of annual capacity. This facility is the world's largest coconut shell charcoal-based activated carbon plant with a new level of automation. This facility, with its size and sophistication, represents the state-of-the-art in carbon activation technology. The Jacobi Carbons Philippines facility includes a charcoal granulation plant, multiple activation kilns with a nominal capacity exceeding 20,000 MT per year, grinding and pulverizing capacity, specialty impregnation and water/acid washing. Jacobi CARBONS PHILIPPINES, INC. is registered as an Ecozone Export Enterprise with the Philippine Economic Zone Authority (PEZA). It operates within a total land area of 4.8-has at PHIVIDEC Industrial Estate.

- **KURARAY CO, LTD., CENAPRO CHEMICAL CORP., AND CALGON CARBON CORP.** Kuraray Co. Ltd. Is one of the world's leading manufacturers of activated carbon (https://www.kuraray-c.co.jp> and https://www.kuraray.com>news). The company started its activated carbon business in 1965 and expanded its production bases to Japan and the Philippines as well as its marketing network to Japan, Germany, USA, China, Korea, India, Singapore, and Vietnam. The company's coconut shell charcoal- based activated carbon is manufactured by Cenapro Chemical Corp., a joint venture in the Philippines. Kuraray Co. Ltd.'s activated carbon-based products and manufactured goods, on the other hand, are processed and manufactured in its processing plant in Japan.

  Cenapro Chemical Corporation, a coco shell charcoal and activated carbon manufacturing company established in Mandaue City, Cebu in 1975, is 35% owned by Kuraray Co. Ltd. Cenapro Chemical Corporation has the capacity to produce 100 MT of granulated coconut shell charcoal per day and 20,000 MT of coconut shell charcoal-based activated carbon per year, making the company one of the leading manufacturers of coconut shell charcoal-based activated carbon in the Philippines (https://wwwcenapro.com>index.ph>our company). Cenapro Chemicals Corporation employs 100 workers and has over 50,000 square meters of warehouses that provide ample storage space for its raw charcoal, granulated charcoal, and activated carbon products. The company exports its products to Japan, Korea, and Europe. The company's largest customer is Calgon Carbon Corporation.

In 2018, Kuraray Co. Ltd. acquired US-based Calgon Carbon Corp., a worldwide leader in the manufacture of bituminous coal-based activated carbon only (https://www.calgoncarbon>media>press-releases and https:www.calgoncarbon.com). At present, Calgon Carbon Corp., a wholly owned subsidiary of Kuraray Co., Ltd., is now a global leader in the manufacture and/or distribution of coal-, wood- and coconut-based activated carbon products in granular, powdered, pelletized, and cloth form to meet the most challenging purification demands of customers throughout the world. Complemented by world class activated carbon and ultraviolet (UV) light purification and disinfection equipment systems and service capabilities as well as diatomaceous earth and perlites. Calgon Carbon Corp. provides purification solutions for more than 700 distinct applications, including drinking water, wastewater, pollution abatement, and a variety of industrial and commercial manufacturing processes. Headquartered in Pittsburg, Pennsylvania, Calgon Carbon Corp. employs approximately 1,300 people and operates 20 manufacturing, reactivation, innovation and equipment fabrication facilities in the U.S., Asia, and Europe where Calbon Carbon Corp. is known as Chemviron.

## Oleochemicals

- **CHEMREZ TECHNOLOGIES**. In 2006, Chemrez Inc. was acquired by D & L subsidiary Corro-Coat, Inc. to form what is now known as Chemrez Technologies, Inc. which operates the Philippines' first continuous-process biodiesel plant (https://chemrez.com and http://chemrez.com>about us). The company acquired the following certifications: ISO 9001, ISO 14001, Halal, HACCP, Kosher, Food Organic, and OHSAS 18001 (International Standards for Occupational Health and Safety). Chemrez Technologies is vertically integrated from coconut oil production to coconut-based products development. The company produced coconut oil called CocoPure RBD CNO.

Chemrez Technologies, Inc. is a leading manufacturer of high-quality resins, oleochemicals (especially coco methyl ester), surfactants, and specialty products that are effective and cost-efficient without sacrificing ethical standards. The company develops innovative coconut-based products and solutions through continuous research and innovation with a focus on green chemistry. New technologies developed by Chemrez Technologies, Inc. are regularly incorporated to improve product performance and manufacturing processes. After years of dedicated clinical development, Chemrez Technologies, Inc. successfully developed "Laurin CocoMCT", a premium all-natural MCT oil. Developed according to the principles of green chemistry, the products developed by Chemrez Technologies, Inc. are widely used in soaps, detergents, dishwashing liquids, shampoos, cosmetics, and even in food applications. Some of the coconut-based products developed by the company include the following: CocoPure SN80; 100% coconut-derived surfactants with cleaning properties suitable for home and personal use; cold process soaps; Cerin functional ingredients which are 100% coconut-derived solutions for enhancing qualities and appearances; Salvonel, a sulfate-free, mild and gentle primary surfactant; Fil-soft, a mild-foaming amphoteric surfactant that provides exceptional cleansing performance and further enhances conditioning properties; Hi-Foam, a nitrosamine-free, EO-free and DEA-free, mild liquid foam booster and stabilizer; Fil-Amide, a non-ionic surfactant used as excellent foam booster stabilizer; Pearlizers/opacifiers,, a cold-processable pearlizing agent for rinse-off products that are naturally-derived and sustainable; thickeners such as Cocerin BGL and Cerin Rheotex 7000; emollients such as Cerin CB 100; emulsifiers such as Cerin GMP, Cerin GMS, Cerin GMO and Cerin GML; and fil-ester, a 100% coconut-derived intermediate raw material suitable and exceptionally safe for a wide variety of industrial applications.

Chemrez Technologies, Inc. also produces biodiesel made from coconut. The company collaborates with seasoned petroleum technologists and reputable testing agencies to formulate a wide range of environment-friendly products. Some of these products include: eco-friendly drilling chemicals with high lubricity and very low toxicity; fuel enhancers and injector cleaners to improve combustion efficiency and promote clean air, plant-based intermediate solvents and non-flammable cleaners; LOVISC, a low-viscosity base fluid for use in drilling formulations for onshore and offshore applications; KLEENFIRE, organic injector cleaners that prevent the build-up of fuel residue, optimized for various applications; BLACKSTARR, a plant-based fuel oil treatment, combustion improver that provides lubricity to low-sulfur fuel and reduces carbon soot and NOx emissions; BIOACTIV, fuel diesel enhancers derived from natural raw materials; BIOSOLVE SPILL RX and SPILL- CARE, concentrated type 2 and 3 oil spill dispersants and washing agents; DEGRIZ, a premium fast- acting, waterless, hand cleaner for various adhesives and lubricants, DISPERSA, and organic, plant- based and non-aromatic solvent used as an additive in the formulation of demulsifiers, wax, paraffin, dispersants/inhibitors and poor point depressants; SURFASOl, plant-derived low VOC solvents and cleaners for intermediate formulations and industrial applications; BIOSOL, an oil system cleaner formulated from esterified seed oil for optimum cleaning of engine lubrication system; DUSTCON, a water-based dust suppressant used in mines, cement plants, logging, etc.; engine coolant, a high quality monoethylene glycol based fluid incorporated with rust and corrosion inhibitors; FMVSS 116 heavy-duty brake fluids that provide superior braking efficiency and safety; Lubricote Wirerope Botube; and Chainkote Spray Oil.

- **PILIPINAS KAO, INC.** Pilipinas Kao, Inc. is a subsidiary of Kao Corporation, one of Japan's best- managed firms (https://chemical.kao.com). The company has been in operation since 1979, supplying high quality, biodegradable chemical products from coconut oil in both local and international markets. Pilipinas Kao operates an oleochemical manufacturing complex in Jasaan, Misamis Oriental Ecozone where the finest quality oleochemicals such as high purity single fatty alcohols, refined glycerin, tertiary amines are produced using Kao's sophisticated technology. The plant in Misamis Oriental is the first cocochemical plant in the Philippines. Pilipinas Kao's environment-friendly oleochemicals are used for applications such as base materials for the manufacture of cosmetics, shampoos, toothpaste, pharmaceuticals, industrial and household detergents, food, emulsifiers, additives, and agricultural chemical products. KALCOL, the fatty alcohol produced by Pilipinas Kao, Inc. comes in various formulations and formats. It is widely used as an added ingredient or in compounds. REFINED GLYCERIN, Pilipinas Kao's refined gycerin brand, is widely used for the formulations of pharmaceuticals, food additives, alkyd resins, soaps, toothpastes, cosmetics, and as a humectant for cigarettes. FARMIN, Pilipinas Kao's brand name for tertiary amines, is a starting material for various cationic/amphoteric surfactants, germicides, bactericides, textile auxiliaries, word preservatives, oil recovery agent, amine oxide, corrosion inhibitors and hair formulations.

In its early stage of operations, Pilipinas Kao manufactured fatty alcohols for Kao Japan's consumer products. After a series of expansions, most of the plant's oleochemical products are now exported to Asian neighbors, the USA, Europe, Africa, and the Middle East. In recognition of its valuable contribution to the economy, the Philippine government declared the whole plant site in Jasaan, Misamis Oriental as an Economic Zone in 2001, and thus accorded Pilipinas Kao, Inc. with a host of incentives. Backed by Kao Corporation's 100-year experience in oleochemical manufacturing, Pilipinas Kao steadily earned a reputation as one of the world's manufacturer of high-quality oleochemicals. In its continuing commitment to meet its customers' needs and exceed their expectations, Pilipinas Kao, Inc. has secured the following certifications: ISO 9001, ISO 1400, OHSAS 18001, Kosher Certificate, and Halal Certification.

- **SAKAMOTO ORIENT CHEMICALS CORPORATION.** Sakamoto Orient Chemicals Corporation is the oleochemical production company of the Sakamoto Group in Southeast Asia (https//sakamotokk.com.ph>about-us). The company was established at the Cocochem Agro- Industrial Park in San Pascual, Batangas in 1988 to produce refined glycerin utilizing the raw material derived from coconut oil, which is abundantly available in the Philippines. The current production capacity for refined glycerin is 15,000 MT. The company started the production of diglycerin and polyglycerol in 2000, and of brominated epoxy flame retardant in 2002. These products of potential have been well accepted by customers throughout the world.

  Sakamoto Orient Chemicals Corporation acquired the following certifications: ISO 9001, Kosher, Halal, and GMP for Food, GMP for Drugs, and RSPO Supply Chain Certification Systems MB Model.

  Having acquired pharmaceutical and food accreditation certificates, Sakamoto Orient Chemicals Corporation is supplying high-quality products all around the world, with the main destination being Japan.

- **STEPAN PHILIPPINES QUATERNARIES, INC.** Stepan Philippines Quaternaries, Inc. is an enterprise based in the Philippines and owned by Stepan Co (https://www.bloomberg.com>profile>company). Its manufacturing plant, which is located at the Cocochem Agro-Industrial Park in San Pascual, Batangas, is ISO 9001 certified, indicating that the manufacturing facility is capable of safe, high- quality, service-oriented, stable, and cost-effective operations and is mechanically reliable. Stepan Philippines manufactures sulfonates, amides, and sulfates. All the products of the company are Star Kosher certified. It has also Halal certification. The company has 51 employees.

In the international oleochemical market, among the leading companies that manufacture high- quality oleochemicals using coconut oil as raw material are Kao Group and Stepan Company. These companies are vertically integrated, have large investments in R&D to produce high-value products, and have different production sites and diverse markets worldwide.

- **KAO GROUP.** The Kao Group has bases handling all phases from research to production and supply in the company's locations in Japan, Asia, Europe, and North America, which work together in various ways to provide quality products (https://www.kao.com>global). In Japan, Kao's plants in Wakayama, Kashima, Tochigi, and Toyohashi are fully integrated with their research facilities to develop efficient, high-quality production processes and produce many chemical products. Overseas, Kao's plants in the Philippines and Malaysia produce oleochemicals which are shipped to customers and Kao Group companies around the globe. Other plants in Shanghai, Indonesia, Thailand, Germany, Spain, the United States and Mexico produce performance chemicals destined for various industrial sectors in those regions.

  Kao Group's chemical business is operated globally in the following three fields: Oleochemicals, to ensure a stable supply of fats- and oils-based products; multi-function Performance Chemicals based mainly on surfactants; and Specialty Chemicals, high value-added products developed to meet customers' needs.

  Kao's products are used in various industry sectors. Kao's two major product groups are fat and oil derivatives surfactants and function polymers aroma chemicals. Under the fat and oil derivatives surfactants group are fatty acids, fatty alcohols, fatty amines, esters, made waxes, glycerin, anionic surfactants, cationic surfactants, amphoteric surfactants, non-ionic surfactants, and special surfactants. The function polymers aroma chemicals include natural polymer derivatives, functional oligomers, polyacrylate polymers, polyamide resins, polyester resins, polyurethane resins, furan resins, phenol resins, and synthetic aroma chemicals.

The Kao Group heavily invests in R&D. Kao Group now operates research facilities in six Asian countries and four in North America and Europe. Research into product development is carried out for Kao's five of its field of business: Cosmetics, Skin Care and Hair Care, Human Health Care, Fabric and Home Care and Chemical, which develop a wide range of chemical products that meet the various needs of the industry. Functions of fundamental research such as material science, biological science, human science, and production technology are concentrated and organizationally linked with Kao's research laboratories outside Japan to continually develop new products and technologies.

- **STEPAN COMPANY.** Stepan Co. is a manufacturer of specialty and intermediate chemicals used in a broad range of industries since 1932 (https://www.stepan.com). Although Stepan Company is classified with other specialty chemicals, it is unique in the industry and does not have a competitor or competitors to precisely match its business because its products have a specific focus. Its product lines are surfactants, polymers, and specialty products. Stephan Co. is the leading merchant producer of surfactants, which are key ingredients in consumer products such as laundry detergents, hard surface cleaners, disinfectants, shampoos, and body wash as well customized solutions for the agricultural oilfield and construction markets. The company is also a leading supplier of polyurethane polyols used in thermal insulation market. Moreover, Stephan Co. manufactures high purity esters, fats, and oils for the pharmaceutical and dietary supplement industries. The company has produced more than 650 commercial products and hundreds of custom formulated blends.

  Stephan Co. utilizes a network of modern production facilities in North and South America, Europe, China, Singapore, and the Philippines with 2,015 employees. The plant locations are: Bauan, Batangas, Philippines; Jurong Island, Singapore; Nanjing, Peoples Republic of China; Anaheim, California; Columbus and Winder, Georgia; Fieldsboro and Maywood, New Jersey; Millsdale, Illinois; Ecatepec and Matamoros, Mexico; Salto and Vespasiano, Brazil; Manizales, Colombia; Brzeg Dolny, Poland; Stalybridge, United Kingdom; Voreppe, France; and Wesseling, Germany.

Stephan Co.'s global R&D team is composed of 230 scientists in 13 R & D Centers across 11 countries. The company has grown through a four-part strategy: (1) R&D by developing a continuous stream of higher, value-added product applications, improving existing processes, and developing new processes for known products; (2) acquisitions in surfactants, polyols, and urethane systems; (3) globalization by establishing manufacturing locations, sales offices, and product laboratories to supply its customers in its global expansion; and (4) strategic alliances by leveraging its core technologies in world markets with joint ventures where it adds know-how technology, capital and customers to complement resources of local partners with raw material supplies, plant sites, regional know-how and connections.

## VIRGIN COCONUT OIL

- **PETER AND PAUL PHILIPPINES AND FRANKLIN BAKER CO.** Both Peter Paul Philippines and Franklin Baker Co. produce organic virgin coconut oil in their FDA-accredited desiccated coconut factories using the expeller (or fresh, dry) method without the use of heat with coconut flour and coconut water as by-products (Peter Paul Philippines, op. cit. and Franklin Baker Co., op. cit.). These companies extract organic virgin coconut oil from fresh matured organic coconut which they process under strict hygienic conditions set by internationally accepted food safety and quality standards (ISO 22000 and ISO 9001). State-of-the-art manufacturing equipment are used to retain the product's freshness and distinct coconut taste and scent. In addition, no chemicals and preservatives are added.

  Peter Paul's 100% organic virgin coconut oil accreditations are USDA Organic, Certification International Philippines, Kosher, Fair Trade USA, Halal, and Ecocert. In the Philippines, Peter Paul sells its expeller-pressed organic virgin coconut oil online through Lazada and Shoppe, in SM Supermarkets, Mercury Drugstores, the Landmark Supermarkets, and other local supermarkets nationwide packed in PET bottles (250 ml, 473 ml, 500 ml, 828 ml, 1000 L), tote bag (1000 L), pail (10 L), and closed drum (20 L). The company exports organic virgin coconut oil in all major markets such as North and South America, Europe, the Middle East, and other Asian countries.

  Meanwhile, Franklin Baker's organic virgin coconut oil accreditations include USDA Organic, Halal, Kosher, Fair Trade USA, GMA-SAFE, and BRC. The company mostly exports its organic virgin coconut oil products to over 50 countries worldwide. The North American market is the biggest market of both companies where they have representative offices in the United States.

Prosource International. In 1995, Prosource International was established in the United States to serve the needs of North American customers. However, the company operates in the Philippines or out of its US Headquarters (https://shop.prosource.coconut.com). In 2003, the company produced and commercialized organic virgin coconut oil under the brand name, "ProSource Extra Virgin Coconut Oil". The "Prosource" brand is one of the top brands of virgin coconut oil in the Philippines. Considered as one of the Philippines' leading manufacturers of virgin coconut oil, the company meticulously chooses the nuts and processes the nuts using the expeller method without heat to preserve and maximize the beneficial nutrients of virgin coconut oil. Made from fresh coconuts, Prosource International's extra virgin oil is 100% organic, all-natural, and non-GMO. The company's virgin coconut oil is also USDA certified organic, Halal and Kosher certified, and manufactured under GMP and HACCP systems. Prosource International, Inc. packaged extra virgin coconut oil in 250-ml bottles and pioneered the sale of virgin coconut oil in Mercury drugstores. Today, the company has expanded its export markets of extra virgin coconut oil in North America, Australia, Europe, and Asian countries.

In addition to the Prosource Extra Virgin Coconut Oil being the company's major coconut product for trade, the company has diversified into a multi-product venture offering other nontraditional products that will cater to the people's growing concern for health and wellness such as Prosource Extra Virgin Coconut Soap, Prosource Cocogugo Shampoo, Prosource Extra Virgin Calming Oil, Nuco Organic Coconut Wraps (Original), Nuco Organic Coconut Wraps (Moringa), Nuco Organic Wraps (Turmeric), and Nuco Organic Coconut Wraps (Cinnamon).

Prosource takes a proactive role in supporting sustainable harvesting and agricultural methods in coconut farming by partnering in sustainable agricultural projects to generate social and economic benefits to the local coconut farming communities.

- **SC GLOBAL COCO PRODUCTS, INC.** Established in Brgy. Caridad, about 20 km north of Baybay City, Leyte in 2006, SC Global Coco Products, Inc. has been producing organic virgin coconut oil using the expeller method in huge volume and exporting 6,000 MT of virgin coconut oil weekly, making the company one of the biggest producers of virgin coconut oil in the world (http://scglobal.com.ph and https://scglobal.food.com.ph). SC Global Coco Products, Inc. exports virgin coconut oil to the United States, Europe, and other countries. All the coconut products of SC Global Coco Products, Inc. are certified organic by Ecocert for USDA NOP and EU and have Star Kosher, IDCP Halal, and SGS HACCP food safety certification.

- **GREENLIFE COCONUT PRODUCTS PHILIPPINES, INC.** Greenlife Coconut Products Philippines, Inc. is a social enterprise company engaged in producing and exporting high-value coconut products focusing on virgin coconut oil. Mr. Francisco Rubio, the founder of the company, was the first innovator who introduced "Kakang Gata", a ready-made coconut milk in 1989 (https://www.greenlifecoco.ph.com). Owing to his innovativeness, he was able to develop a virgin coconut oil process that uses ANH (Absolute No Heat) method. In 2013, he introduced the VCO Standardization Process for small virgin coconut oil processors to sustain the quality and food safety of the product as well as to meet the standards established and set by the Philippine National Standards for virgin coconut oil. In 2014, the company was incorporated. Greenlife Coconut Products Philippines, Inc. has the capacity to produce 14,000 liters per month of both conventional and organic virgin coconut oil (Costales 2019). It has a central processing plant in Tayabas, Quezon that produces and standardizes variants of virgin coconut oil. The company produces virgin coconut oil using the fermentation and wet centrifuge process technology. In the latter technology, a tubular centrifuge with a capacity of 300 liters/day at 8 hours of operation per day is used to purify virgin coconut oil. This equipment enhances the purity by reducing moisture content in the virgin coconut oil at the minimum level without the use of heat and at the same time provides higher recovery.

  Greenlife Coconut Products Philippines, Inc. was granted organic certification by EU, JAS, and USDA- NOP in 2015 and was able to secure other compliances such as Halal, Kosher, and Fair TSA. These certifications enabled the company to export organic extra virgin coconut oil to Canada, USA, and Netherlands using its brand name, "Greenlife" in the same year. Like the "Prosource" brand, "Greenlife" is one of the top five Philippine VCO brands.

## Coco Coir Products

- **DUTCH PLANTIN COIR INDIA PVT LTD.** Dutch Plantin Coir India Pvt., Ltd. is the world's producer of coir products, was established in 1984 (https://www.indiamart.com and https://www.indiamart.com>aboutus). At present, the company has 14 coir production plants in Asia (i.e., 10 in India and 1 in Sr Lanka), Africa (1 in Ivory Coast), and in Netherlands (1 in Helwood and 1 in Boekel). The company has two headquarters: 1 in Boekel, Netherlands and 1 in Coimbatore, Tamil Nadu, India. The distribution of the company's production sites enables Dutch Plantin to produce and supply coir products throughout the year, unaffected by weather. The company adopts the same quality standards in all its coir production plants, whether they relate to raw material packaging or hygiene. Each coir production site has its own research laboratory with air-conditioned rooms, producing results that are representative and reliable. Samples of coir products produced at the production sites are subjected to a detailed analysis and inspected by ECAS (European Certification for the Sector), an independent institute, which sees to it that the company's coir products meet the requirements of the RHP (Regeling Handelspotgronden or Potting Soil Regulation). By using a variety of processing methods, Dutch Plantin produces three coir materials, namely: coco peat, coco chips, and coco fiber. The company's coir products are grow bags, slabs and open to grow bags, coco peat block, coco block, and briquettes. The company has both a central sales team and a separate logistics department located among the production sites in India. Together they coordinate the organization of sales and transport down to the smallest detail. The company exports its coir products to over 50 countries.

  In 2014, the Dutch Plantin was the recipient of the "Coir Pith Exporter of the Year" award from the Government of India for being the largest exporter of coir pith products with superior quality. Dutch Plantin holds the Dutch RHP quality mark as a label for its coir pith products as well as the Swiss IMO- certificate which assures eco-friendly, environmentally friendly, and socially responsible products. Dutch Plantin also holds SA certification 8000 for social accountability and Fair Trade certification.

- **HARISH COCONUT PRODUCTS PVT., LTD.** Harish Coconut Products Pvt., Ltd., which commenced its operation in 1993, is one of the largest manufacturers and exporters of coir products in India and in the world (https://www.harishcoconut.com).

Its main headquarters is in Pollachi, India. Apart from Its coir manufacturing plant in Tamil Nadu, India, Harish Coconut Products Pvt., Ltd. started its own subsidiary company in Sri Lanka – Harish Tuff Lanka Pvt., Ltd., which commenced operations in 2006. The company's manufacturing sites and warehouses combined with modern machineries in production are spread across Southern India and Sri Lanka, enabling the company to handle large orders at the shortest time possible. The company acquired a dedicated yard for inhouse drying of coir fibers in 2008.

Harish Coconut Products Pvt., Ltd. manufactures rubberized coir products such as mattresses, pillows, and cushions under the brand name, "COIR-ON", which are marketed overseas and domestically. The company also specializes in the production of horticulture products (e.g., coir pots, coir pole, and mulch mats) and posting soil and coir substrates such as coir pith (i.e., compressed blocks, grow bags, disc, and pellet), husk chips, and custom substrates using modern technology for home and garden markets as well as geo textile and biolog for erosion control. Moreover, the company produces and exports coir fiber products such as sheet rope and compressed bale.

The company exports its coir products to 18 countries. Coir fiber, twisted fiber, and coco peat are exported to USA, European countries (e.g., Russia and the United Kingdom), and China. About 80% of the total volume of coir fiber exports of the company were shipped to China. The manufactured horticulture products, potting soil and substrates are exported mainly to USA, China, Australia, and many other European countries. China is the company's major export market for geo textile.

In 2014, Harish Coconut Products Pvt. Ltd. was a recipient of the "Coir Industry Award" for being the largest exporter in India in that year and the "Business Award" in 2017-2018. Due to the company's strict adherence to producing organic coir products of high quality, the company obtained OMRI (Organic Materials Review Institute) – USA, OMRI – Canada, and Sedex certifications in 2019.

- **SIVANTHI JOE COIRS PVT., LTD**. Sivanthi Joe Coirs Pvt., Ltd., which was founded in 1993 in Tuticorin, India, is a manufacturer and exporter of high quality international standard coco peat-based products (https://www.silvanthijoecoirs.com). The company has the world's largest state-of-art production coco peat factory in the port city of Tuticorin and seven other manufacturing locations covering more than 200 has (500 acres) in Tamil Nadu where coconuts are bountiful. The company's plant has a production capacity of 500,000 m3. The factory has 24-hours quality control laboratory and well- equipped machineries and uses modern processing technology. Sivanthi Joe Coirs Limited employs 2,000 workers and has one of the biggest network of raw material suppliers in India.

The company produces coir peat-based products (e.g., briquettes, blocks, growbags, quick fill bags, and naked planks), coco cut fiber, coco chips, coco crushed chips, coco cubes, coco discs, and coco mixed blocks. The qualities of the company's coir products are: (1) buffered/treated in compliance with RHP Standards; (2) organic/bio coco/green coco/eco coco in compliance with the procedures stipulated in the National Program for Organic Production and the EEC Regulation N 2902/91 of Switzerland's IMO Control; (3) washed to low EC level; and (4) unwashed for both horticulture and non-horticulture purposes.

Sivanthi Joe Coirs Pvt., Ltd. is the first company outside Netherlands to get certification from the RHP certifying agency in the Netherlands, controlled by ECAS. It is also the first coir company in the world to get the Certification for Organic Coco Peat Production with compliance of procedures in the National Program for Organic Production (NPOP) and the Regulation (EEC) N 2902/91 from IMO Control, Switzerland. Moreover, it is the first company in the world to be awarded the RAL quality mark "Substrate für Pflanzen" by GGS - Gütegemeinschaft Substrate für Pflanzen e.V., Germany on the company's coco peat/coco cut fiber/coco chips products. The company has ISO 9001-2008 certification issued by the European Certification for Agricultural Sector (MPS-ECAS), Netherlands and SA 8000-2008 certification issued by the British Standard Institution (BSI), United Kingdom. For 12 consecutive years (2000-2012), Sivanthi Joe Coirs Private Limited received the prestigious award from the Government of India as the largest exporter of coco peat -based products in that country.

- **HAYLEYS FIBER PLC.** Hayleys Fiber PLC, which was incorporated in 1878, is the biggest and premier manufacturer and exporter of coconut fiber-based products in Sri Lanka (https://markets.ft.com>data>equities>tearshett>pro). The company has five (5) manufacturing plants in Sri Lanka and another plant in India with ample capacity to serve its customers year-round with uninterrupted production. All the company's coir manufacturing plants are equipped with modern technology and state-of-the-art manufacturing facilities, thus ensuring a continuous supply of quality and eco-friendly coir fiber-based products. The company's erosion control products include geo blankets, geo textiles, and geo logs. Its growing media products include grow bales, grow blocks, and grow bags. The company's horticulture products comprise of basket liners, weed suppressors, bark guards, coco pots, and creeper guide. Its bedding and upholstery products consist of bare block and finished mattresses, and flock and needled felt. Its industrial fiber products include coir twine,

Its geo blankets consist of natural blanket, mulch cotton blanket, coir yarn blanket, and coir twine blanket. Moreover, the company produces rubberized coir bare blocks, interlocking coir bare blocks, and finished mattresses of varying densities. Sri Lanka is renowned for the production of brown coir fiber and these in their raw form are used extensively by numerous industries both locally and internationally. The company supplies all the grades of coir fiber in bale form as well as in curled form (twisted fiber).

Hayleys Fiber PLC has secured BCSI, ISO 9001:2015, GMP and GOLS (Global Organic Latex Standard) certifications. The company has marketing offices in USA, UK, Netherlands, and Japan. It is exporting over 400 customized coir fiber-based products around the world. The company's customers include world renowned supermarket chains, European automobile manufacturers, potting mix manufactures, and several fortune 500 companies in more than 40 countries.

- **PILIPINAS ECOFIBER CORPORATION.** Pilipinas Ecofiber Corporation is one of the leading manufacturers of processed coco fiber and coco peat in the Philippines. It used to be called Soriano Multi-Purpose Fiber Corporation, but in September 2011, its corporate name was changed with the approval of the Securities and Exchange Commission (http://pilipinasecofiber.com). Pilipinas Ecofiber Corporation is a wholly subsidiary of the Foundation for a Sustainable Society, Inc. (FSSI), which acquired the company in June 2006. The company has operations in the provinces of Laguna, Quezon, and Albay, processing fiber from coconut husks. The company's processing plant in San Pablo City, Laguna focuses on stitched coir and coco pot production while the processing plant in Sariaya, Quezon produces coco fiber and coco peat. Meanwhile the company's processing plant in Malilipot, Albay is engaged in geotextile rope, net and sack production. The company has established partnerships with the Fabrica

Small Coconut Farmers Organization in San Vicente, Camarines Norte, the Coconut Integrated Farmers Association in Labo, Camarines Norte, and the Cocobind Inc. in Irosin, Sorsogon. The company's main office is in San Pablo City, Laguna.

Pilipinas Ecofiber Corporation supplies coco mats made of stitched fiber to local furniture and bed manufacturers and has both domestic and export market for various products such as coco fiber, coco hips/coco mats, stitched coir pads, coco door mats, plant liners in various shapes, coco nets, coco sacks, roll fiber or coir felt, biologs/fascines, coco trays, coco pots, handmade coco ropes, coco biotray, and cocopeat. The company exports its products to the United States, Canada, Japan, Republic of Korea, People's Republic of China, France, and Australia. It has a growing domestic market for cocopeat among horticultural businesses, hog and poultry raisers, and vegetable farmers. It has a solid domestic market for geotextiles, biologs, and the like for soil erosion control.

Apart from manufacturing and trading coco coir products, the company is actively involved in providing the following services: Installation of net, conduct of training services, and equipment fabrication, and maintenance. The National Irrigation Administration (NIA) has tapped Pilipinas Ecofiber Corporation to install geonets and plant vetiber for erosion control in the agency's river projects in different municipalities of Laguna. In addition, the company installed geonets in the Petrowind Farm Project in Nabas, Aklan and in the Antipolo Pumping Station.

As a social enterprise, Pilipinas Ecofiber trains mostly women from low-income families on the art and skill of twining coco fiber into high quality ropes. Groups of women in the Bicol Region and Manila have been trained for free by the company's experienced pool of twiners and weavers. The company also provides training on weaving coco ropes into nets including training on quality standards and quality control. Moreover, the company has extensive years of experience in the fabrication of various machinery and equipment and/or equipment for coco fiber production and equipment such as decorticating machine, cleaning machine, manual weaving loom, motorized and manual twining machine, and ancillary equipment (e.g., conveyor belts, carding machine, screening machine, etc.).

## Coco Sugar

- **SPYTHE GLOBAL.** Spythe Global, a 100% Filipino-owned company based in Balingasag, Misamis Oriental, was registered with the Department of Trade and Industry in 2006 as a coconut sugar manufacturer (http://www.pca.da.gov.ph and https://www.sunstar.com.ph). Spythe Global maintains its own coconut farm and at the same time partners with other plantation owners who are willing to supply the company with quality sap. The company employs more than 300 farm families covering 30-38 has. Spythe Global employs at least 8 to 10 workers for every ha of coconut plantation.

  Spythe Global's coconut sugar processing plant is an environment-friendly facility. The company follows a no-waste production system. Raw materials not converted to sugar and other commercial products are either donated or set aside for product development. Used wastewater is collected to water plants or planting materials.

  The coconut sugar processing factory of Spythe Global is BFAD-accredited. The company's certifications include Kosher, Halal, USDA Organic, OCCP, CERES EU, and NOP. In the domestic market, Spythe Global sells its organic coconut sugar in malls and other big stores in Cagayan de Oro City. The company also exports its organic coconut sugar to the United States, Japan, Australia, Canada, Middle East, and Europe. Due to the high demand for organic coconut sugar abroad, the company is targeting at least 20 to 30 tons of finished products per month.

  PT Coco Sugar. PT Coco Sugar, which was established in 1939, is one of the leading producer- exporters of high-quality organic and non-GMO coconut sugar and nectar in the world (https://cocosugar.com). The company is in Banyumas Regency, Central Java, the center of coconut sugar production in Indonesia. PT Coco Sugar is the first company in the world coconut sugar industry to get the FSSC 22000 Food Safety System Certification which provides a framework for effectively managing food safety responsibilities. FSSC 22000 is fully recognized by the Global Food Safety Initiative (GFSI). The company has state-of-the art coconut sugar processing facility that adheres to Good Manufacturing Practice standards. The company has the following international product standard certifications: USDA, EU, JAS and Brazil Organic Standard certification, Non-EU-Agriculture ID Bio-149 certification, US FDA registration, Halal Certification, Kosher Certification, Fair Trade Certification, Paleo Certification, Non-GMO Project Verified Certification, and Vegan Verified Certification. Through the brand name, "COCO SUGAR", the company offers its coco sugar products in the domestic and export market.

PT Coco Sugar directly works with its organic farmers to produce high quality organic coconut sugar and nectar. The company conducts trainings for its farmer-cooperators on organic farming practices, from how to organically fertilize the coconut trees until processing the coconut sap according to international organic standards while enabling them to have better income through fair trade.

- **TREELIFE. TREELIFE** is a company located in North Cotabato, Mindanao, Philippines that was established in 2011 to produce and export high-quality organic coconut sugar, coco aminos, and coco syrup (http://treelife.organic.com). The company adopts organic and sustainable farm practices in its 50-ha farm to ensure that it produces high grade, premium quality, organic products for its local and international buyers. TREELIFE has the following product certifications: TUV SUD, USDA Organic, FDA Philippines, JAS, Kosher, Katha Award, IT 00006 Italia. A TUV SUD certificate represents a third- party endorsement by a globally renowned organization. It is a mark of distinction that serves marketing tools, enhancing the value of the company's brand and inspiring greater confidence among its business partners and end-users. The company sells its coco sugar in the domestic and export markets under the brand name, "TREELIFE".

  TREELIFE's aim is to provide a sustainable and reliable source of organic products, at the same time helping to uplift local coconut farm households by offering them a chance to work with a steady source of income, supporting the local, organic market as well as a greener Philippines. The company is currently employing 800 coconut farmers in surrounding coconut communities. The company provides standard training to each employee in the production of world class organic coconut sugar, coco aminos, and coco syrup.

- **BIG TREE FARMS.** Big Tree Farms is a sustainable organic foods company in Bali, Indonesia (http://www.bigtreefarms.com). The company processes and manufactures organic coco sugar, coco aminos, and coco nectar. Coco sugar produced by the company has three flavors, namely, Brown, Golden and Vanilla while coco aminos has the following flavors: Original, Gingery Lime, Tangy BBQ, and Teriyaki. The company has USFDA organic, Kosher, Fair Trade, Vegan, Paleo, and Non-GMO certification. Hence, the company's products are certified organic, fair trade, GMO-free, gluten-free, and vegan.

Big Tree Farms works directly with over 14,000 small farmers to ensure fair and transparent prices to its farmers for the coconut sap collected and to create transparent, socially equitable relationships. The company launched a Farmers Expansion Program to build an efficient and sustainable value chain for coco sugar by connecting small farmers with lucrative export markets. Big Tree Farms' inclusive business model hinges on support with organic and Good Manufacturing Practice (GAP) certification, the establishment of coconut sugar collection points to improve the supply of processed sugar, and the provision of credit for processing equipment. While this strategy enables farmers to secure a lucrative market for their produce, it has also turned Big Tree Farms into the country's largest organic food company with Southeast Asia's most extensive organic supply chain. The key to Big Tree Farms' model is working through intermediaries—local traders who provide farmers with microcredit and build producer groups' capacity to assist their members with organic certification. These intermediaries also help producer groups to develop coco sugar collection points, establish efficient supply systems and pay farmers for their produce. Since Big Tree Farms is committed to Fair Trade, it monitors intermediaries' business practices and allows farmers to switch traders if they do not receive reasonable prices. With training and microfinancing support, this initiative has enabled small coconut growers to increase their household incomes by up to 40%. To ensure that it maintains a close connection with farmers, Big Tree Farms has begun constructing a new facility closer to the area of coconut cultivation. This minimizes transport costs, which translates into greater returns for the company and higher incomes for farmers.

Lao Integrated Farms. The coconut processing facility of Lao Integrated Farms, Inc. is situated in Mr. Benjamin Lao's diversified 5-ha coconut farm in Bansalan, Davao del Sur where he practices organic farming (https://www.laointegratedfarms.com). Mr. Lao, the owner of the Lao Integrated Farms, Inc. bagged his first national Gawad Saka award as Outstanding Coconut Farmer that earned him a Php 120,000 cash prize, which he invested in the construction of a mini-processing plant for coco sugar and coco syrup products. He was bestowed another Gawad Saka award as Outstanding Organic Farmer with a cash prize of Php 100,000. Prior to its incorporation in November 2009, the company employed 18 regular employees and had 30 suppliers of coconut sap. Since February 2010, the company's work force increased to 25 and the number of his coconut sap suppliers rose to 55.

Lao Integrated Farms, Inc. has been known internationally as a major producer and exporter of organic coconut syrup and coconut aminos seasoning to several countries including USA, Canada, Germany, and Australia. The company was granted the following certifications and accreditations by local and international certifying agencies: FDA, HACCP, USDA Organic, Naturland, Stak K Kosher, Ecocert France, and Halal which enabled the country to export coconut syrup and coconut aminos seasoning abroad.

The brand name of the company's coconut sap-based products is "Donnabelle". Donnabelle coco syrup sold in 320-ml, 500-ml, and 1000-ml bottles is used as sweetener for other food products in restaurants and industrial and pharmaceutical purposes, both locally and internationally. In the domestic market, the company sells Donnabelle coco sugar in 250-g jars and 250-g packs to the Dragon Recipe Choice and Prangels Snack Inn, both in Digos City, Davao del Sur. Donnabelle coconut sugar and syrup are all 100% natural and 100% organic. Both coco sugar and syrup products are consigned to the stores of the New City Commercial Corporation and Bios Foundation in Davao City, and the major malls in Bohol and Samar in the Visayas. Two hospitals in Cebu, the Mt. Blessings and Bio Integrated Health, are also patronizing these products. These coconut sap-based products are also displayed in airports. The company maintains an office in Manila to facilitate marketing and promotion as well as to handle local orders and product orders from abroad.

## Coconut Water

- **PETER PAUL PHILIPPINES CORPORATION.** The international beverage firm, Pepsi Cola, forged a joint venture agreement with Peter Paul Philippines Corporation for the export of coconut water to the US market for its O.N.E brand of coconut water drink (Peter Paul Philippines, op. cit.). Peter Paul Philippines Corporation is now the largest and sole manufacturer of the U.S brand of coconut water drink. In manufacturing coconut water drink in its coconut processing plants in Candelaria, Quezon and Sorsogon, Sorsogon, the company uses the latest sterilization and packaging technology to ensure a fresh water drink with an eight-month shelf life. In addition, the local Pepsi Cola also partnered with Peter Paul Philippines Corporation to manufacture its Tropicana Coco water drink for local distribution. Owing to Peter Paul's stringent standards in processing coconut water and coconut water concentrate, the company has been granted the following certifications: HACCP, ISO 9001, ISO 22000, GMP, and Organic certification (USDA and Europe), Halal, Fair Trade, and Kosher.

Moreover, Peter Paul Philippines Corporation has a joint venture agreement with Taiwan's Chia Meei company to export concentrated and frozen coconut water for final processing in Taiwan as a commercial drink. Before Peter Paul Philippines Corporation entered into this joint venture with Chia Meei company, it was generating 80,000 liters a day of coconut water wastes from its desiccated coconut processing plants. Peter Paul improved its handling of shelled and pared coconuts and installed a breaker to facilitate collection of coconut water. The Chia Meei plant requires 40,000 liters a day of coconut water from Peter Paul Philippines Corporation. After processing, the coconut water is shipped to Taiwan where it is produced as a commercial drink. Coconut processing into a commercial juice drink involves pasteurization and centrifugation to produce a clear, non-oily solution for packing in sterile containers.

In 2021, Peter Paul Philippines Corporation will be establishing a new integrated coconut processing facility in Plaridel, Misamis Occidental which would process coconut into high-value coconut products such as coconut water, desiccated coconut, and virgin coconut oil, among other coconut products.

- **AXELUM RESOURCES CORP.** Axelum Resources Corp., which was incorporated in 2010, is a fully integrated manufacturer and exporter of premium coconut products such as coconut water, coconut water concentrate, desiccated coconut, virgin coconut oil, coconut milk powder, coconut cream, coconut milk, reduced fat content, and coconut oil. The company devotes a large portion of its production for export to the world's major continents (https:www.axelum.ph).

  Coconut water accounts for 20-30% of the company's revenues. The company packs its own coconut water ("Fiesta" label). It also packs coconut water for several other brands and private labels. Axelum Resources Corp. sells the Fiesta Coconut Tropicale brand on retail basis and the Fiesta Coconut Water brand for industries. Fiesta Coconut Water and Fiesta Tropicale Coconut Water are processed using advanced UHT technology to preserve the refreshing quality and flavor of natural coconut water. Fiesta Tropicale Coconut Water comes in two variants: the Fiesta Tropicale Coconut Water Natural and the Fiesta Tropicale Coconut Water Lychee Flavor, packed in 330-ml Tetra Prisma in a carton of 12 bricks. It makes a delicious thirst-quenching drink and can be used as a juice base for beverages when it is mixed with other fruit flavors. Fresh Coconut Water is aseptically packed in 25-liter bags in a carton and 200-liter bags in a drum to address the needs of beverage manufacturers.

Axelum Resources' products undergo strict quality control and assurance in its modern laboratory facilities (i.e., ISO 17025 accredited) that are fully equipped to conduct all standard physical, chemical, and microbial tests for process control and release of all finished goods. The company's new state-of-the-art pressed coconut water processing plant in Cagayan de Oro City, Misamis Oriental is a USDA- and EU-certified organic plant and operates under strict GMP and HACCP programs. Its coconut water processing plant, which was established within its 22-ha facility, is also BRC. Kosher, Halal, SEDEX, Fair Trade and Unilever Sustainable Supplier certified. The company also owns manufacturing and distribution facilities in the United States and Australia.

Axelum Resources, Inc. signed a supplier contract with All Market, Inc., the owner of Vita Coco, the world's largest coconut water brand, making the company the second coconut supplier of coconut water to All Market, Inc. after a company in Brazil. The coconut water processing plant produces a high-demand product variant for American coconut juice, Vita Coco, an anchor client. Pressed coconut water offers a nuttier and sweeter taste than traditional coconut water without additional sugar content. With the commercial operation of its pressed coconut water line, Axelum Resources Co. was able to meet its commitment to supply All Market, Inc. with 25 M liters of coconut water in 2019. The coconut water is packaged using a Prisma Tetra packing machine, the first of its kind in the Philippines. Vital Coco has a market volume of 120 M liters per year supplied by eight to nine manufacturers including Axelum (20%) and Century Pacific Food, Inc.

The company's coconut products are exported to 23 countries around the world. The company has established an excellent distribution network covering USA, Canada, South America, Australia, New Zealand, Europe including United Kingdom, Japan, South Korea, Taiwan, and the Philippine market.

- **CENTURY PACIFIC FOOD, INC.** Century Pacific Food, Inc., which was incorporated in 2013, is primarily engaged in manufacturing, processing, canning, buying, and selling all kinds of food and food products (https://cenagricom>about-cpavi and http://www.bloomberg.com>profile>company). Apart from its canned and processed fish, canned meat, and dairy and mixes business segments, the company is engaged in the coconut business segment. Century Pacific Food, Inc. is an integrated manufacturer of coconut products and produces retail-packaged conventional and organic coconut water, organic virgin coconut oil, desiccated coconut, coconut flour, and coconut milk for the domestic and international markets. Century Pacific Food's coconut processing facility, which was acquired from Century Pacific Agricultural Ventures, is in General Santos City, Mindanao. The company's own coconut water brand, "Aqua Coco Century Pacific" is geared toward the domestic market and is currently sold through the company's extensive distribution network in the Philippines.

  Century Pacific Foods, Inc. sells coconut water to global brands and retailers. The company has been one of the two suppliers of coconut water from the Philippines to All Market, Inc. for Vita Coco, the world's leading coconut water brand. In 2020, Century Pacific Food, Inc. extended and expanded its long-term agreement to supply packaged coconut water to All Market, Inc., the owner of Vita Coco, as it gears up for a major expansion of its coconut processing business. The multi-year contract valued at more than US$ 165 M reinforces the company's position as one of the leading coconut water exporters and one of the largest suppliers for Vita Coco globally. The expanded deal between Century

  Pacific Food, Inc. and Vita Coco is expected to benefit the many coconut farmers of Mindanao, where the company's coconut factory is located and sources its main raw materials. In 2021, the company embarked on a major expansion of its coconut business, increasing manufacturing capacity with an additional investment of Php 300 M to address the growing global demand for high-value coconut products.

  The coconut product manufacturing facilities and quality systems of Century Pacific

Food, Inc. are compliant and certified by leading and refutable local and international agencies, including GMP, HACCP, BRC, Halal, and Kosher. It is also organic certified for the U.S., EU, Korea, and Canada markets. Recently, the company was the first to receive in the Philippines the United States FDA Food Safety Modernization Act and Voluntary Qualified Importer Program for the export of its virgin coconut oil.

Century Pacific Food, Inc. went into a partnership with Vita Coco's owner, All Market, Inc. and the Founder of Hope to renovate old coconut plantations. Together, they are developing a 20-ha coconut seedlings nursery. The plan is to distribute 130,000 seedlings yearly and to replace 90% of the senile trees in Mindanao over the next 25 years.

- **FRANKLIN BAKER INC.** In its two manufacturing facilities in San Pablo, Laguna and Sta. Cruz, Davao del Sur, Franklin Baker Co. has a combined annual capacity of 4 M liters of coconut water concentrate or 60 M liters of single strength coconut water (Franklin Baker Co., op.cit.). In 2017, Franklin Baker Company opened a Php 2-B coconut processing facility in a 15-ha plant site in Darong, Sta. Cruz, Davao del Sur to produce 30 M liters of coconut water, 120 M pounds of desiccated coconut, 20 M liters of virgin coconut oil, and 15 M liters of coconut milk. The establishment of this new coconut processing plant has made the company one of the leading producers and exporters of coconut water globally.

  Coconut water and coconut water concentrate produced by Franklin Baker Co. are packaged in tetra packs and exported to over 50 countries all over the world. Coconut water exported by the company to the United States carries the brand name, "Kirkland (Costco)". In manufacturing its premium quality coconut water and coconut water concentrate products, Franklin Baker, Inc. was granted the following certifications and accreditations: USDA Organic, EU Organic, Non-GMO Project Verified, Fair Trade USA, BRC, JAS, ISO 9001:2000, ISO 22000, HACCP, FDA, Kosher, and Halal.

- **CELEBES COCONUT CORPORATION.** Celebes Coconut Corporation, which started its operation in 1986 in Butuan City, Agusan del Norte, is one of the leading fully integrated producers and exporters of organic and Fair Trade-certified coconut products in the Philippines (https://www.celebes.com). The company transforms its coconut water utilizing the most recent innovation to preserve the refreshing quality and flavor of natural coconut water.

Celebes Coconut Corporation manufactures both the Single Strength Coconut Water and the Coconut Water Concentrate. These are available either as Conventional or as Organic Coconut Water Concentrate. Frozen Coconut Water Concentrate 60 Brix is produced by evaporation of the fresh coconut water. Coconut water is first collected, filtered, then concentrated by evaporation, pasteurization, filling, and stored frozen. The company's coconut water products are 100% coconut water and are non-GMO certified. Organic coconut juice or water is packed in cans or aseptic bulk packaging. Meanwhile, organic coconut water is sold in cans. tetra pack, aseptic bulk packaging, or sold frozen.

The company has the following certifications: USDA Organic, European Organic Regulation, Fair Trade, JAS, BRC, Star – K Kosher, Halal, and Certified PAR Vin Bio-10 France. It was also granted certification by TUV SUD PS Philippines, Inc. for auditing, testing and inspection services. The company also engages in continuous manpower training in all aspects of the company's operations. Presently, the company has over 2,000 employees and exports its coconut products to 49 countries worldwide.

- **CARDINAL AGRI PRODUCTS, INC.** Cardinal Agri Products, Inc. is a diversified agribusiness enterprise based in the Philippines which established a world-class coconut processing plant in 2015 at the Brooke's Point Agro-Industrial Economic Zone in Palawan (http://cardinalagri.com). The company has 500 employees and works with over 3,000 farmers whose coconut farms and nut harvests have been inspected and certified organic under USDA/NOP and EU regulations. The company can process up to 300 MT of dehusked nuts per day to produce organic coconut water in 300-ml Tetra Pak, organic virgin coconut oil, organic desiccated coconut, organic coconut milk, organic coconut cream, organic coconut flour, white copra cake/meal, paring oil, and paring cake. In manufacturing organic coconut water, Cardinal Agri Products, Inc. uses fresh mature coconut. Once the nuts enter the factory, the coconut water is drained after drilling and each batch is tested after collection but prior to UHT pasteurization. The company uses exceptional UHT processing equipment to reduce heat damage during processing while at the same time preserving flavor and texture. Cardinal Agri Products Inc. implements strict end-to-end controls from sourcing to shipping. The company is FDA accredited in the Philippines and its major export market is the United States. The company sells coconut water in bulk 200-kg drums or 330-ml Tetra Pak Prisma for select markets.

Other key players of the global coconut water industry from other countries include the Sambu Group (Indonesia), Universal Food PLC (Thailand), and the Silvermill Group (Sri Lanka).

- **SAMBU GROUP OF COMPANIES**. The Sambu Group of Companies is one of the leading coconut water processors in Indonesia and one of the largest coconut producers in the world (https://sambugroup.com). The company is headquartered in Singapore, but it has facilities and plantations in Indonesia and the Philippines. P.T. Kara Coco Nucifera Pratama was the first Sambu Group member company in Indonesia to start processing coconut water in addition to other coconut products. P.T. Kara Coco Nucifera Pratama is producing bulk coconut water (e.g., 20-kg bag packaging; 200-kg drum packaging; and 1,000-kg flexbox packaging) but has also launched its own brand, "Kara Coco". Another company member of the Sambu group, Pulau Sambu (Guntung) produces and commercializes coconut water in different variants: Kara Coco 100% Coconut Water, Kara Coconut Water with Mango, and Kara Coconut Water with Pink Guava. The Kara Coconut Water brands are exported by the Sambu Group to Europe and Singapore.
- **SILVERMILL GROUP OF COMPANIES.** One of the most notable coconut water processors in Sri Lanka is Silvermill Group of Companies which also packages coco water in Tetra Pack machines for the Vita Coco brand, the market leader of packaged coconut water in the world. Coconut water in 200-ml, 250-ml, 330-ml and 1-liter Tetra Pack sizes are shipped to different countries. Surplus capacity of the Tetra lines is used to provide contract packing service to well-known brands in Sri Lanka and abroad (http://www.silvermillgroup.com>group-of-companies). The Silvermill Group of Companies is also one of Sri Lanka's largest manufacturers and exporters of coconut-based products and has secured the following certifications: ISO, BRC, FSCC, Kosher, Halal, NOP, and EU Organic.
- **UNIVERSAL FOOD PLC.** Universal Food PLC is one of the successful exporters of coconut water from Thailand (https//www.bloomberg.com>company>UFC:TB). The company produces a wide range of products in two factories in Lampang and Nakhon Pathom province. The Universal Food PLC's coconut water brand, "UFC Refresh", has

managed to be one of the recognized brands in Europe (i.e., Germany, Netherlands, Russia, Switzerland), selling packed coconut water in several retail markets. The company also exports "UFC Refresh" to Canada, Australia, New Zealand, Guam, China, Hong Kong, India, Malaysia, Cambodia, Myanmar, Bahrain, Brunei, and Oman. Thai coconut water is highly priced in the international market since it is produced from the high-Brix, fragrant Nam Hom variety. The company secured the following certifications and accreditations: SGS HACCP, SGS GMP, IFS, Halal, Non-GMO Project Verified, Sedex, and Smeta. In 2020, the Universal Food PLC won the "Superior Taste Award" for its coconut water brand, "Universal Refresh", from the International Taste Institute in Belgium.

# THE COPRA-CNO PATHWAY

The farmers initiate the copra-CNO pathway by harvesting the coconuts, followed by dehusking, and then drying of the nuts into copra using smoke kiln or tapahan, generally in the farms by the farmers themselves. The tapahan is a very useful contraption that has been used by farmers for over 120 years. The problem with the use of the tapahan is the smoke which poses a health hazard to the users and which contaminates copra with carcinogenic compounds called the PAHs. The drying time to make sufficiently dry copra [8% moisture content (MC)] is about 24 to 30 hours. To save on time and effort, the farmer stops drying after 12 to 16 hours, when the MC is still about 18 to 20%.

The traders buy copra even it is partially dried only. Copra at corriente grade (22% MC) is tradable, but with penalty in prices based on a discount table provided by PCA. The farmer sells his copra to a nearby barangay trader who will pay for the partially dried copra at a discounted price. The barangay traders keep copra at the warehouse until enough volume is accumulated to fit a jeepney for delivery to the town trader. (During the time that the wet copra is in the barangay trader's warehouse, the copra will become infested with molds. On the other hand, the MC will decrease to about 15% due to the natural phenomenon of moisture migration).

Similarly, the town trader will store the still-wet copra in the warehouse until there is enough copra volume to fit a truck for delivery to a provincial trader. (Copra in the town trader's warehouses will continue to be infested with molds. The MC will now decrease to about 12%).

The provincial trader likewise will keep copra in his warehouse until it is ready for delivery to the oil millers or to the miller's copra consolidators. (Copra in the provincial trader's and miller's warehouse will continue to be infested with molds. The MC will decrease to about 8%).

The time interval from the farmers to the oil mill is about one to three months.

Due to mold infestation (caused by MC while in the various warehouses), the FFA and aflatoxin level in copra will be high.

The oil millers, upon receiving the copra, immediately measure the moisture content using the Brown-Duvell Moisture Meter. The price of copra is based on the price of CNO in the world market using a formula similar to that used by UNICOM (Coconut Industry Yearbook, 1988). The oil mill consists of several standard industrial pieces of machinery, including copra cutters, hammer mills, flakers, cookers, expellers, filters, among others. The oil mills have reached the level of efficiencies where the crude oil recovery is 62.5% (from copra feedstock with 64.5% fat content); and copra cake by-product with 8% residual oil. The FFA in the crude oil will be in the range of 2-3% and will be high in PAHs. Recent PCA data shows the aflatoxin level in copra cake is below the market upper limit of 20 ppb.

The refiners purify the crude coconut oil through the following processes: a) neutralization to reduce FFA to 0.01% using caustic soda and physical refining with steam under high vacuum; and, b) de-colorization to remove the smoke contamination compounds, PAHs, and color using activated carbon. After purification, the coconut oil is ready as feedstock for industrial processes, such as in the manufacture of coco-chemicals. For making RBD cooking oil, the purified oil is further deodorized by steam stripping.

The copra cake by-product is mainly used as an ingredient in animal feeds.

The oleochemicals processors convert the purified coconut oil into high-value products such as fatty acids, fatty alcohols, methyl esters, surfactants. For food supplements and cosmetics, organic certification is increasingly required.

The downstream industries need better quality CNO to enable them to produce better products at competitive costs.

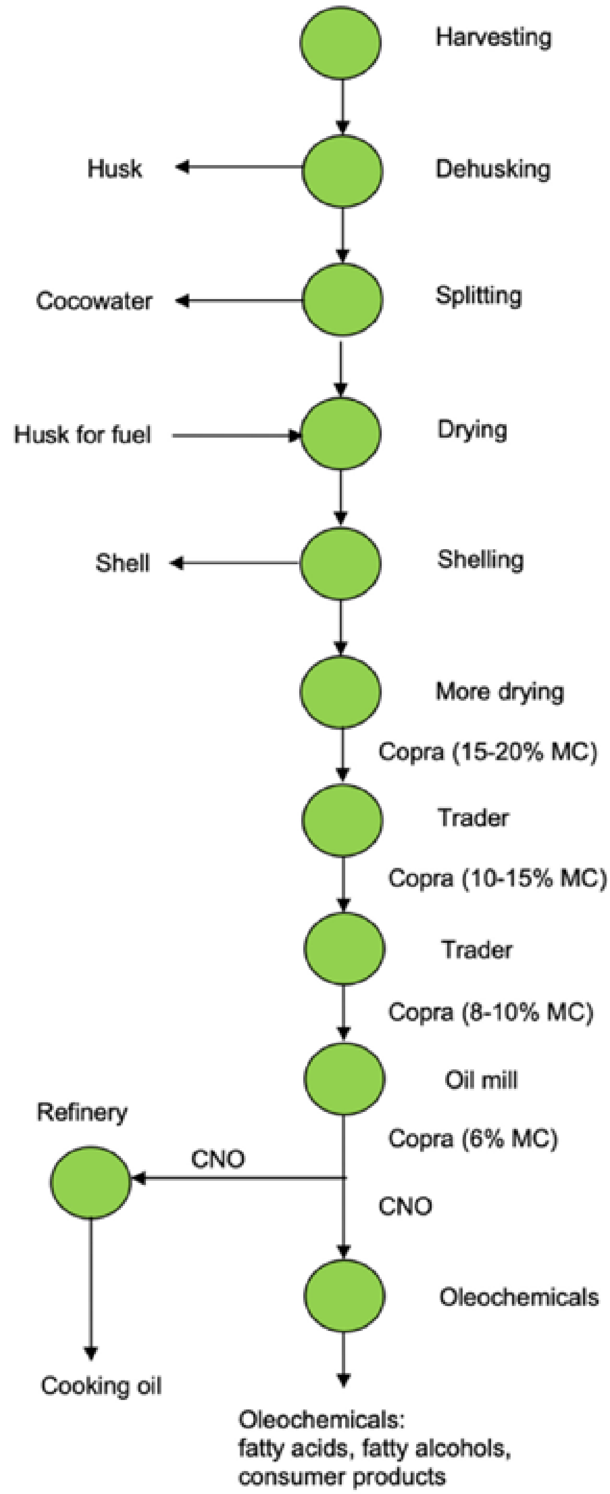
**ON MOISTURE CONTENT AND MOLDS**

The most destructive mold that attacks copra is reported to be the yellow-brown

mold, Aspergillus flavus, which can grow on copra with 7-8% MC. The next most pernicious is the black mold, Aspergillus niger, which can grow on copra when MC is 18 to 20% (Banzon and Velasco, 1982). The green mold, Penicillium, is reported to be not damaging, but it can grow on copra with only 5 to 6% MC. Copra with an MC of 6% or less is not easily damaged by molds, insects, and bacteria (Thampan, 1975). This is confirmed in a study by Villanueva (1989), where it was found that below 6% copra is not infected with molds even after 2 months in storage. Tuason and Madamba (1980) reported that at 8% and below, no aflatoxin-producing molds will thrive on copra. The present table for MC discount shows the reference MC is 6% and that price for copra with 5% MC and below. Thus, the target MC 6% and must be dried fast enough to avoid mold growth.

Lozada (2020) found that moisture condensation on well-dried copra will support mold growth. To prevent surface condensation in the warehousing of well-dried copra, an aeration system should be provided.

## FIGURE 8.1. PROCESSES IN THE COPRA-CNO OLEOCHEMICALS



## HARVESTING

There are three methods of harvesting coconuts in the Philippines: (1) by allowing the nut fall freely, (2) by climbing, and (3) by the use of harvesting poles.

### FREE-FALL

The nuts become fully ripe at end of the 12th month from the date of the opening of the spates with maximum oil content and maximum thickness of endosperm (Balleza and Sierra, 1968, cited by Banzon and Velasco, 1982). The 12-month old bunch is characterized by having nuts that are brown in color but are not fibrous. On the 13th month, the nuts become very brown and dry and they will fall to the ground one after the other (Banzon and Velasco, 1982). This is probably the easiest means of harvesting, provided that the farms are clean and the nuts can be located easily. When there is thick underbrush, the nuts will only be found when they have germinated into tall plants. At this state, a portion of the meat would have been consumed as food for the haustorium. For tall coconut varieties, at the 12th and

13th months, the nuts would have the highest oil content of 71.4% and 71.85% dry basis (or 68.79% and 69.23% wet basis at 3.64% moisture (Balleza and Sierra, 1968, cited by Banzon et al, 1990).

FIGURE 8.2. NOTCHES ARE CUT ON THE TREE TRUNK TO STEP ON

FIGURE 8.3. ONE OF THE CLIMBING JIGS

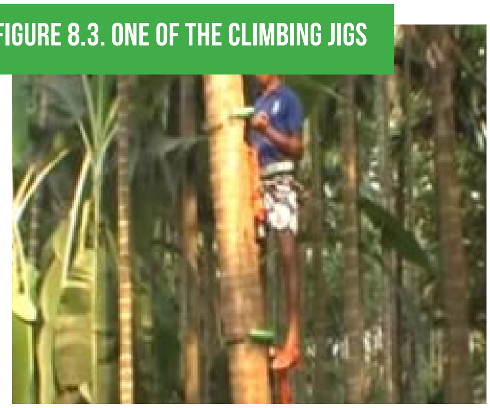
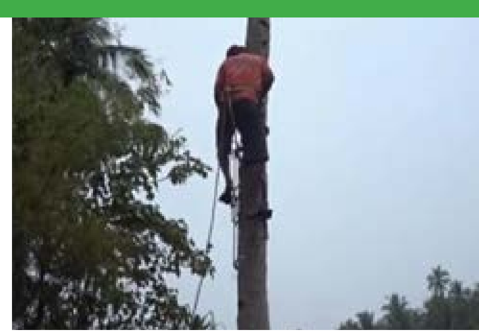


FIGURE 8.4. ANOTHER VERSION OF A CLIMBING JIG



## CLIMBING

It is a practice in the Visayan regions to climb each tree and cut whole bunches with a tool called a halabas. This is a time- consuming and tiring way of harvesting coconuts. A person climbs a tree with a circled rope on his feet to press around the tree trunk. With this method, a harvester can do 25 trees per day. To make climbing easier, some harvesters cut notches along the trunk to serve as steps. There were many attempts to design climbing jigs but none have been widely used (Banzon and Velasco, 1982).

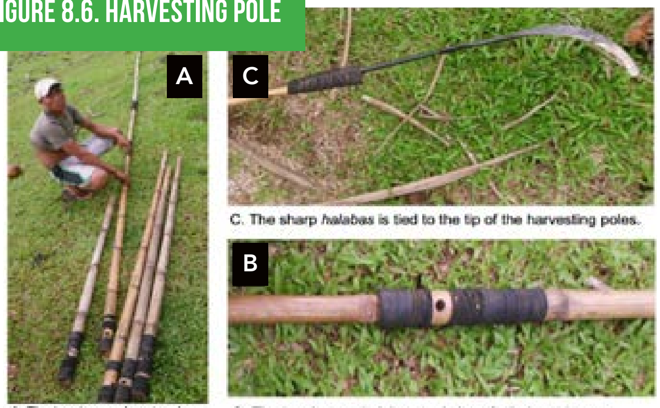
## USE OF HARVESTING POLE

Harvesting with the use of bamboo poles with a halabas at the tip is much easier than climbing. Very old trees that reach heights of up to 70 feet can still be easily reached with several extensions of the poles. The bamboo poles in segments of 4-5m long are joined end-to-end and secured by a peg. This operation is done by specialized and highly skilled harvesting crews. Using the harvesting poles, about 100 trees can be harvested in one day (Banzon and Velasco, 1982).

Since the *manunungkit* is paid by the number of nuts harvested, he harvests 3 bunches each time he takes a tree to maximize the number of nuts at about the same effort. The problem is: the first bunch is mature (mostly brown in color), the 2nd bunch is half-mature(more green than brown), while the third bunch is immature (totally green). Harvesting of immature nuts should be discouraged because the oil content of the resulting copra would be lower, and it is much more difficult to dry. Ideally, only the mature nuts should be harvested because they yield more copra and have high oil content. When this is widely practiced, the value of copra produced will be higher by PHP 0.40-0.60 per kg.

FIGURE 8.5. THE SKILLED MANUNUNGKIT SHOWN WITH HIS MOTORCYCLE IS RESPONSIBLE FOR A 50 HA -FARM

**FIGURE 8.6. HARVESTING POLE**




A. The bamboo pole extensions

C. The sharp *halabas* is tied to the tip of the harvesting poles.

B. The bamboo pole joint consisting of a hole and a peg.

**FIGURE 8.7. HARVESTING WITH EXTENDED BAMBOO POLES**

**FIGURE 8.8. NUT CHARACTERISTICS AND RECOMMENDED USES**


**A.** All brown but not dry, good for making copra, high oil content.

**B.** Mostly green with brown, good for DCN; good enough for making copra.

**C.** All green will make copra goma, low oil content.

## DEHUSKING

After harvesting, the nuts are gathered together into small piles, where they are then dehusked. The tool that is being used by the taga-tapas in the Philippines for separating the husks is a pointed metal or wooden spikes which are anchored firmly on the ground. The husk is removed by impaling the nut against the spike, followed by a twisting action of the wrist. A skilled taga-tapas can do 1,000 to 1,500 nuts per day. In remote areas, the dehusked nuts are hauled using carabao-driven sleds or rattan baskets on horseback. The husks are later collected for use as fuel in making copra, cooking, and sold to the fiber mill. There are now a number of promising dehusking machines that can now be used to mechanize this operation. Two of those are shown in the pictures (Figures 8.13 and 8.14).

FIGURE 8.9. (LEFT) DEHUSKING IS DONE BY IMPALING THE HUSK ON A POINTED OBJECT FOLLOWED BY A TWISTING MOVEMENT OF THE WRISTS
FIGURE 8.10. (RIGHT) DEHUSKING DONE IN THE MIDDLE OF A COCONUT FARM (MASBATE)

FIGURE 8.11. (LEFT) THE HUSKS ARE PILED SEPARATELY FROM DEHUSKED NUTS (BROOKE'S POINT, PALAWAN)
FIGURE 8.12. (RIGHT) THE HORSE CAN CARRY 4 TIMES MORE DEHUSKED NUTS THAN WHOLE NUTS

FIGURE 8.13. (LEFT) A PROMISING MODEL OF MANUALLY OPERATED DEHUSKER
FIGURE 8.14. (RIGHT) A MOTORIZED COCONUT DEHUSKING MACHINE (SOURCE: NEWTECH INDUSTRIES, 2017)

## SPLITTING, LUGIT, COLLECTING COCONUT WATER

In Luzon, the practice in making copra is to split the nuts into halves and then loading the nuts into the tapahan. In the Visayas and Mindanao, the general practice is to separate the meat from the shell and it is only the meat that is loaded into the tapahan. Splitting and lugit are usually contracted to a crew of 3 to 4 people. The crew in Figure 8.15 can do 2,000 pieces in 4 hours. There is no effort to collect the coconut water and it is simply drained to the grounds.

FIGURE 8.17. (LEFT) THE GROUND IS SOAKED WITH COCONUT WATER AND SMELLS OF FERMENTING AND SPOILING MATERIAL (OZAMIS CITY)
FIGURE 8.18. (RIGHT) DRYING OF COCONUT HALVES INTO COPRA

## COPRA MAKING

The fresh meat of mature coconut which contains about 50% moisture is a good medium for the growth of molds, bacteria, and insects. To improve its storage ability and transportability and to concentrate its oil content, it is processed into copra with a moisture content of 5-10%. Drying down to 8% MC will not allow the growth of aflatoxin growing fungi (Tuason and Madamba, 1980). Drying down to 6% MC will not allow the growth of molds of any kind at room temperature (Villanueva and Sanchez, 1988).

## DIRECT SUNDRYING

In some provinces in Mindanao, sun-drying is practiced especially during the dry season. The split nuts are exposed to direct sunlight by placing them on concrete pavements or mats with the meat up. When the weather is favorable, sun-drying takes 5 to 7 days, yielding good products. When the duration of unbroken sunshine is inadequate to dry fast enough and when the split nuts are not protected from rain or from dew at night, the resulting copra is moldy. Sundried copra by the roadside is susceptible to contamination with dirt, soil or even animal waste.

In some installations in Sri Lanka, Indonesia, and quite rarely in the Philippines, the sun-drying pavement is provided with roof on rails which can be moved over the drying area at nightfall or in the event of rain.

## *TAPAHAN* OR SMOKE KILN

The process of copra making starts by splitting the nut into halves with a single stroke of an ax or a large knife. The coconut water is drained off into the ground as waste. The coconut halves with the husks on are placed in the dryer and fired continuously for about 12 hours until the meat shrinks and can be separated easily with a hand tool. Meat separation takes about 0.75 man-days for 1000 nuts. After separating the meat they are returned back to the dryer for further drying until the moisture content is about 10% moisture content which takes about 12-18 hours more.

## TYPES OF *TAPAHAN*

The kilns commonly used in the Philippines are of the direct-fired type where the products of combustion come in contact with the product being dried. When coconut husk is used for fuel, the resulting copra is heavily laden with smoke. Thus, the copra kilns are called smoke kilns or "tapahan." Five (5) general types of traditional direct-fired dryers have been identified and have been used in the Philippines and Indonesia. These dryers are shown in Figure 8.20a to 8.20e. They are low- cost, easy to build, and have served the oil milling industry for many decades.

From the engineering point of view, however, it has the following technical deficiencies: a) poor temperature control, b) poor temperature distribution; and c) low thermal efficiency. These may be due to the incomplete combustion because of the absence of a good furnace. Incomplete combustion also resulted to smoke contaminated products. Furthermore, a slight breeze will carry away a good amount of hot gases.

It is shown that the copra-making system using the tapahan as practiced in the Philippines is an appropriate one because of its affordability. Furthermore, it also provides excess husks or shells which are used as cooking fuel in the village households. Many farmers share the use of the dryer with others, but the dryers are still generally under-utilized with usage rates of as few as 12 to 48 times per year.

Despite the deficiencies of the tapahan engineering-wise, it is the most widely used contraption for making copra and has served the coconut industry remarkably well for over 120 years. In the absence of any census, it can be estimated that there could be between 400,000 to 500,000 units of tapahan built with different dimensions, configurations, and types of materials.

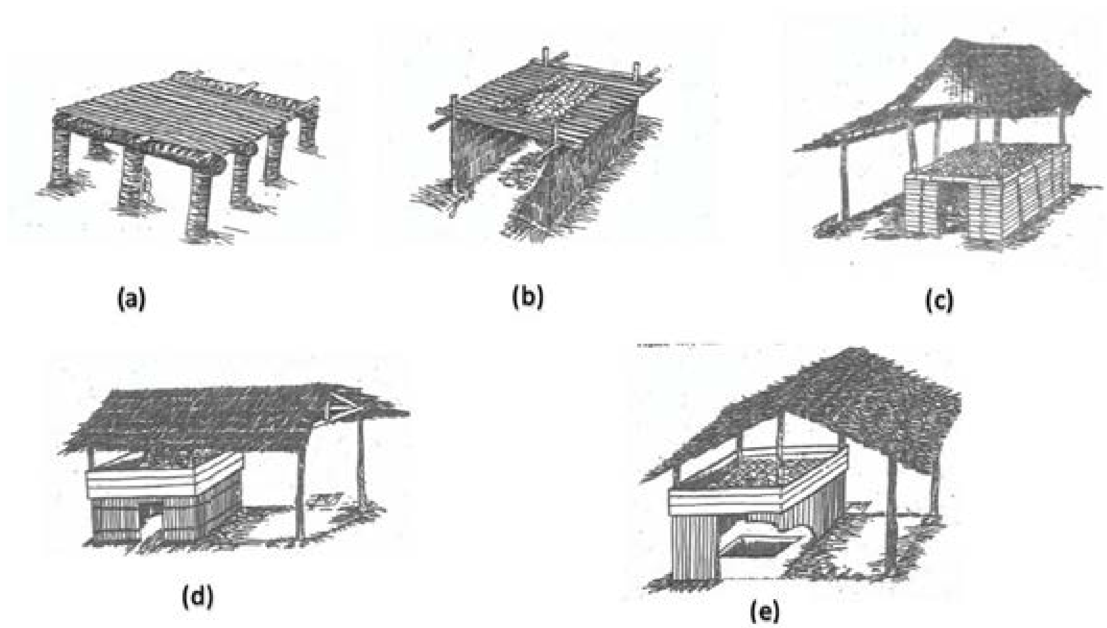
## COPRA QUALITY

The quality of copra ultimately determines the quality of the oil and of the copra cake. Good quality (clean, low moisture, mold-free and smoke- free) copra will yield oil that is edible and is characterized by low FFA, pleasant smell, and water white copra. The nutritive value of the copra cake as ruminant feed will be higher than that of poor quality copra (Thampan, 1975).

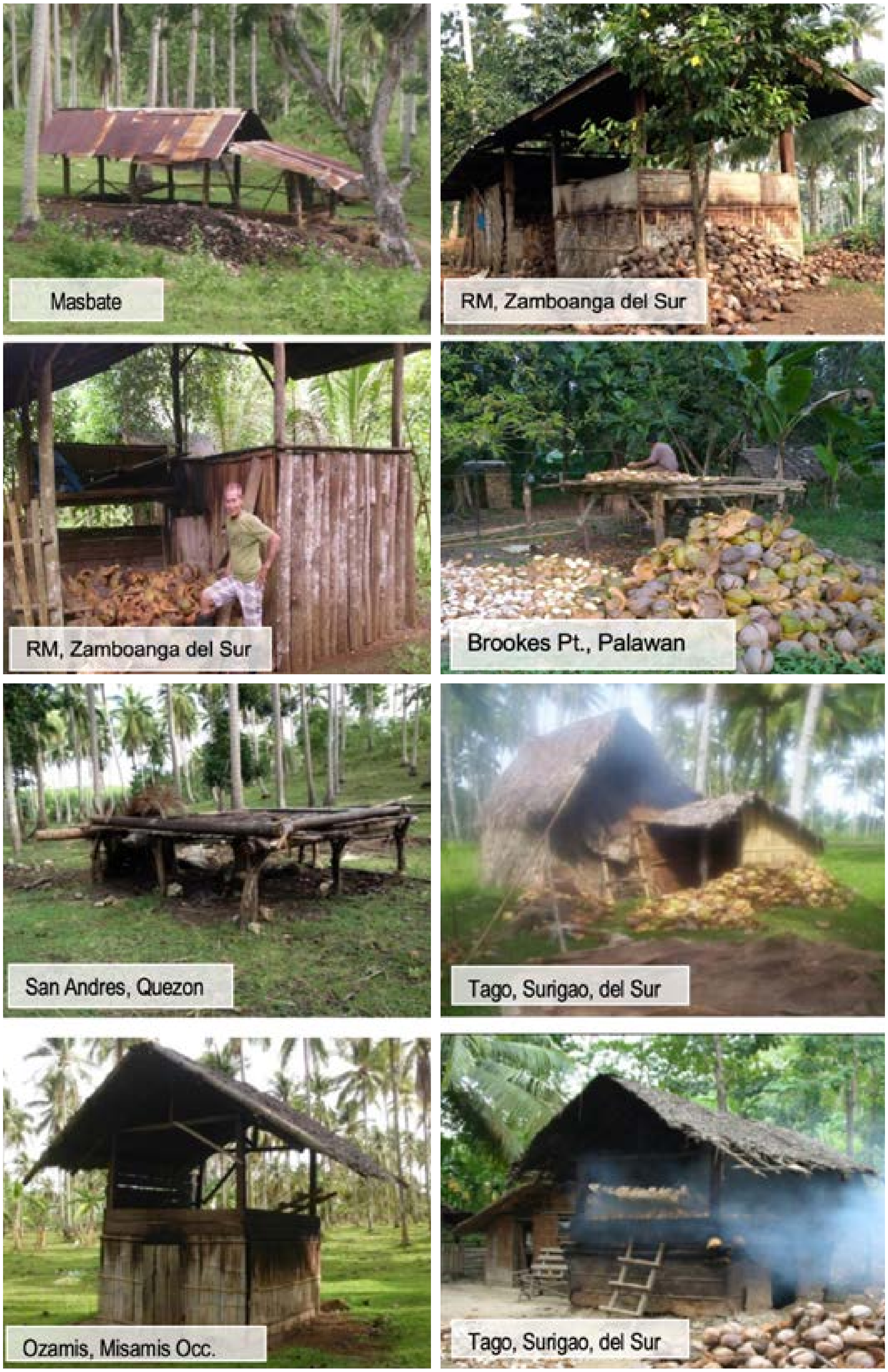
FIGURE 8.19. COPRA IS DARK WHEN THE FUEL USED IS COCONUT HUSKS (A) WHILE COPRA IS LIGHTER WHEN THE FUEL MOSTLY COCONUT SHELL (B)


There is no doubt that Philippine copra is among the poorest in quality, if not the worst in the world. It is infested with molds and insects, with contaminated smoke. This poor copra quality is the result of the practice of using immature nuts, drying to high moisture content at the farm level, non-adoption of a grading standard, and the use of trading practices that do not discriminate against low quality. Furthermore, the warm and humid climate in the Philippines also helps mold growth even at a relatively low moisture content of copra.

**FIGURES 8.20 (A-E). A TYPICAL 'TAPAHAN' DRYERS BEING USED IN THE PHILIPPINES AND INDONESIA. WHICH ARE EASY TO CONSTRUCT AND MADE OF LIGHT MATERIALS. (SKETCHES FROM WB 1987 REPORT)**



## FIGURES 8.21. EXAMPLES OF SMOKE KILNS OR TAPAHAN USED IN THE PHILIPPINES



## IMPROVED TAPAHAN, DIRECTLY-FIRED DRYER

FIGURE 8.22. THIS 'TAPAHAN' IS FEATURED BY AN EXTERNAL FURNACE WHERE VARIOUS KIND OF BIOMASS FUEL CAN BE USED SUCH AS FIREWOOD, COCONUT HUSK, ETC., CAN BE USED. THERE ARE MANY USERS OF THIS TYPE OF DRYER IN NEGROS OCCIDENTAL.

FIGURE 8.23. THIS 'TAPAHAN' IS SIMILAR TO THAT SHOWN IN FIG 2K EXCEPT IT IS KNOCK-DOWN AND IS MADE OF STAINLESS STEEL BODY AND A FURNACE LINED WITH REFRACTORY.

## INDIRECT, NATURAL DRAFT DRYERS

FIGURE 8.24. THIS IMPROVED TAPAHAN IS IDENTIFIED AS THE LOS BANOS COPRA DRYER. IT HAS A BURNER THAT GENERATES CONTINUOUSLY FOR 2-3 HOURS WITHOUT TENDING. SINCE COCONUT SHELL SHARDS ARE USED FOR FUEL, THE COPRA PRODUCED IS WHITE. SOME 500 UNITS OF THIS DRYER HAVE BEEN EXPORTED TO PNG FROM BETWEEN YEARS 1990-2000.

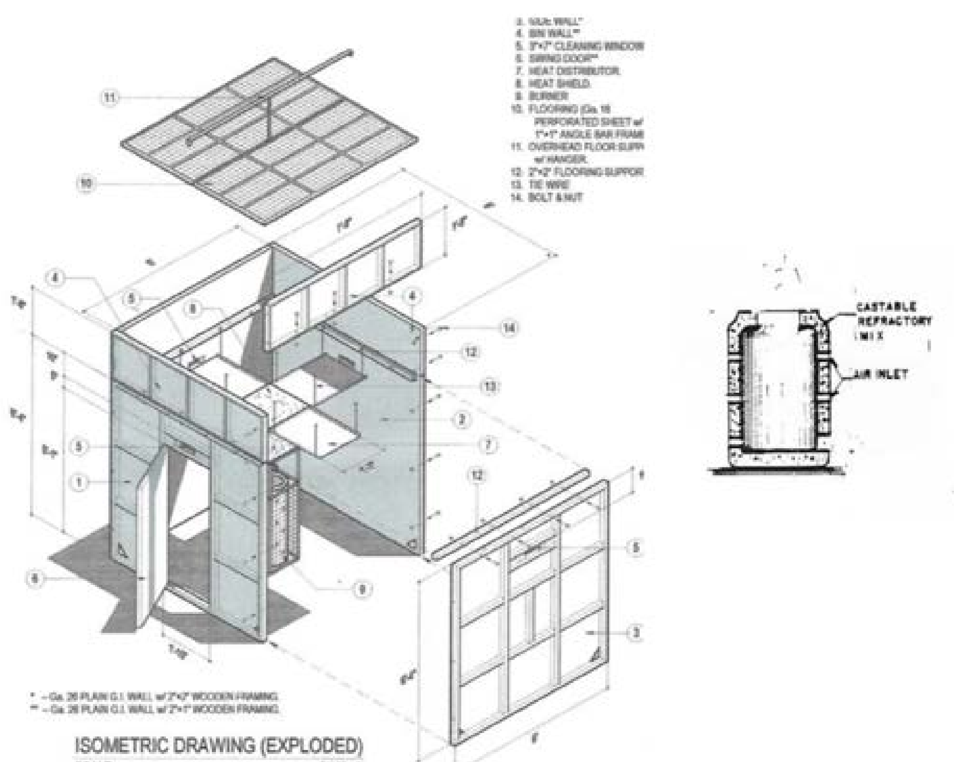


FIGURE 8.25. THE KUKUM DRYER (KUKUM, PNG) AND COCOPUGON (ZAMBOANGA, PCA) HAVE HEAT EXCHANGERS WHERE FUEL IS ALSO BURNED INSIDE AND THE HOT PRODUCTS OF COMBUSTION GO OUT THROUGH THE CHIMNEY. THE HEAT EXCHANGER OF KUKUM DRYER IS MADE OF METAL DRUMS WHILE COCOPUGON IS MADE OF BRICKS. WHEN AMBIENT GETS IN CONTACT WITH HOT SURFACE OF THE HEAT EXCHANGERS, IT BECOMES HOT AND WOULD RISE THROUGH THE LOAD OF COCONUT MEAT BY NATURAL DRAFT. THE RESULTING PRODUCT IS WHITE COPRA. THE DOWNSIDE IS THAT BOTH DRYERS CONSUME A LOT OF FUEL BECAUSE MOST OF THE HEAT GOES OUT THROUGH THE CHIMNEY. (FIGURES FROM: DIPPON K. AND VILLARUEL R. COPRA DRYERS AND COPRA DRYING TECHNOLOGIES).

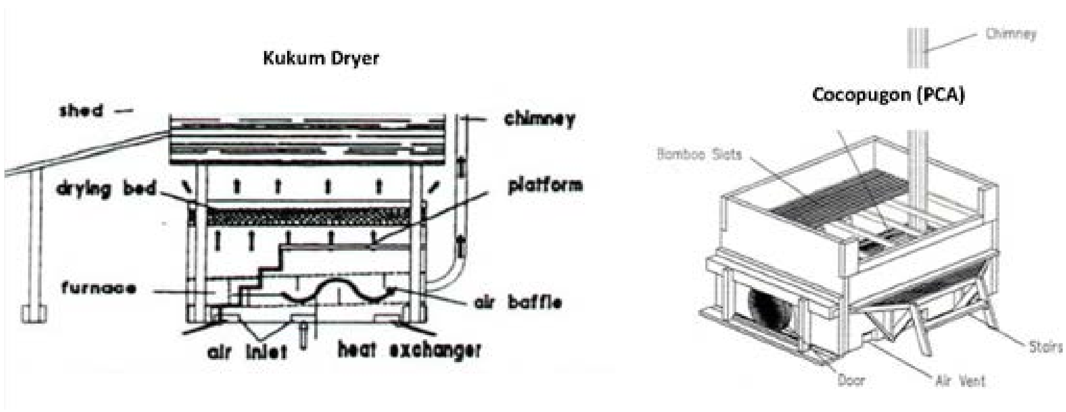



FIGURE 8.26. THE LMC AND THE NEWTECH BELONG TO THE SAME COPRA DRYER CLASSIFICATION: INDIRECTLY HEATED AND FORCED AIR DRYERS. THE LMC HAS A HEAT EXCHANGER HEATED WITH HOT WATER FROM A BOILER AND THE NEWTECH HAS A HEAT EXCHANGER HEAT BY HOT GASES FROM A FURNACE. BOTH DRYERS CAN HAVE LARGE CAPACITIES OF PRACTICAL LOADS UP TO 4000-6000 KG-NUT AND COULD BE VIABLE FOR USE IN COPRA CENTRALS. THE PRODUCT IS WHITE COPRA.

## COPRA TRADING AND WAREHOUSING

Generally, there are three to four layers of traders involved in the movement of copra from the farmers to the millers. These are the following: barangay traders, town traders, provincial traders, consolidators and finally, the millers. Each trading node has its costs and margins. Since the mill gate price is pegged by world prices, all trading costs along ways are deductions from the farm gate prices as shown in (Figure 8.27).

All the copra warehouses shown in the following pages (Figure 8.28) have the common deficiency of not having an aeration system that would prevent temperature buildup and would also dry copra some more.

**FIGURE 8.27. THE CNO – COPRA – COCONUT VALUE CHAIN**

**Value Chain :CNO-COPRA-COCONUT**

| | | | |
|---|---|---|---|
| Rotterdam Price, FOB, P/kg | 60 | | |
| Domestic Price,P/kg | 60 | | |
| Miller | | | |
| BASIS: | 100,000 kg copra at 6% | | |
| 62.8% oil recovery | | | |
| 32% copra cake recovery | | | |
| 62800 CNO,kg | | | |
| 32000 Copra cake,kg | | | |
| Revenue | | | 4,136,000 |
| CNO sale | 60 | 3,768,000 | |
| Copra cake sale | 11.5 | 368,000 | |
| Margin, P/kg copra | 1 | 100,000 | 100,000 |
| Milling cost, P/kg copra | 1.58 | 157,555 | 248,236 |
| Cost of Copra | | | 3,787,764 |
| Buying price of copra at 6% mc | | | 37.88 |

**PROVINCIAL TRADERS**

| | | | | |
|---|---|---|---|---|
| BASIS: | 200,000 kg copra at 6% MC | | | |
| Revenue | | | | 7,575,527.00 |
| Copra sale | 200,000 | 37.88 | 7,575,527 | |
| Margin | | 1.5 | 200,000 | 300,000.00 |
| Transport Cost | | 1.5 | 200,000 | 300,000.00 |
| Expenses | | 0.5 | 200,000 | 100,000.00 |
| Cost of Copra | | | | 7,175,527.00 |
| Price of Copra with 6% mc | | | | 35.88 |
| Buying Price of Copra with 8% mc | | | | 34.11 |

**Computation of copra mill gate price(UNICOM)**

| | | | | |
|---|---|---|---|---|
| Coconut oil price, CIF USA(converted to P/kg) | | | | |
| | Less insurance and outurn loss(1.55 | | | 60 |
| Coconut oil price, FOB ex mill | | 1.55% | 0.93 | 59.07 |
| | Copra price equivalent(63% extraction efficiency at P/kg) | | | |
| | Less export price on coconut oil(if any) | 62.80% | | 37.096 |
| | Millers' margin(5% production cost) | | | 0 |
| Production cost | | | | 1 |
| | add copra meal credit(32% copra meal yield at P/kg) | | | |
| | less: crushing and administrative cost | 0.32 | 11.5 | 3.68 |
| Copra cost | Inventory cost | | | 1 |
| | less copra inventory cost(21% per annum for 2 months) | | | |
| Copra Inventory Cost | | 12.00% | | 0.7419 |
| | Less miller's tax(2% of copra price, ex-mill) | | | |
| Copra price,ex mill | | 0.02 | | 0.74 |
| | | | | 37.230 |

**TOWN TRADERS**

| | | | | |
|---|---|---|---|---|
| BASIS: | | | | |
| Revenue | | | | 170,571 |
| Copra Sale | 5,000 | 34.11 | 170,571 | |
| Margin | | 1 | 5,000 | 5,000 |
| Expenses | | 0.5 | 5,000 | 2,500 |
| Cost of Copra | | | | 163,071 |
| Price of copra | | | | 32.61 |
| Buying price copra with 12% mc | | | | 30.03 |

**BARANGAY TRADERS**

| | | | | |
|---|---|---|---|---|
| BASIS | 1,000 kg copra at 12% mc | | | |
| Revenue | | | | 30,033 |
| Copra Sale | 1,000.00 | 30.01 | | |
| Margin | | 1 | 1,000 | 1,000 |
| Expenses | | 0.5 | 1,000 | 500 |
| Cost of Copra | | | | 28,533 |
| Price of copra | | | | 28.53 |
| Buying price copra with 12% mc | | | | 23.10 |

**FARMERS**

| | | | | |
|---|---|---|---|---|
| BASIS | 1,000 kg-nut | | | |
| Sale | | | | 6,488 |
| Copra at 20% mc | 280.83 | 23.1 | 6,488 | |
| Expenses | | | | 1,500 |
| Harvesting, etc. | | 0.5 | 500 | |
| Husking | | 0.25 | 250 | |
| Drying | | 0.25 | 250 | |
| Transport | | 0.5 | 500 | |
| Net Revenue,P per 1000 nuts | | | | 4,988 |
| Value of nuts, P/kg-nut | | | | 4.99 |

## FIGURE 8.28. IMAGES OF COPRA TRANSPORT, STORAGE/WAREHOUSES, AND OTHER PROCESSES

A. Farmer utilizes a tricycle to deliver his copra to the barangay trader.

B.. Barangay trading post.

C. Farmer watches as his copra is being weighed.

D. Partially dried copra being naturally aerated outside the warehouse.

**E.** Partially dried copra in a barangay trader's warehouse. The moisture content at this point is about 20%. In a few days, it will be infested with molds.

**F.** Molds infestation starting to set in copra in barangay trader's warehouse.

**G.** Mold-infested copra in a barangay trader's warehouse.

**H.** Mold-infested copra in a town trader's warehouse.


FIGURE 8.29. (LEFT) BULK HANDLING OF COPRA. HOPPER HOLDS 5 TONS OF COPRA.
FIGURE 8.30. (RIGHT) A CARGO SHIP THAT CAN HANDLE 2000 TONS OF COPRA

FIGURE 8.31. A MOUNTAIN-HIGH COPRA INVENTORY IN A MILLER'S WAREHOUSE. THE MC AT THIS POINT IS ABOUT 8%. THE MOLD GROWTH CONTINUES BUT AT A LOWER RATE. INFESTATION WITH INSECT PESTS HAS INCREASED WITH THE CORRESPONDING PHYSICAL LOSSES.

# NOTES ON AFLATOXIN AND POLYCYCLIC AROMATIC HYDROCARBON (PAHs)

## Aflatoxin

The stringent Sanitary and Phytosanitary (SPS) requirement of importing countries in the European Union limiting the aflatoxin levels in feed ingredients and feeding stuff are due to the harmful effects of aflatoxin on animals and human health. The SPS regulations require that the aflatoxin level in copra cake should not exceed 20 ppb (PCA). The aflatoxin levels in Philippine copra cake exceeds this level.

## PAHs

Another major problem confronting the Philippines with regard to crude coconut oil exportation is the stiffer quality requirement of the European Union, which imposes that crude oil to be exported to Europe should have low polycyclic aromatic hydrocarbon (PAH). PAH is derived from too much smoke when processing copra. Copra processed using the traditional tapahan method has been reported at 79.8 ppb of benzo-A-pyrene, one of the PAHs from smoke (Swetman, Head and Evans, 1999).

## Competitiveness

In terms of price and quality, the country's Philippine coconut oil is highly dependent on the quality of copra. According to Boceta (1997), Philippine coconut oil sells at a discount of 2 percent in the world market owing to its low quality. This situation had been estimated to cost the country US $52million annually in terms of reduced export prices and physical losses.

## Complicated grading system

AO (1991) maintained the base price of copra at 12 percent moisture content as set by AO 01(1991) but, in addition, the rejection level was reduced to 12 percent. However, PCA-certified traders with drying facilities will be permitted to purchase tapahan-dried copra within the 12.2 to 14 percent moisture range provided, that this copra is dried down immediately to at least 12 percent. Aside from the moisture content, price adjustments in copra are also made according to the percentage of aflatoxin-related mold (ARM). AO 01 (1991) also provided price discounts for inferior copra (i.e., burnt copra and copra goma) and level of dust and foreign matter.

## OIL MILLING

At the oil mill, the delivery truck coming in is weighed using a truck scale. After copra is unloaded, the truck is weighed again. The weight difference is the weight of the copra delivered. Samples are randomly collected from copra in sacks using a sampler called buriki. The samples are brought to the laboratory for moisture content determination using the Brown Duvell set-up.

FIGURE 8.32. WEIGHING LARGE COPRA DELIVERIES USING A TRUCK SCALE (LEFT)
FIGURE 8.33. THE CONVENTIONAL BUT RELIABLE BALANCE FOR DETERMINING WEIGHT (RIGHT)


FIGURE 8.34. COPRA IN A MILLER'S WAREHOUSE. IT APPEARS THAT THE FIRST-IN FIRST-OUT MOVEMENT IS DIFFICULT TO EXECUTE (LEFT)

FIGURE 8.35. WEIGHING LARGE COPRA DELIVERIES USING A TRUCK SCALE (RIGHT)

FIGURE 8.36. COMPUTATION METHOD OF COPRA MILL GATE PRICE (COCONUT INDUSTRY YEARBOOK, 1998)

**Computation of copra mill gate price(UNICOM)**

| | | | | |
|---|---|---|---|---|
| Coconut oil price, CIF USA(converted to P/kg) | | | | |
| | Less insurance and outturn loss(1.55% CII | | | 60 |
| Coconut oil price, FOB ex mill | | 1.55% | 0.93 | 59.07 |
| | Copra price equivalent(63% estraction efficiency at P/kg) | | | |
| | Less export price on coconut oil(if any) | 62.80% | | 37.096 |
| | Millers' margin(5% production cost) | | | 0 |
| Production cost | | | | 1 |
| | add:copra meal credit(32% copra meal yield at P/kg) | | | |
| | less: crushing and administrative cost | 0.32 | 11.5 | 3.68 |
| Copra cost | Inventory cost | | | 1 |
| | less copra inventory cost(21% per annum for 2 months) | | | |
| Copra Inventory Cost | | 12.00% | | 0.74192 |
| | Less miller's tax(2% of copra price, ex-mill)) | | | |
| Copra price,ex mill | | 0.02 | | 0.74 |
| | | | | 37.290 |

## TABLE 8.1. DISCOUNT TABLE DISTRIBUTED BY PCA

| Moisture Content (%) | Discount (%) | Moisture Content (%) | Discount (%) | Moisture Content (%) | Discount( %) | Moisture Content (%) | Discount(%) |
|---|---|---|---|---|---|---|---|
| 5 | 2 | 10 | 4.7 | 15 | 13 | 20 | 23 |
| 5.1 | 1.8 | 10.1 | 4.8 | 15.1 | 13.2 | 20.1 | 23.2 |
| 5.2 | 1.6 | 10.2 | 4.9 | 15.2 | 13.4 | 20.2 | 23.4 |
| 5.3 | 1.4 | 10.3 | 5 | 15.3 | 13.6 | 20.3 | 23.6 |
| 5.4 | 1.2 | 10.4 | 5.1 | 15.4 | 13.8 | 20.4 | 23.8 |
| 5.5 | 1 | 10.5 | 5.2 | 15.5 | 14 | 20.5 | 24 |
| 5.6 | 0.8 | 10.6 | 5.3 | 15.6 | 14.2 | 20.6 | 24.2 |
| 5.7 | 0.6 | 10.7 | 5.4 | 15.7 | 14.4 | 20.7 | 24.4 |
| 5.8 | 0.4 | 10.8 | 5.5 | 15.8 | 14.6 | 20.8 | 24.6 |
| 5.9 | 0.2 | 10.9 | 5.6 | 15.9 | 14.8 | 20.9 | 24.8 |
| 6 | 0 | 11 | 5.8 | 16 | 15 | 21 | 25 |
| 6.1 | 0.1 | 11.1 | 6 | 16.1 | 15.2 | 21.1 | 25.2 |
| 6.2 | 0.2 | 11.2 | 6.1 | 16.2 | 15.4 | 21.2 | 25.4 |
| 6.3 | 0.3 | 11.3 | 6.2 | 16.3 | 15.4 | 21.3 | 25.6 |
| 6.4 | 0.4 | 11.4 | 6.3 | 16.4 | 15.8 | 21.4 | 25.8 |
| 6.5 | 0.5 | 11.5 | 6.4 | 16.5 | 16 | 21.5 | 26 |
| 6.6 | 0.6 | 11.6 | 6.5 | 16.6 | 16.2 | 21.6 | 26.2 |
| 6.7 | 0.7 | 11.7 | 6.6 | 16.7 | 16.4 | 21.7 | 26.4 |
| 6.8 | 0.8 | 11.8 | 6.7 | 16.8 | 16.6 | 21.8 | 26.6 |
| 6.9 | 0.9 | 11.9 | 6.8 | 16.9 | 16.8 | 21.9 | 26.8 |
| 7 | 1 | 12 | 7 | 17 | 17 | 22 | 27 |
| 7.1 | 1.1 | 12.1 | 7.2 | 17.1 | 17.2 | 22.1 | 27.2 |
| 7.2 | 1.2 | 12.2 | 7.4 | 17.2 | 17.4 | 22.2 | 27.4 |
| 7.3 | 1.3 | 12.3 | 7.6 | 17.3 | 17.6 | 22.3 | 27.6 |
| 7.4 | 1.4 | 12.4 | 7.8 | 17.4 | 17.8 | 22.4 | 27.8 |
| 7.5 | 1.5 | 12.5 | 8 | 17.5 | 18 | 22.5 | 28 |
| 7.6 | 1.6 | 12.6 | 8.2 | 17.6 | 18.2 | 22.6 | 28.2 |
| 7.7 | 1.7 | 12.7 | 8.4 | 17.7 | 18.4 | 22.7 | 28.4 |
| 7.8 | 1.8 | 12.8 | 8.6 | 17.8 | 18.6 | 22.8 | 28.6 |
| 7.9 | 1.9 | 12.9 | 8.8 | 17.9 | 18.8 | 22.9 | 28.8 |
| 8 | 2 | 13 | 9 | 18 | 19 | 23 | 29 |
| 8.1 | 2.1 | 13.1 | 9.2 | 18.1 | 19.2 | 23.1 | 29.2 |
| 8.2 | 2.2 | 13.2 | 9.4 | 18.2 | 19.4 | 23.2 | 29.4 |
| 8.3 | 2.3 | 13.3 | 9.6 | 18.3 | 19.6 | 23.3 | 29.6 |
| 8.4 | 2.4 | 13.4 | 9.8 | 18.4 | 19.8 | 23.4 | 29.8 |
| 8.5 | 2.6 | 13.5 | 10 | 18.5 | 20 | 23.5 | 30 |
| 8.6 | 2.7 | 13.6 | 40.2 | 18.6 | 20.2 | 23.6 | 30.2 |
| 8.7 | 2.8 | 13.7 | 10.4 | 18.7 | 20.4 | 23.7 | 30.4 |
| 8.8 | 2.9 | 13.8 | 10.6 | 18.8 | 20.6 | 23.8 | 30.6 |
| 8.9 | 3 | 13.9 | 10.8 | 18.9 | 20.8 | 23.9 | 30.8 |
| 9 | 3.1 | 14 | 11 | 19 | 21 | 24 | 31 |
| 9.1 | 3.4 | 14.1 | 11.2 | 19.1 | 21.2 | 24.1 | 31.2 |
| 9.2 | 3.6 | 14.2 | 11.4 | 19.2 | 21.4 | 24.2 | 31.4 |
| 9.3 | 3.7 | 14.3 | 11.6 | 19.3 | 21.6 | 24.3 | 31.6 |
| 9.4 | 3.8 | 14.4 | 11.8 | 19.4 | 21.8 | 24.4 | 31.8 |
| 9.5 | 3.9 | 14.5 | 12 | 19.5 | 22 | 24.5 | 32 |
| 9.6 | 4 | 14.6 | 12.2 | 19.6 | 22.2 | 24.6 | 32.2 |
| 9.7 | 4.1 | 14.7 | 12.4 | 19.7 | 22.4 | 24.7 | 32.4 |
| 9.8 | 4.2 | 14.8 | 12.6 | 19.8 | 22.6 | 24.8 | 32.6 |
| 9.9 | 4.3 | 14.9 | 12.8 | 19.9 | 22.8 | 24.9 | 32.8 |

FIGURE 8.37. EACH OIL HAS SIMILAR COPRA RECEIVING REPORT FORMS

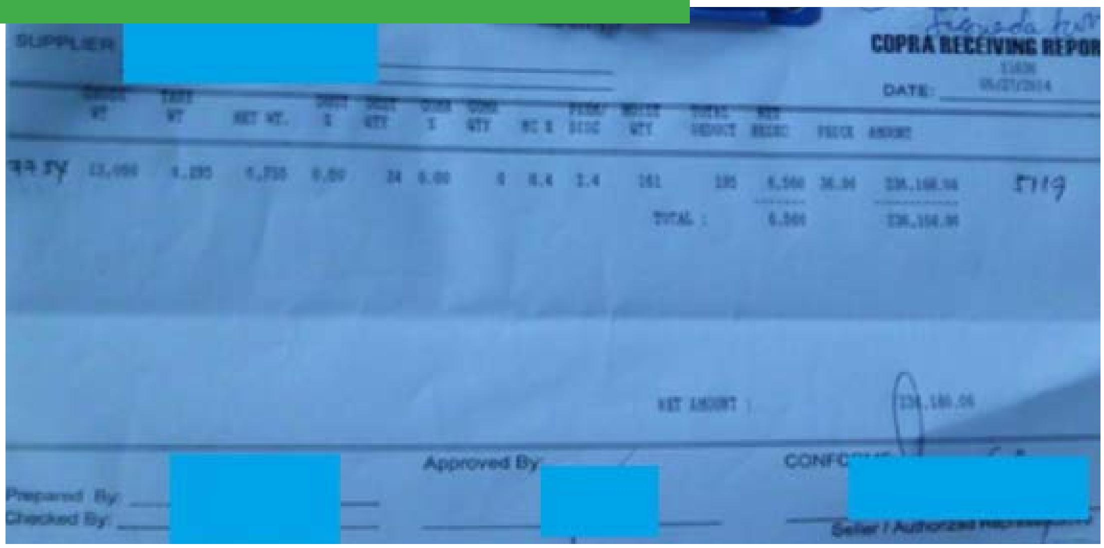



FIGURE 8.38. A HAMMER MILL REDUCES THE SIZES OF COPRA TO SMALL PIECES.
FIGURE 8.39. A FLAKER IS USED TO FLATTEN THE PIECES OF COPRA TISSUES TO MECHANICALLY BREAK THEM FURTHER.

FIGURE 8.40. THE MAIN COMPONENTS OF THE OIL MILL ARE THE EXPELLERS (OZAMIS CITY)
FIGURE 8.41. THE CRUDE COCONUT OIL ARE STORED IN THESE STORAGES.

# FWCCs and FCBSs

## FARMER-OWNED WHITE COPRA CENTRALS (FWCCs) & FARMER-OWNED COPRA BUYING STATIONS (FCBSs)

### Business model for Farmers-Owned White Copra Centrals (FWCC)

The FWCC will buy mature, dehusked nuts directly from farmers and dry them into white copra with a moisture content of not more than 6%. The dryers are indirectly heated using a system of heat exchangers and heat source designed to recover charcoal. Before drying, the coconut water will be extracted in a clean way so that it can be processed into coconut water concentrate or made into plant growth enhancers. The white copra will be sold directly to the oil millers or their consolidators. This business model, where by-products are recovered and where at least 1 layer of trader is skipped, the FWCC will be able to pay prices for de-husked nuts almost at par with that of the desiccators.

### Capital Expenditures (CapEx) and financial viability for FWCC

The total investment for an FWCC with a capacity of 12,000 kg-nut per day is PHP 10M (building PHP 3.5M, vehicles PHP 2.5M, equipment PHP 4.0M). The payback period is 2.00 years and the Financial Internal Rate of Return (FIRR) is 56.62%.

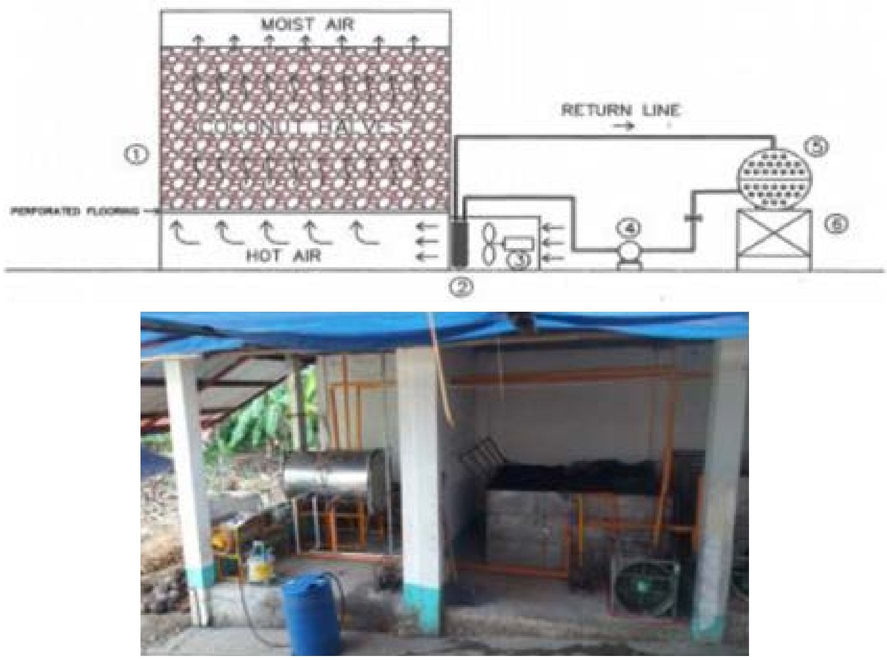
### Business model for FCBS

The FCBS will buy partially dry copra from farmers, re-dry to lower MC, and then sell to oil millers at a profit. One dryer can hold 4,000 kg of pasa copra at about 20% MC which is re-dried into copra with 8% moisture content weighing about 1,125 kg. Re-drying time is about 5-6 hr. Fuel consumption is about 60kg of dry biomass fuel. *(During the month of May 2019, pasa copra was priced at PHP 13.00 and re-dried copra was priced at PHP 17.00/kg)*

### CAPEX and financial viability for Farmers-Owned Copra Buying Stations (FCBS)

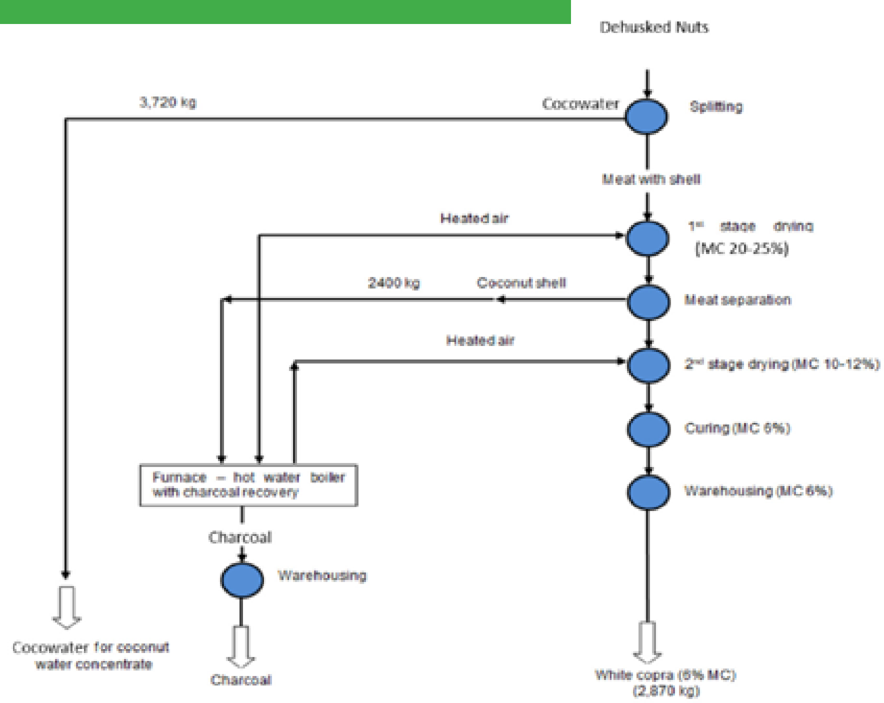
The total investment for a FCBS is PHP 8.0M (building PHP 3.46M, vehicles PHP 2.5M, equipment PHP 2.04M). The payback period is 2.25 years and FIRR is 61.89%.

## FIGURE 8.42. A MODERN COST-EFFECTIVE DRYING SYSTEM AT IVISAN, CAPIZ



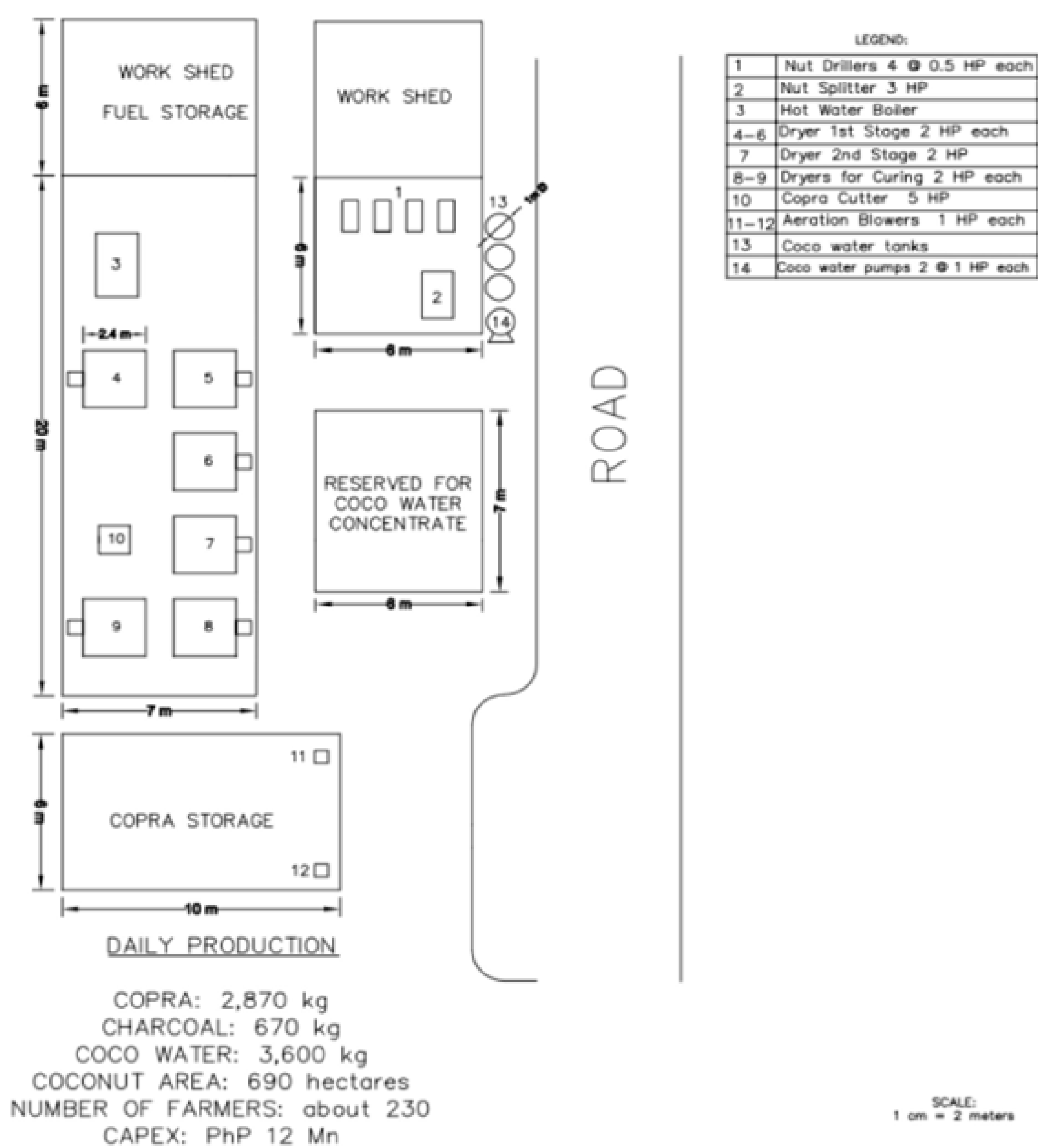

CASCOFAMCO, Ivisan, Capiz

## FIGURE 8.43. FLOWCHART OF THE BY-PRODUCTS WE GET FROM COCONUT



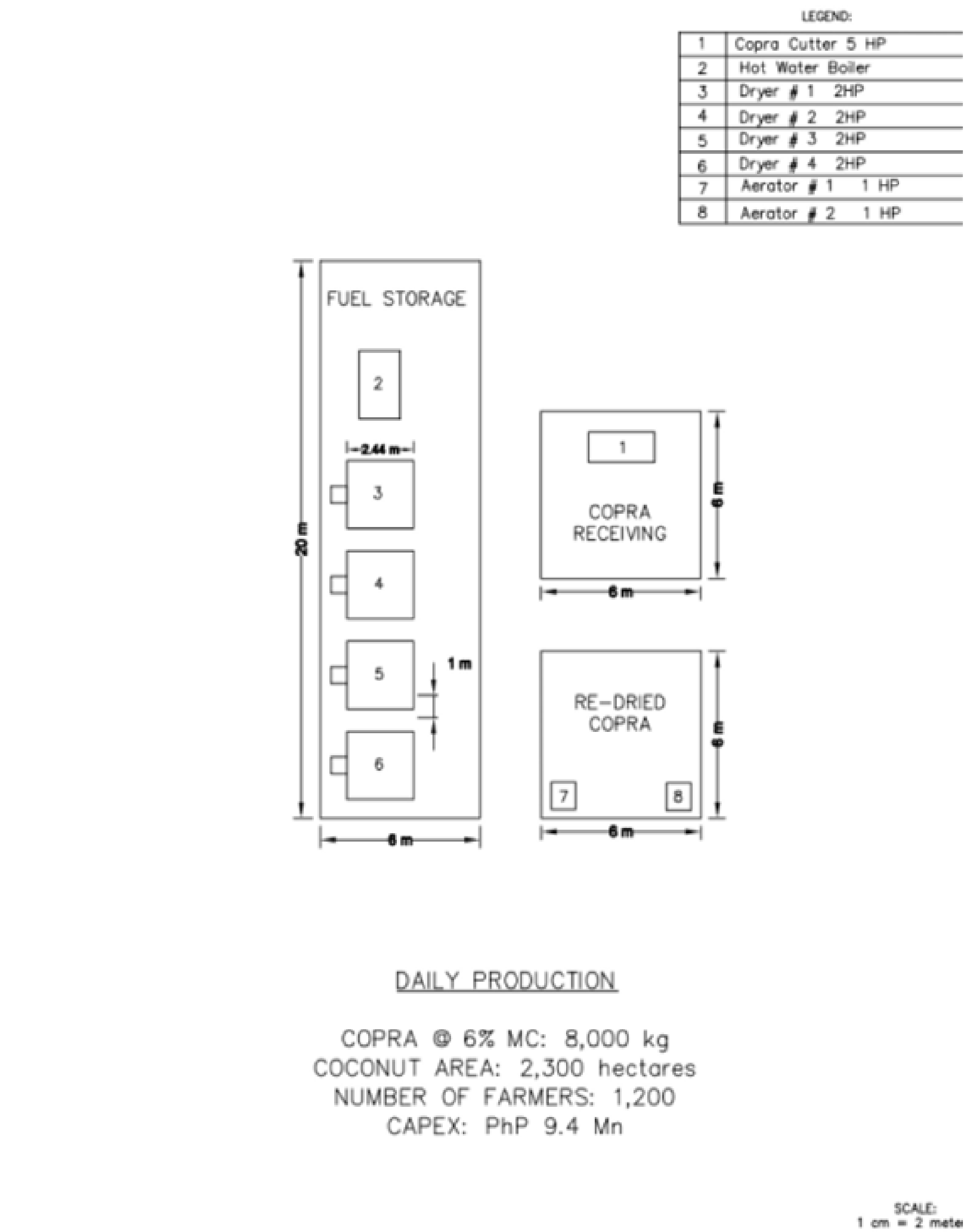
The FWCC produces white copra with a moisture content no higher than 6%. The oil extracted from this kind of copra has the following attributes: low in PAH, low in Free Fatty Acids (FFA), and almost colorless. It satisfies the most stringent quality standards in the world market. The main components of WCC are Copra Dryer with a heat exchanger and a heat source that produces charcoal, at the same time generating process heat. The technology for FWCC was developed using the vast experiences in the development and promotion of UPLB Copra Dryer starting in 1979 (Figure 8.44).

**FIGURE 8.44. FARMER-OWNED WHITE COPRA CENTER (FWCC)**




*Each FWCC will need 26 factory workers, 13 harvesters and 10 dehuskers or a total of 49 people.

FIGURE 8.45. FARMER-OWNED COPRA BUYING STATIONS (FCBS)

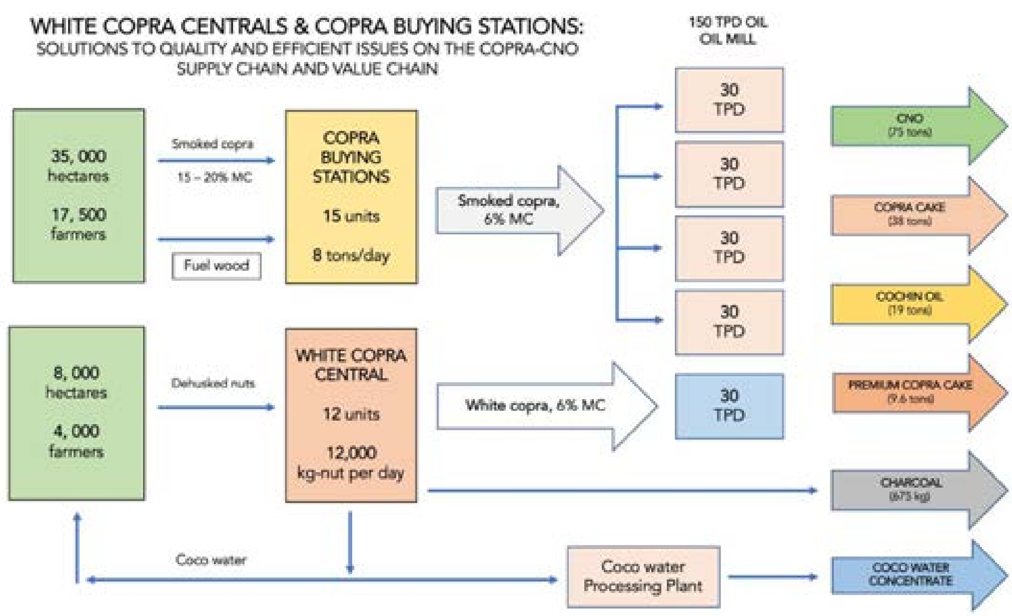



*Each FWCC will need 16 factory workers

## Implementation Scheme: Linking the farmers with industry

The FWCCs and FCBSs will supply high-quality copra to the oil mills in a coordinated manner to ensure a "just-in-time" operation. In this manner, the time elapsed between copra-making and oil milling will be dramatically shortened in order to reduce inventory costs and post-harvest losses (in terms of quality loss and dry matter loss). Exports of high-quality CNO and copra cake are very much welcomed by reputable CNO users like Unilever and oleochemical companies. This innovative value chain with export orientation will qualify for Philippine Economic Zone Authority (PEZA) accreditation.

**FIGURE 8.46. FARMER-OWNED WHITE COPRA CENTRAL (FWCC)**




*Each oil mill will be requested to set up a processing line using white copra as feedstock from 700 hectares of coconut farm. Only 1 unit of 30-TPD expeller will be used for this purpose. Twelve (12) units of FWCC, 624 workers will be needed. Area of farms from which coconuts will come from is 8,400 hectares cared of by 4,200 farmers.

Farmers-owned Copra Buying Stations (FCBS). The remaining 4 expellers will need 120 tons copra per day (TPD) copra from 15 units of FCBS with 8 TPD capacity. The copra supply will come from 35,000 hectares of coconut farms cared for by 17,500 farmers. Each FCBS will need 16 factory workers; for 15 units of FCBS, the number of workers needed is 240.

## TABLE 8.2. SUGGESTED PARTICIPATING OIL MILLS

| PROVINCE | REGION | Average yield 50 | | Percent of nut production 80% | | WCC 12,000 kg-nut/day | CBS 8,000 kg copra/day |
|---|---|---|---|---|---|---|---|
| | | Estimated area (hectares) | Estimated bearing trees | OIL MILLS | CAPACITY,... | QTY, WCC | QTY, CBS |
| | | | Cluster 1 | | | | |
| 1. Quezon II | IV-A (CALABARZON) | 178, 180 | 23, 329, 000 | A&G (1) | 360 | 12 | 162 |
| 2. Quezon I | IV-A (CALABARZON) | 129, 010 | 18, 540, 730 | Tantuco (2) | 300 | 12 | |
| 3. Laguna | IV-A (CALABARZON) | 68, 620 | 9, 311, 990 | New Silangan (3) | 175 | 12 | |
| 4. Batangas | IV-A (CALABARZON) | 37, 130 | 4, 746, 500 | Unidico (4) | 160 | 12 | |
| 5. Cavite | IV-A (CALABARZON) | 11, 840 | 694, 700 | La Suerte (5) | 120 | 12 | |
| 6. Romblon | IV-B (MIMAROPA) | 44, 830 | 5, 273, 320 | Mt. Holy Coco (6) | 120 | 12 | |
| 7. Marinduque | IV-B (MIMAROPA) | 28, 230 | 2, 733, 530 | Filipinas Agri (7) | 119 | 12 | |
| 8. Oriental Mindoro | IV-B (MIMAROPA) | 37, 120 | 3, 188, 430 | New Quezon (8) | 100 | 12 | |
| 9. Occidental Mindoro | IV-B (MIMAROPA) | 2, 450 | 206, 000 | Gloton Ent. (9) | 100 | 12 | |
| 10. Palawan | IV-B (MIMAROPA) | 39, 930 | 3, 793, 440 | Monaco (10) | 60 | 12 | |
| | | | 18.9672 | Tongsan (11) | 150 | 12 | |
| | | | | Licup (12) | 125 | 12 | |
| | | | | Southern Luzon (13) | 200 | 12 | |
| | | | | Southern Pacific (14) | 125 | 12 | |
| | | | | New Tayabas (15) | 120 | 12 | |
| | | | | Fraters (16) | 100 | 12 | |
| | | | | Branis-Sulit (17) | 80 | 12 | |
| | | | | JTP Commercial (18) | 50 | 12 | |
| | | | | Obien Oil Mill (19) | 68 | 12 | |
| | | | | Golden Oil (20) | 75 | 12 | |
| | | | | NH Oil Mill Corp | 75 | 12 | |
| | | | | GRANEX (57) | 900 | 36 | |
| | | | Cluster 2 | | | | |
| 1. Camarines Norte | V (Bicol Region) | 78, 530 | 6, 049, 920 | Gosay (24) | 120 | 12 | 228 |
| 2. Camarines Sur | V (Bicol Region) | 107, 420 | 10, 351, 340 | Globe (23) | 300 | 12 | |
| 3. Camarines Sur | V (Bicol Region) | 64, 100 | 6, 006, 910 | Legaspi (22) | 600 | 24 | |
| 4. Albay | V (Bicol Region) | 79, 150 | 7, 474, 300 | | | | |
| 5. Sorsogon | V (Bicol Region) | 74, 690 | 5, 899, 650 | | | | |
| 6. Catanduanes | V (Bicol Region) | 14, 930 | 681, 250 | | | | |
| 7. Masbate | V (Bicol Region) | 128, 560 | 12, 766, 460 | | | | |
| | | | Cluster 3 | | | | |
| 1. Northern Samar | VIII (Eastern Visayas) | 102, 800 | 10, 789, 020 | New Leyte (31) | 300 | 12 | 188 |
| 2. Eastern Samar | VIII (Eastern Visayas) | 102, 800 | 10, 625, 710 | Visayan Oil Mill | 200 | 12 | |
| 3. Samar | VIII (Eastern Visayas) | 80, 150 | 5, 786, 650 | SC Global (34) | 150 | 12 | |
| 4. Leyte I | VIII (Eastern Visayas) | 79, 800 | 7, 434, 310 | Tacloban Oil (32) | 300 | 12 | |
| 5. Leyte II | VIII (Eastern Visayas) | 79, 690 | 6, 919, 180 | A.D. Gothong (28) | 150 | 12 | |
| 6. Southern Leyte | VIII (Eastern Visayas) | 46, 730 | 3, 821, 930 | Ricor (29) | 75 | 12 | |
| 7. Biliran | VIII (Eastern Visayas) | 16, 930 | 1, 510, 920 | Sanvic Oil Mill | 105 | 12 | |
| | | | Cluster 4 | | | | |
| 1. Siquijor | VII (Central Visayas) | 6, 800 | 549, 440 | Ducom (30) | 250 | 12 | 74 |
| 2. Negros Occidental | VI (Western Visayas) | 28, 000 | 1, 861, 520 | Viscoco (25) | 60 | 12 | |
| 3. Negros Oriental | VII (Central Visayas) | 50, 160 | 4, 775, 910 | International Pha.. | 50 | 12 | |
| 4. Aklan | VI (Western Visayas) | 26, 860 | 1, 664, 980 | Samar Coco Prod | 300 | 12 | |
| 5. Capiz | VI (Western Visayas) | 10, 770 | 1, 199, 750 | | | | |
| 6. Antique | VI (Western Visayas) | 14, 360 | 1, 359, 860 | | | | |
| 7. Iloilo | VI (Western Visayas) | 13, 970 | 1, 119, 460 | | | | |
| 8. Guimaras | VI (Western Visayas) | 5, 680 | 534, 310 | | | | |
| 9. Cebu | VII (Central Visayas) | 42, 290 | 4, 094, 330 | | | | |
| 10. Bohol | VII (Central Visayas) | 42, 640 | 3, 621, 330 | | | | |
| | | | Cluster 5 | | | | |
| 1. Surigao del Norte | XIII (Caraga) | 91, 690 | 8, 201, 260 | Celebes (60) | 100 | 12 | 113 |
| 2. Surigao del Sur | XIII (Caraga) | 71, 800 | 7, 166, 640 | | | | |
| 3. Agusan del Norte | XIII (Caraga) | 39, 150 | 2, 939, 230 | Cagayan de Oro | 400 | 12 | |
| 4. Agusan del Sur | XIII (Caraga) | 23, 070 | 1, 463, 460 | | | | |
| 5. Davao City | XI (Davao Region) | 29, 100 | 2, 768, 920 | Davao Bay (50) | 600 | 24 | |
| 6. Davao del Norte | XI (Davao Region) | 121, 100 | 13, 726, 520 | Mindanao Coco | 75 | 12 | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Pacific Farmers.. | 220 | 12 | |
| | | | | | New Davao Oil.. | 300 | 12 | |
| | | | | | International Cop.. | 525 | 24 | |
| | | | | | Legaspi Oil (53) | 525 | 24 | |
| | | | | | Far East Fresh | 140 | 12 | |
| | | | | | Asia Pacific (55) | 75 | 12 | |
| | | | | | Interco (56) | 475 | 24 | |
| Cluster 6 | | | | | | | | |
| 1. | Misamis Oriental | Region X (Northern Mindanao) | 81, 740 | 8, 000, 130 | Iligan Bay (58) | 600 | 24 | 103 |
| 2. | Misamis Occidental | Region X (Northern Mindanao) | 96, 520 | 7, 742, 260 | Third Millennium | 500 | 24 | |
| 3. | Lanao del Norte | Region X (Northern Mindanao) | 59, 770 | 6, 170, 590 | Limketkai (45) | 125 | 12 | |
| 4. | Sarangani | Region XII (SOCCSKSARGEN) | 60, 860 | 5, 429, 030 | Cargill (59) | 600 | 24 | |
| 5. | South Cotabato | Region XII (SOCCSKSARGEN) | 23, 660 | 1, 964, 840 | | | | |
| 6. | North Cotabato | Region XII (SOCCSKSARGEN) | 20, 350 | 1, 782, 090 | | | | |
| 7. | Bukidnon | Region X (Northern Mindanao) | 5, 520 | 480, 830 | | | | |
| Cluster 7 | | | | | | | | |
| 1. | Zamboanga | Region IX (Zamboanga Peninsula) | 111, 450 | 8, 534, 380 | Interco (38) | 600 | 24 | 180 |
| 2. | Basilan | BARMM | 53, 600 | 5, 446, 350 | Unicab (40) | 150 | 12 | |
| 3. | Zamboanga | Region IX (Zamboanga Peninsula) | 182, 680 | 13, 109, 610 | Dipolog Coco Oil | 450 | 12 | |
| 4. | Zamboanga City | Region IX (Zamboanga Peninsula) | 26, 710 | 2, 365, 200 | Wilmar 2 (43) | 550 | 24 | |
| 5. | Maguindanao | BARMM | 76, 720 | 6, 845, 860 | Osamco (47) | 220 | 12 | |
| 6. | Tawi-tawi | BARMM | 23, 980 | 2, 296, 970 | Wilmar 1 (41) | 500 | 24 | |
| 7. | Lanao del Sur | BARMM | 53, 840 | 4, 653, 430 | Phil International | 400 | 12 | |
| 8. | Sultan Kudarat | Region XII (SOCCSKSARGEN) | 13, 650 | 1, 483, 560 | Pacific Farmer | 220 | 12 | |

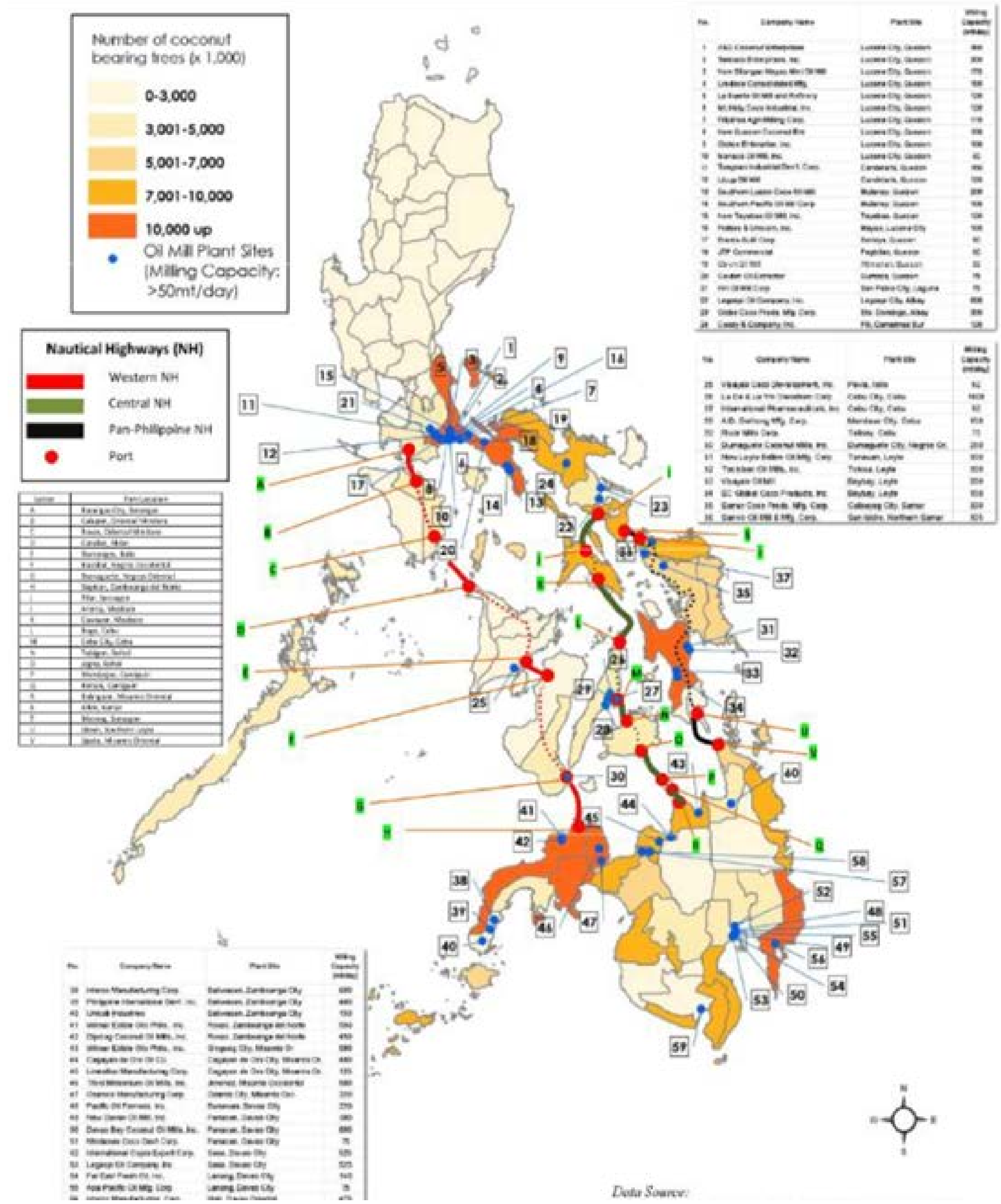
## TABLE 8.3. SUMMARY AND COSTS OF WCC AND CBS

| | | Area (ha) | Nuts per year | Total nuts covered | |
|---|---|---|---|---|---|
| | | 3, 142, 110 | 15, 064, 362, 948 | 13, 359, 171, 440 | |
| | QTY | Unit Cost | Subtotal | Hectares covered nuts | |
| Cost of WCC | 864 | 11, 000, 000 | 9, 504, 000, 000 | 597, 197 | 2, 985, 984, 000 |
| Cost of CBS | 1, 047 | 9, 000, 000 | 9, 423, 317, 078 | 2, 412, 369 | 10, 373, 187, 440 |
| | | Total cost | 18, 927, 317, 078 | | |
| | | Total area | 3, 009, 566 | | |
| | | Farmers | 1, 504, 783 | 6, 289 | PHP/hectare |

## TABLE 8.4. SPECIAL CLUSTER/SPECIAL PROJECTS BY PROVINCES

| Special cluster/special projects | | | |
|---|---|---|---|
| 1. Cagayan | Region I-IV B (Luzon) | 17, 830 | 267, 450 |
| 2. Isabela | Region I-IV B (Luzon) | 1, 380 | 109, 640 |
| 3. Quirino | Region I-IV B (Luzon) | 680 | 35, 380 |
| 4. Pangasinan | Region I-IV B (Luzon) | 8, 930 | 664, 660 |
| 5. Bataan | Region I-IV B (Luzon) | 2, 770 | 249, 500 |
| 6. Ilocos Norte | Region I-IV B (Luzon) | 2, 750 | 163, 060 |
| 7. Zambaels | Region I-IV B (Luzon) | 930 | 58, 810 |
| 8. La Union | Region I-IV B (Luzon) | 2, 300 | 50, 800 |
| 9. Ilocos Sur | Region I-IV B (Luzon) | 440 | 36, 600 |
| 10. Aurora | Region I-IV B (Luzon) | 18, 290 | 86, 450 |

## FIGURE 8.47. LOCATION OF OIL MILLS AND NAUTICAL HIGHWAYS SUPERIMPOSED ON THE COCONUT PRODUCTION DENSITY




*This will help in where to locate the FWCCs and the FCBS.

| | | | |
|---|---|---|---|
| **Some reference numbers** | | | |
| Coconut farm area, has | 3,000,000 | | |
| Copra production, ton | 3,000,000 | CNO | 1,890,000 |
| Price, PHP/ton | 35,000 | Price , PH/ton | 60,000 |
| Total value, PHP | 105,000,000,000 | Total value, PHP | 113,400,000,000 |
| Number of farmers | 1,744,186 | | |
| Number of farm workers | 1,000,000 | | |
| **Benefits from copra quality improvement** | | | |
| | | Quantity | Value |
| Reduction physical losses in copra | 3.500% | 105,000 | 3,675,000,000 |
| Reduction physical oil losses (in refining) | 0.04 | 75,000 | 4,500,000,000 |
| Saving in refining cost | 3000 | 0.5 | 2,835,000,000 |
| | | Total benefit | 11,010,000,000 |
| **Premiums** | | | |
| CNO with FFA less than 2% FFA | | | |
| Copra cake with low aflatoxin | | | |
| INVESTMENTS IN WCC AND CBS | | | 19,200,000,000 |
| | | Payback, yrs | 1.74386921 |

The transport and communication infrastructure in the Philippines has improved in the last 20 years making copra trading more efficient by way of reduction in the layers of trader and better awareness about copra and CNO prices. Another improvement needed at the farm level is rural roads that would allow product movements under all-weather conditions by tricycle.

## BENEFITS FROM COPRA QUALITY IMPROVEMENT

# INTEGRATED COCONUT PROCESSING: VCO Based

The Integrated Coconut Processing Concept (ICPC) involves the production of multiple products from coconut in one processing plant.

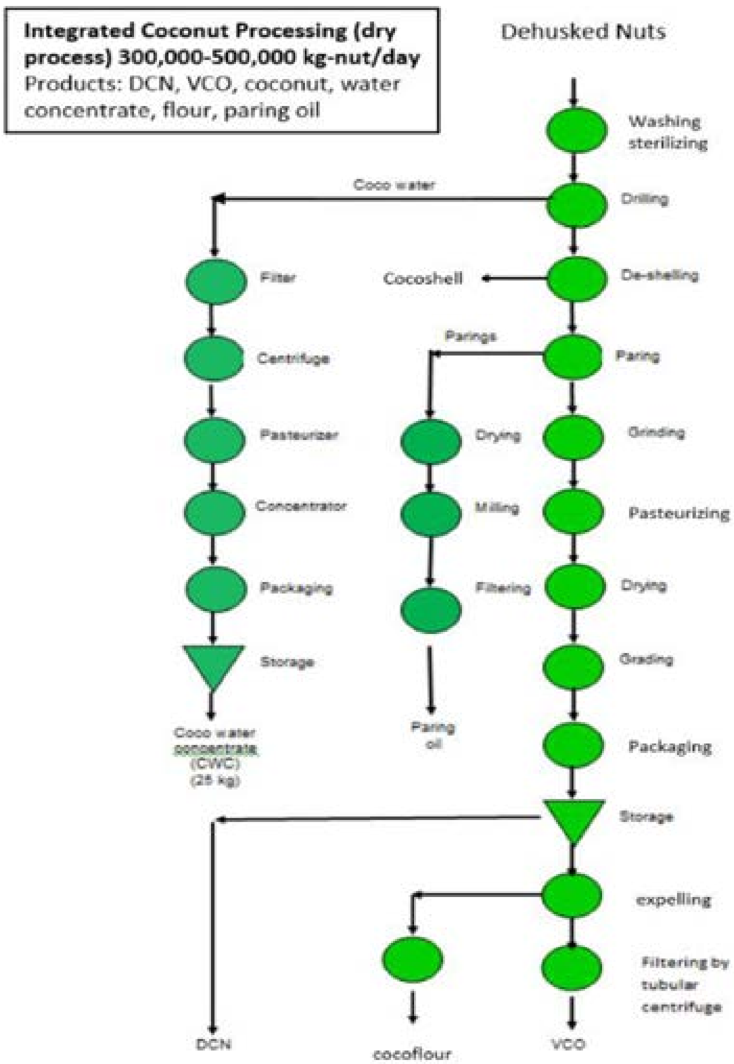
## Large Scale (300,000-500,000 nuts per day)

The Desiccated Coconut (DCN) factories have capacities ranging from 300,000 to 500,000 nuts per day. Today, a typical DCN factory manufactures the following products: DCN, coconut water concentrate, virgin coconut oil (VCO), coconut flour, and paring oil. The VCO is produced by the dry method, where the oil is extracted from the DCN with the use of expellers. The by-product in this operation is a cake that is pulverized into flour. Paring oil, another specialty product, is derived from the hard brown testa covering of coconut meat. The oil extracted from it contains oil with higher content of unsaturated fatty acids than the regular CNO. The VCO production rate could go as high as 25 tons/day. The products of DCN factories are exported. Figure 8.48 below is the typical process flow chart used.

Quantum Diversified Coconut Products has the following product lines: Coconut milk (canned and frozen), low-fat DCN, VCO 1 (wet process by centrifuge method), VCO 2 (expeller pressed), coconut protein (from skimmed milk), coconut water concentrate, and vinegar. Canned coconut milk is exported but limited in volume. Frozen coconut milk in 5-kg pouches is marketed locally and is an ingredient in an ice-cream manufacture. The capacity of Quantum is 10,000 kg-nuts/day and operating 2 days per week only (KII, Dario Collo, Natural Quantum Diversified Products, Inc., March 2021).

Integrated coconut processing is also done at the village or micro-scale level, however, the number of products is limited to what can be sold locally. In many instances, the VCO is sold to a consolidator who does re-filtration and drying using a tubular centrifuge before making it part of his inventory for export. The wet method is more extensively used because of its lower equipment cost. In Sri Lanka, the dry method is used on the micro-scale because the coconuts can be easily dried under the sun and small expellers are available. Figure 8.50a and 8.50b show the flow charts for micro-scale processing.

## FIGURE 8.48. PROCESS FLOW IN DCN FACTORY (FRANKLIN BAKER, PRIMEX, ETC.) MEDIUM SCALE (10,000 NUTS PER DAY)



## FIGURE 8.49. PROCESS FLOW USED AT QUANTUM COCONUT DIVERSIFIED PRODUCTS MICRO-SCALE (200-600 NUTS PER DAY)

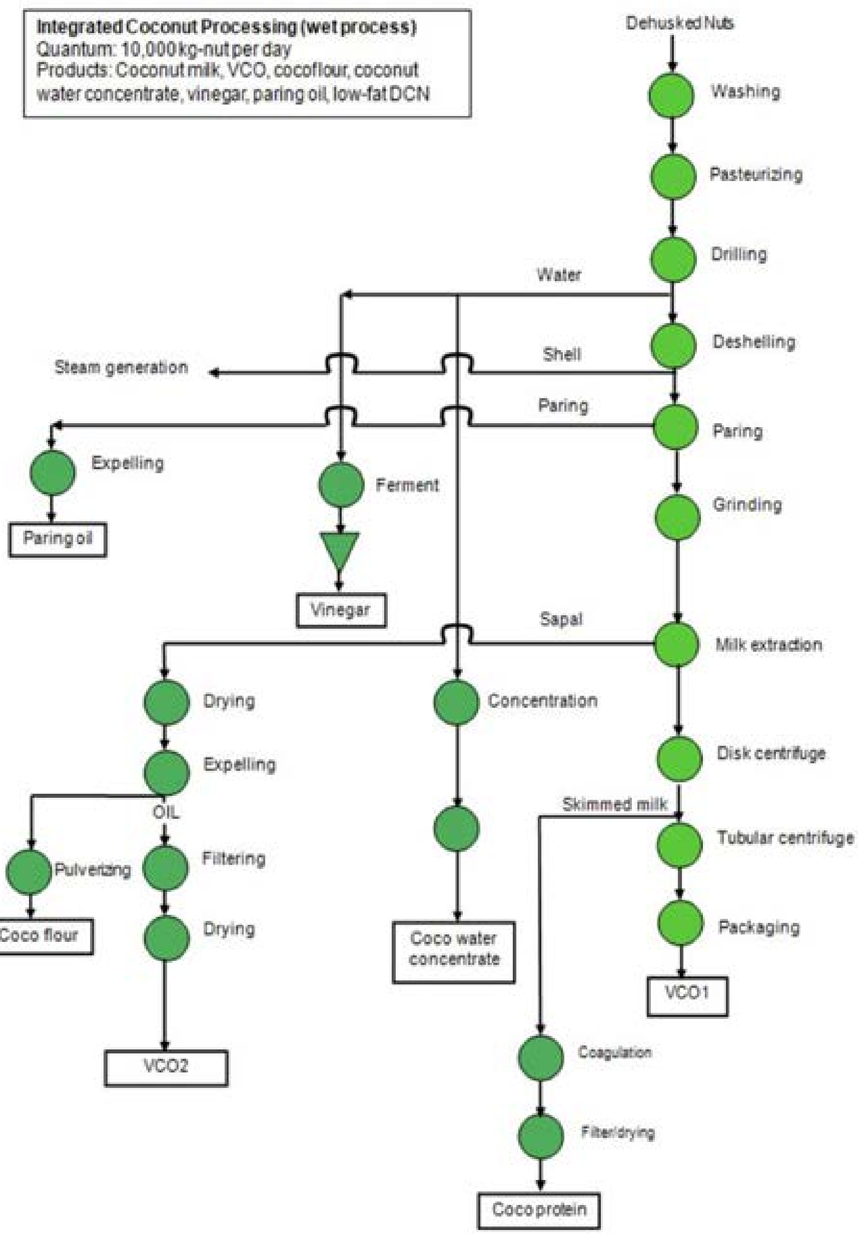


**FIGURE 8.50A. SMALL-SCALE INTEGRATED COCONUT PROCESSING (DRY PROCESS) 600-1000**

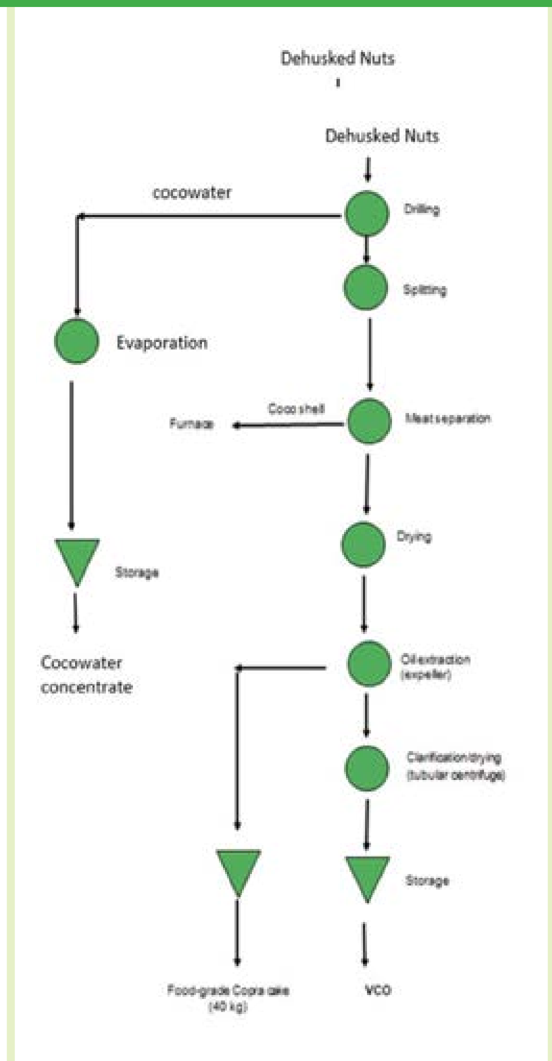
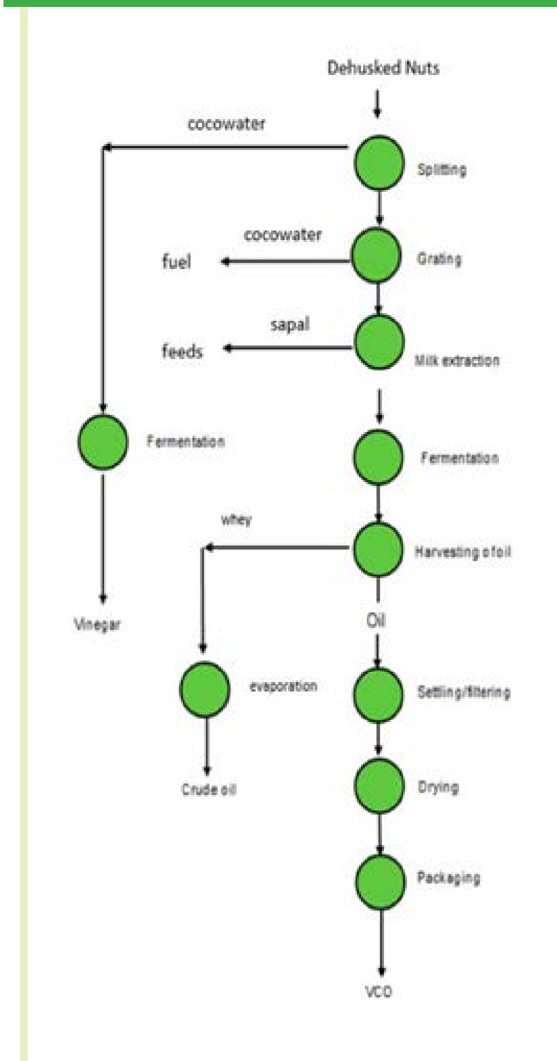



**FIGURE 8.50B. INTEGRATED COCONUT PROCESSING (WET PROCESS). MICRO-SCALE 200-600 KGNUT/ DAY VCO PROCESSING**




## List of equipment for Integrated Coconut Processing: VCO-Based

### DRY METHOD (MICRO-SCALE)

**White copra route (600-1000 kg-nut/day)**

Indirect dryer (white copra)

Hammer mill (grind copra)

Expeller (extract oil, copra cake)

Pressure filter (remove fine sediments)

Double jacketed kettle (dry the oil)

**Village level DCN route (600-1000 kg-nut/day)**

De-shelling machine (remove the shell)

Paring tools (remove testa)

Coconut meat grinder (fine grinding)

Indirect cabinet dryer (drying DCN) Expeller (extraction of oil)

Pressure filter (remove fine sediments)

Double jacketed kettle (drying and pasteurizing of oil)

Pulverizer (cocoflour)

## WET METHOD (MICRO-SCALE)

**Fermentation method 600 kg-nut/day**

Graters

Coconut milk extractor

Fermentation cabinet

Fermentation vessels Pressure filter

Double jacketed kettle Vacuum dryer

**Fermentation method (with tubular centrifuge)**

Graters

Coconut milk extractor

Fermentation cabinet

Fermentation vessel

Tubular centrifuge (remove fine sediments and last traces of moisture)

Double jacketed kettle (to pasteurize the oil)

## DRY METHOD (LARGE SCALE)

The average industrial scale DCN processing line can process 300,000 kg-nut per 24 hours to produce some 40 tons of DCN. When this amount of DCN is pressed, about 24 tons of VCO is obtained. The set of equipment needed to produce VCO from DCN are the following:

- Conditioner
- Expeller
- Filter press
- Tubular centrifuge

## COCONUT SAP VALUE CHAIN

Coconut sap is the unfermented, sweet, honey-colored sap tapped from the immature inflorescence of coconut. It is collected as the raw material for tuba, coco-sugar and syrup, lambanog, and vinegar. Coconut sap itself is a healthy drink and a rich source of sugar, protein, minerals, anti- oxidant, and vitamins. It is considered one of the best natural health drinks (it has served as an important source of nutrients for the people of the isolated Pacific Island nations such as Kiribati since time immemorial). The most significant characteristic of coconut sap is its low glycemic index (GI) of 35; GI is an indicator of the extent of sugar absorbed into the blood (Manohar, 2007).

### Tapping

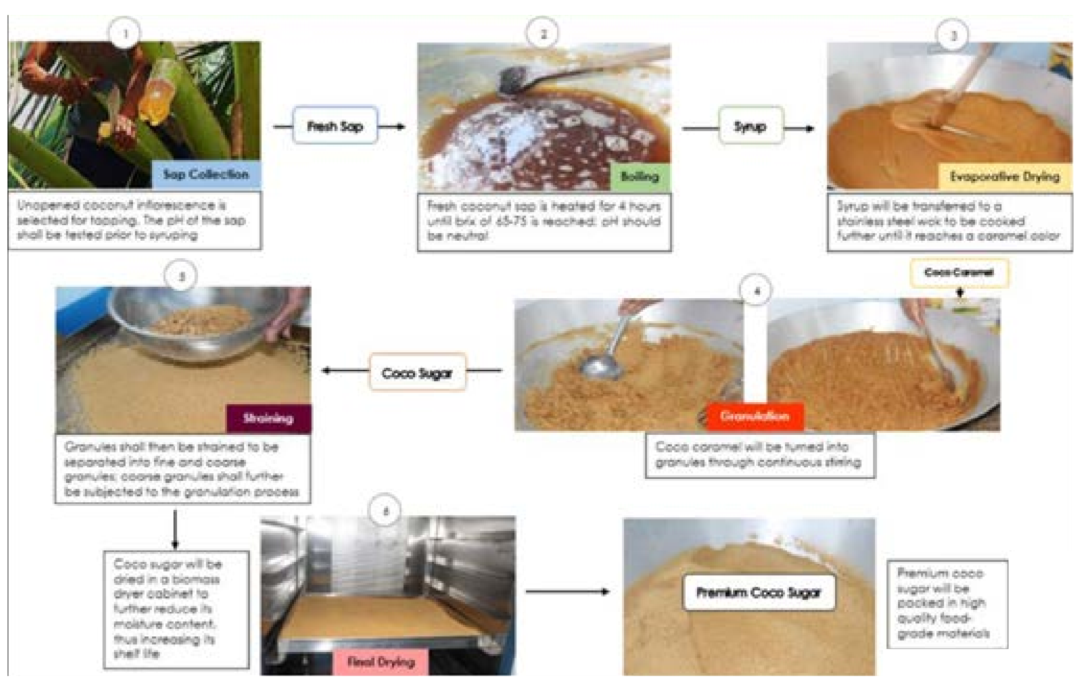
Coconut sap is obtained by tapping the unopened spadix of the coconut palm. The tapper cuts a thin slice off at the end of the efflorescence from which the sap drips out. On average, a tree can yield 1-2 liters of coconut sap per day. The frequency of tapping depends on the kind of products to make. It has been reported that a tapper (climbing the palms) can tap 25 to 30 palms in a working day. Where the coconut trees are connected by tree-top bamboo walkways, a tapper can tap about 75 to 90 trees. In situations where the trees are still short or are of dwarf variety, tapping can be easy. To ensure the freshness of the coconut sap, it must be collected every 5-6 hours. This is done three to four times a day - two in the morning, two in the afternoon, and at night time. The sap that has a pH of below 6 is made into vinegar and aminos. In an experiment with tapping of 100 trees, a daily total of 1.38 litre per tree was obtained. When calculated in 12 hour periods, during the daytime, the sap flow was 0.64 litre and during the night it was 0.74 litre (Manohar, 2018). In Quezon province, processors buy good quality coco sap for coco sugar processing at PHP 15.00 per liter. The price of coco sap for vinegar and lambanog is PHP 10.00 per liter, PHP 5.00 per litre less than the good quality sap (Costales, 2020).

## PROCESSING OF COCO SUGAR AND COCO SYRUP

The process of making coco sugar is very simple following the steps as outlined by Manohar, 2018 (Figure 8.51):

- **Syruping:** The fresh coconut is gently heated in a cooking vat for about 4 hours until it becomes thick at 65-70 Brix;
- **Caramelizing:** The syrup is transferred to stainless steel wok where gentle heating is continued until the syrup has caramelized and becomes granules of coco caramel;
- **Sieving:** The fine granules are separated from the coarse granules. The coarse coco caramel is returned to the wok for further heating;
- **Drying:** The fine granules are placed on trays for drying in a cabinet dryer;
- **Packaging:** Only food-grade material should be used.

FIGURE 8.51. PROCESS FLOW OF COCO SUGAR AND COCOSYRUP MAKING (MANOHAR, 2018)



## HIGHLIGHTS:

1.) The quality of raw material is an important determinant of coco sugar quality. The metrics of quality is the level of sugar break. Philippine coco sap has a sugar break of 12.5%, which is a slightly higher than Indonesia's sugar breaks of 11% to 12%. The quality of the coco sugar is much better when the sap is immediately processed and when the sap's pH level is neutral.

2.) Eight (8) kg of coconut sap will yield 1 kg coco sugar.

3.) Filipino tappers and processors do not use anti-fermenting agents such as limestone and mangosteen bark to retard the fermentation, which is a practice in Indonesia (Manohar, 2018).

4.) Variability in quality of the coco sugar is a common problem. This is attributed to the use of solid fuel stoves and non-measuring stoves in the crystallization of the syrup. The difficulty of controlling the heat from solid fuel combustion results to variability in the finished products (Costales, 2020).

5.) Off-grade or fermented coconut sap are made into vinegar.

## RECOMMENDATIONS FOR COCO SUGAR AND COCO SYRUP PROCESSING:

1.) Use of double jacketed kettle where there is temperature control feature (KII, Norberto Ambagan, March 2021).

2.) Pre-process the sap into syrup in an intermediate processing point to stop fermentation right away.

3.) In tapping of sap, the procedure of using a sterile food-grade tubing of conveying coconut sap from a collecting receptacle (tied to the efflorescence) to the collecting vessel on the ground, must be fully developed (Fabula, 2013).

FIGURE 8.52. COCONUT TREES INTER-CONNECTED BY TREE-TOP BAMBOO WALK –WAYS (LEFT)
FIGURE 8.53. DWARF TREES USED FOR COCONUT SAP PRODUCTION (RIGHT)

FIGURE 8.54. AN EFFLORESCENCE USED FOR TAPPING (LEFT)
FIGURE 8.55. A SAP COLLECTING VESSEL IS TIED TO AN EFFLORESCENCE USED FOR TAPPING (RIGHT)

Source: pca.da.gov.ph

Source: businessdiary.com.ph

FIGURE 8.56. DEMONSTRATION OF COLLECTING COCONUT SAP USING STERILE PLASTIC TUBE AND BAGS (FABULA, 2013)

FIGURE 8.57. DOUBLE JACKETED KETTLE FOR BETTER TEMPERATURE CONTROL

FIGURE 8.58. EXAMPLE PACKAGING OF COCO SUGARS


## LAMBANOG PROCESSING

The process steps in the processing of lambanog are summarized below based on the paper by Buenavista:

1. **Receiving:** Upon collection, the coconut sap should have a pearly white appearance with a distinctive smell, and a pH of 7. Coconut sap packed in 20-L containers is received at the production area and subsequently filtered.
2. **Fermentation:** At the fermenting vat, coconut sap is allowed to ferment in 200-L food-grade plastic drums. Three to four days duration of fermentation results in an alcohol content of approximately 7-8%.

3. **Distillation:** The batch-type pot-still process using rice hull or wood as sources of fuel is the traditional process of distillation used. Gently heating of the alcoholic liquor is observed. The initial distillate (head or 'bating') of about 10 ounces contains methanol. An alcohol meter (hydrometer) is utilized to measure the alcohol content, which varies from 80 to 90 proof. The remaining liquor in the distillation vat (the tail) is discarded. Distillation time takes around 6 to 8 hours. Rice hull, used bamboo, fuelwood, and farm wastes are used as fuel for distillation. Temperature is controlled by adjusting the feeding of fuel; too high a temperature can burn the coconut sap which can produce a dark and unpleasant tasting distillate. It is a temperature-critical process; over-boiling is avoided, and the longer the distillation time, the finer the distillate. The yield of lambanog is based on the 17.51% recovery efficiency.

**FIGURE 8.59. THE SEQUENCE OF MAKING LAMBANOG IN PICTURES (PERALTA, ET AL OF SANGHAYA INC, 2015)**


Note that it is a crystal clear product.

4. **Packaging:** The final product ('alak') is packaged in HDPE plastic containers for storage or delivery.

**Problems in the production of lambanog**

1.) Inconsistent coconut sap quality.

2.) Distilling units have no temperature control; thus, tedious to operate.

3.) The present practice is 1st stage distilling only, resulting to a product that lacks "smoothness".

FIGURE 8.60. AN EXAMPLE OF A DISTILLATION UNIT FOR VODKA

**Recommendations**

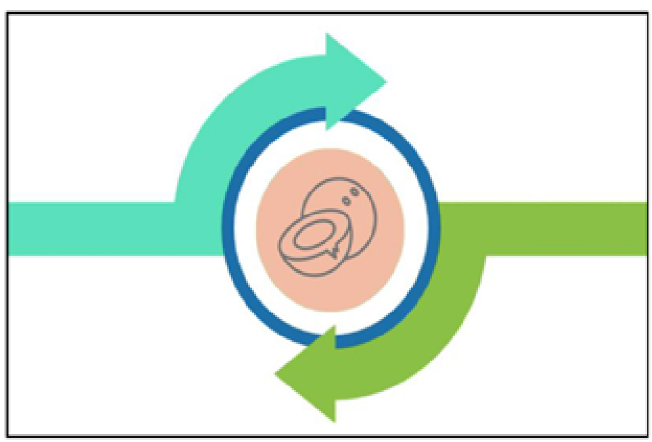
1.) Use the method of collecting sap in sterile food-grade plastic hose receptacles;

2.) Use a double jacketed kettle in heating the distilling vessel; and

3.) Establish a re-distillation shared service facility to 2nd and 3rd distillation to upgrade product quality.

# ZERO WASTE COCONUT FARMS

## AIMING FOR ZERO WASTE COCONUT FARMS



The Philippines has the largest coconut area, and the 2nd highest nut producer in the world (FAOSTAT, 2019) with 3.65 M ha and 14.7 B nuts in 2019, respectively. When copra is the final product sold by the farmer, the husk, shell, and water are left on the farm. When whole nuts are sold, the by- product left on the farm is the husk.

The following table presents the amount of coconut biomass that is left on the farm when mature nuts are harvested and copra or whole nuts are sold by the farmers. In 2019, about 80% of coconuts produced in the country were processed and sold as copra while the 30% were marketed either as whole nuts or young green nuts. Husks compose the largest volume of by-products in coconut farms, amounting to almost 5B MT. It is a valuable resource that should be fully utilized.

### TABLE 8.1. VOLUME OF COCONUT PRODUCTION (NUT MT) AND POTENTIAL BIOMASS OF BY-PRODUCTS FROM HUSK (FIBER, DUST AND SHORTS), SHELL, AND COCONUT WATER

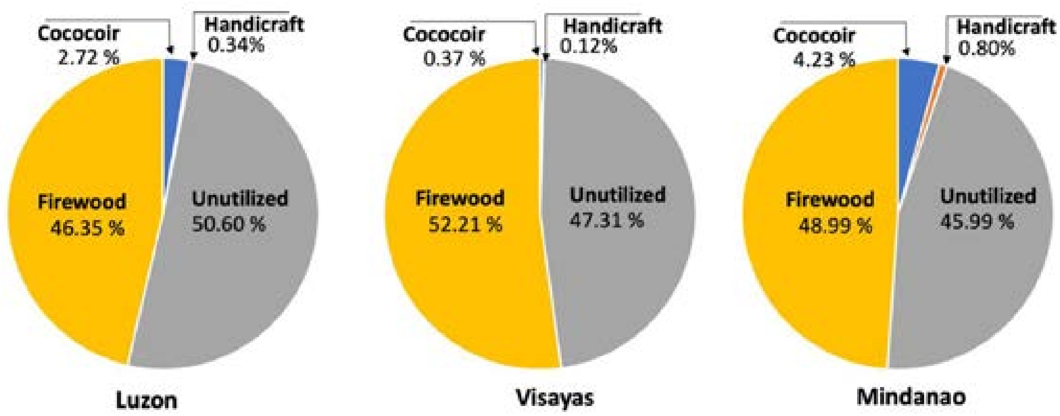
| Region | Nut Prod'n | Husk | Coir fiber | Coir dust | Shell | Water |
|---|---|---|---|---|---|---|
| CAR | 91 | 304 | 91 | 213 | 137 | 198 |
| Ilocos Region | 4,262 | 14,193 | 4,258 | 9,935 | 6,393 | 9,249 |
| Cagayan Valley | 7,263 | 24,187 | 7,256 | 16,931 | 10,895 | 15,762 |
| Central Luzon | 11,840 | 39,428 | 11,828 | 27,599 | 17,760 | 25,693 |
| CALABARZON | 164,348 | 547,278 | 164,184 | 383,095 | 246,522 | 356,635 |
| MIMAROPA | 79,112 | 263,443 | 79,033 | 184,410 | 118,668 | 171,673 |
| Bicol Region | 124,648 | 415,077 | 124,523 | 290,554 | 186,972 | 270,486 |
| Western Visayas | 51,340 | 170,961 | 51,288 | 119,673 | 77,010 | 111,407 |
| Central Visayas | 42,251 | 140,697 | 42,209 | 98,488 | 63,377 | 91,686 |
| Eastern Visayas | 112,380 | 374,226 | 112,268 | 261,958 | 168,570 | 243,865 |
| Zamboanga Peninsula | 174,695 | 581,734 | 174,520 | 407,214 | 262,042 | 379,088 |
| Northern Mindanao | 183,611 | 611,425 | 183,428 | 427,998 | 275,417 | 398,436 |
| Davao Region | 193,196 | 643,341 | 193,002 | 450,339 | 289,793 | 419,234 |
| SOCCSKSARGEN | 116,099 | 386,610 | 115,983 | 270,627 | 174,149 | 251,935 |
| CARAGA | 78,188 | 260,367 | 78,110 | 182,257 | 117,283 | 169,669 |
| BARMM | 133,180 | 443,491 | 133,047 | 310,444 | 199,771 | 289,002 |
| **Philippines** | **1,476,506** | **491, 676** | **147,502** | **344,173** | **221,476** | **320,402** |

Note:
1MT whole nuts = 0.150 MT coconut shell (UCAP) 1MT whole nuts = 0.333 MT coconut husk (UCAP) 30% husk=fiber (Banzon and Velasco, 1982)
70% husk= coir dust
1MT whole nuts = 0.217 MT coconut water (UCAP)

# COCONUT HUSK UTILIZATION

Pogoso et al. (2018) surveyed the husk utilization by farmers in Luzon, Visayas, and Mindanao (Figure 8.1). At most, only half of the husk was utilized across the country, as firewood while less than 5% is used for handicrafts and as coco coir. With about 50% of the volume unutilized year after year, about 150,000 MT of husks goes to waste.

FIGURE 8.1. HUSK UTILIZATION BY FARMERS IN LUZON, VISAYAS AND MINDANAO




Source: Pogoso, et. al., 2018

# COCONUT HUSK AS FUEL

Coconut husks are usually used as fuel for copra processing or for cooking in the household by direct combustion, otherwise, husks are left to rot in piles around the tapahan. The husk (mesocarp, exocarp, and seedcoat) has a heating value of 17 MJ-kg-1, but when burned as when it is used as fuel in copra making, it produces so much smoke which irritates the eyes, nose, and throat, and odor may be nauseating (health.ny.gov). All smoke contains carbon monoxide, carbon dioxide, and particulate matter (PM or soot). Inhaling carbon monoxide Smoke inhalation damages the body due to lack of oxygen.

The smoke itself can contain products that do not cause direct harm but takes up the space needed by oxygen such as carbon dioxide (webmd.com). Long-term exposure or frequent exposure to smoke for brief periods may cause long-term health effects.

## COCONUT HUSK CHARCOAL

Husk cannot sustain a flame unless fanned or mixed with other fuels. Processing of husk to charcoal overcome this concern. Husk charcoal, using the technology not much different from charcoaling of wood or coconut shell, has a heating value of 6320 kcal/kg and burns continuously without smoke (Lozada, as cited by BAnzon and Velasco 1982).

Photo source: https://www.lifegreencharcoal.com/coconut-shell-charcoal-briquette/

Husk yields 25% charcoal with 80% fixed carbon, 11.6% ash, and a heat value of 5926 Kcal/kg (22.8 kg of coconut husk charcoal produces the equivalent heat value of 12.5 kg LPG tank (13.5 x 104 kcal)). Coconut husks have a high amount of lignin and cellulose, and that is why it has a high

Photo source: https://www.lifegreencharcoal.com/coconut-shell-charcoal-briquette/

calorific value of 18.62MJ/kg. The chemical composition of coconut husks consists of cellulose, lignin, pyroligneous acid, gas, charcoal, tar, tannin, and potassium. Every 10% of the husk (50,000 MT) converted to charcoal yields 12,500 MT charcoal which is over 24,000 equivalent of 12.5 kg LPG tank heating value.

## COCONUT HUSK ASH

The coconut ash is rich in potassium in the form of potassium oxide (Estudillo et al., 1979, as cited by Banzon and Velasco,

Photo source: melanatedmedia.com

1982). Coconut husk ash has been demonstrated to be an excellent source of potassium for immature coconut hybrids on developed peat performing as well as KCl at a ratio of 2.0-2.5:1. After 2 harvests, yield of control palms was 26 nuts/tree, KCl treated 93, and husk at 105 (Bonneau, et al., 2010).

Mantiquilla et al. (1994), reported that the husk of coconut supplies 40.7% and 66.9% of the Cl and

Photo source: melanatedmedia.com

K needs of the palm, respectively. Coconut husk ash has 17-35% K under average conditions. According to Balce (1956), coconut husk ash contains 37.5% as K2O. In the example above, 12,500 MT of charcoal (processed from only 10% or 50,000 MT husk produced in 2019), would give about 2.0-4.6 MT of K2O raw coconut husk.

### TABLE 8.2. CHEMICAL COMPOSITION OF COCONUT HUSK (DRY BASIS)

| Constituent | Maturity (dry basis), % | | |
|---|---|---|---|
| | Very young | Young | Mature |
| Organic matter | 96.2 | 95.4 | 95.0 |
| Mineral matter (ash) | 3.8 | 4.6 | 5.0 |
| Water-soluble substances (ws) | 38.5 | 29.0 | 26.0 |
| Pectin | 15.2 | 14.8 | 14.2 |
| Pectin (as % of total ws) | | | |
| Hemicelluloses | 9.0 | 8.1 | 8.5 |
| Hemicelluloses (as % of total ws) | 23.4 | 27.9 | 32.7 |
| Water-insoluble substance (wi) | 61.5 | 71.0 | 74.0 |
| Lignin | 20.1 | 31.6 | 29.2 |
| Lignin (as % of total wi) | 32.7 | 44.5 | 39.5 |
| Cellulose | | | |
| Cellulose (as % of total wi) | 23.4 | 27.0 | 32.3 |
| Mineral elements | | | |
| K | 0.62 | 0.64 | 0.78 |
| P | 0.08 | 0.07 | 0.04 |
| Ca | 0.18 | 0.16 | 0.08 |
| Mg | 0.17 | 0.17 | 0.05 |
| Nitrogen (as N) | 0.57 | 0.54 | 0.23 |
| Protein (N x 6.25) | 3.6 | 3.4 | 1.4 |

Source: Nathanael, 1965

Based on the table, 100 kg of mature husks will give 23 kg N, 4 kg P, 78 kg K, 8 kg Ca and 5 kg Mg. The husk is a significant source of K and of valuable mulch for the conservation of moisture. Husk increases the water-holding capacity of the soil and enriches the organic matter content.

Application of husk can either be piled at the base of the coconut trunk as mulch or chopped and composted. A layer of husk with the convex side upward is placed 2m away from the base around the tree to minimize the loss of moisture and heavy growth of weeds. An ideal method is to bury the husks in trenches of 3 x 1.2 x 0.5m deep along coconut rows. Each layer of husk is covered with a layer of earth. Mulched husk also improves the physical condition of the surface soil by lowering its bulk density (Mantiquilla et al., 1994). The following is another recommendation on the use of husk as mulching material.

## RECYCLING HUSK

- Husks have a high mineral content; 50 husks contain about 0.5 kg potash equal to about 1kg muriate of potash. Husks may represent the equivalent of 200 to 300 kg KCl/ha per year. This should be taken into consideration when calculating the profitability of alternative industrial uses of husks (fibers, energy).
- Husks can absorb and retain about six times their own dry weight of water.
- It takes about 3-4 years for husks to decompose.
- Dehusking the coconuts and leaving the husks in the field are generally recommended practices.
- Husks can be placed around the palm as mulch, but they can also be buried. When buried, they will improve soil conditions, and the soil's water-holding capacity will be increased. Husks should be placed with their convex side upwards, in circles around the stem of palm.
- Inoculation with the cellulolytic fungus Trichoderma has been found to accelerate the decomposition of husks. Two months after treated and untreated husks were buried in the soil, distinct areas of decomposition in the treated husks were noted when fibers were reduced to tiny pieces. The original soil K content was 190 ppm. After two months, soil with untreated husks and soil with treated husks contained 517-593 ppm

and 700-747 ppm extractable K, respectively.

- Leaving the husks in the field may attract termites.

Source: Liyanage, 1987; Nunez et al., 1991

The use of both husks and coir dust was found to be beneficial to coconut production and partly attributed to their ability to retain moisture in the soil and the regeneration of more roots per unit area (De et al., 2010). Coir dust appeared to be more effective than husk in lateritic soil in terms of increasing copra yield. Husk in pits caused significant improvement in nut and copra yield per palm, while coir dust placed in trenches had the least effect. Furthermore, placing husk or coir dust in pits between two palms appeared to be more effective and economical than in circular trenches around each palm. Based on these results, the use of coir dust in pits is recommended as an effective

alternative to husk pits, for moisture conservation and in reducing the adverse effects on the palm during the dry period.

## COCONUT HUSK CHIPS

Photo source: httpps://amazon.com

Photo source: httpps://amazon.com

Coconut husk is a popular growing medium in the Horticulture industry, as 100% natural and renewable resource. Coconut husk chips /cubes are small pieces of husk and are recommended for use in hydroponic systems due to their excellent water retention and drainage properties. For gardening purposes, it is promoted for use in flower beds and gardens for orchids, anthuriums, and other flowering plants. Advantages of using husk chips include cut down fertilizer application by 25-20%, neutral pH, and innate buffering capacity, resistance to fungal growth (greenmylife.in). Fibredust.com markets coco chips in various sizes and combinations with coco coir in 5 kg grow bags for hydroponics production of vegetables.

Coir husk chips are the fastest-growing coir exports products in the Philippines. Export started in 2011 and by 2019, the average annual growth rate in export price (FOB US$/MT) was 573.5%.

## COMPOSTED COCONUT HUSK

Photo source: https://epigardening.com/coconut-coir/

The coconut husks' high Carbon Nitrogen ratio (C/N) and its high lignin content resulting to low biodegradability are some limitations for the use of raw husk. It is not considered a good C source for agriculture until it is decomposed. Composting reduces the wide C/N ratio, reduces the lignin and cellulose content, reduces bulk, and converts plant nutrients to forms available for plant uptake (Agritech portal: Organic farming agritech.tnau.ac.in).

Photo source: https://epigardening.com/coconut-coir/

### TABLE 8.3. NUTRITIVE VALUE OF COIR DUST IS INCREASED BY COMPOSTING (WITH THE ADDITION OF POULTRY MANURE AT A RATE OF 200 KG MANURE PER 1 TON OF COIR DUST) AS FOLLOWS:

| Parameters | Raw coir pith (%) | Composed coir pith (%) |
|---|---|---|
| Lignin | 30.00 | 4.80 |
| Cellulose | 26.52 | 10.10 |
| Carbon | 26.00 | 24.00 |
| Nitrogen | 0.26 | 1.24 |
| Phosphorus | 0.01 | 0.06 |
| Potassium | 0.78 | 1.20 |
| Calcium | 0.40 | 0.50 |
| Magnesium | 0.36 | 0.48 |
| Iron (ppm) | 0.07 | 0.09 |
| Manganese (ppm) | 12.50 | 25.00 |
| Zinc (ppm) | 7.50 | 15.80 |
| Copper (ppm) | 3.10 | 6.20 |
| C/N ratio | 112.10 | 24:10 |

Source: https://agritech.tnau.ac.in/org_farm/orgfarm_coircompost.html

On-farm production of coir dust compost is recommended with application rate of 5 kg/ established tree.

## COIR-BASED BIO-ORGANIC FERTILIZER (BOF)

Bioorganic Fertilizer (BOF) is a processed inoculated compost from any organic material that has undergone rapid decomposition by the introduction of homogeneous microbial inoculants (PCA), unlike fresh organic fertilizer, where heterogeneous microbes present in organic matter cause the natural decay process. Compared with the traditional composting method, microbial inoculation hastens the decomposition from three months to just 3-4 weeks.

The rate of application depends on the kind of crop to be fertilized. BOF application ranges from 10-20 bags/ha or 2-6 kg/tree for bearing plantation crops like coconut. Initially, this recommendation must be combined with 50% of the recommended rate of inorganic fertilizers.

The Philippine Coconut Authority also recommends the use of coir dust/coco peat based BOF at a rate of 5 kg + 0.75 kg + 0.85 kg of BOF + AS + NaCl or Cocopeat + NaCl at a rate of 8.0 kg + 1.6 kg as a soil conditioner and general fertilizer for coconut.

Eroy and Pedrones (2019) recommended that coconut crown residues as organic fertilizer and nitrogen-fixing legumes (Flemingia and Desmodium rensonii) can substitute for AS as N-sources while cocopeat and husk for chlorine.

## COCONUT WATER

Photo source: https://foodtanck.com/news/2012/01/indigenous-food- coconuts

Photo source: https://foodtanck.com/news/2012/01/indigenous-food-coconuts

Coconut water (coconut liquid endosperm), with its many applications, is one of the world's most versatile natural products, other than its already worldwide recognized importance as a natural, fat- free beverage that is nutritious and beneficial for health and medicinal applications. Coconut water is traditionally used as a growth supplement in plant tissue culture/micropropagation. The wide applications of coconut water can be justified by its unique chemical composition of sugars, vitamins, minerals, amino acids, and phytohormones.

Coconut water (CW) is a rich supplement that naturally contains sugar and minerals including Potassium, Sodium, Magnesium, Calcium, and Iron. (https://coconuthandbook.tetrapak.com/chapter/chemistry-coconut-water). Unopened, the coconut water is sterile inside the shell, but once opened and the enzymes come in contact with oxygen, changes occur and CW loses its nutrients and aroma. Minerals account only for 0.4% to 1% of the liquid volume but contributes to CW's isotonic properties. Potassium is the main element of coconut water (Yong et. al., 2019).

With 1 MT whole nuts=0.217 MT coconut water (UCAP), the Philippines produced a total of 320,000 MT of water. With 80% of the total nut production processed into copra, about 70,000 MT of water is left of the farm, generally wasted year after year. There is a great potential for this water to be collected by DCN factories which already have the technology and market to add value to an otherwise wasted resource.

The proposed white copra central will be an ideal collection venue for this model. Else, the copra central itself can process the water into concentrate. Coconut water that is not further processed into concentrate should not be wasted. There are promising studies on the use of coconut water in improving crop growth and yield. This should be pursued further. There should be a means to bring the water back to the farm for irrigating coconut and intercrops.

Coconut water contains plant growth regulators such as indole acetic acid (IAA).

A study by V.A. Agampodi and Æ Bimali Jayawardena (2009) evaluated the potential of CW extracts containing natural IAA, on adventitious root development in vegetative propagation of ornamental plant canes of D. purple compacta L. Steeping canes in 143-lM IAA CW extract improved rooting in D. purple compacta L., and it was comparable to the application of 143-lM authentic IAA. Exogenous application of IAA CW extract is beneficial for induction and growth of adventitious roots in D. purple compacta L. canes for vegetative propagation. The authors suggested that Reverse phase dialysis may be an option for large-scale extraction of hormones from CW.

Mature coconut water has been used for the mass propagation of different orchid species like Dendrobium sp., Vanda sanderiana and Grandiflora sp. by tissue culture techniques. (Rethinam and Kumar, 2001). While the growth promoters present in coconut water (Marmaril et al., 1986) and milk (Pollard et al., 1961) have been identified, their application to promote rooting has not been explored. Reverse phase dialysis may be an option for large-scale extraction of hormones from CW.

The addition of fresh coco-water to hydroponically grown Lettuce (Lactuca sativa L.) at an application rate of 50 ml, 100 ml and 150 ml for the 1st, 2nd, and 3rd week, respectively, significantly increased the length and diameter of leaves; plant height; percent foliage N and K content; length, fresh and oven-dry weight of roots; and yield compared to control (coco-water addition) Application of coco-water as hydroponics nutrient solution and as an additive to hydroponics solution was financially viable which has positive net present value and a higher percentage of internal rate of return (IRR) Poliquit et al. (2019). Coco-water as an additive for nutrients solution of hydroponics system is highly recommended for lettuce production. The use of coco-water in hydroponics systems should be further studied in other crops such as fruit vegetables by increasing its volume of application.

Coconut water (previously called "coco-nut milk") has been shown to induce the division of mature cells. For example, the growth of spinach tissue on a medium supplemented with 10% to 15% (v/v) mature coconut water increased the weight of spinach callus after 5 weeks and accelerated shoot regeneration (4–5 weeks instead of 8– 12 weeks without).

The presence of both polyols and phytohormones could explain the growth-promoting action of coconut water (Prades et al., 2012). Coconut water was highly sensitive to fluctuations in potassium and sodium inputs and also sensitive to phosphorus, sulfur, and chloride supplementation.

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# Procedure and Sample Costs and Return in Coir-Based Bio-Organic Fertilizer (BOF) Production

## MATERIALS

I. Raw materials: The amount depends on the desired quantity of heap and ratio of plant residue and animal manures which could be 1:1, 2:1 or 1:2. For a 4 ton heap at 1:1 ratio you need:

   a. Coir dust (2T)

   b. Chicken manure (1T0

   c. Swine Manure (1T)

   d. Inoculant (1% of weight of raw material – 40kg)

II. Small tools and implement

   a. Rakes

   b. Shovel

   c. Spading fork

   d. Sprinklers or water hose

   e. Plastic laminated sack as cover

   f. Wheelbarrow

   g. Weighing scale

   h. Siever (wire mesh size of ¼ of an inch

   i. Protective wear: gloves, mask, hats, boots

Note: Inoculants are commercially available in selected areas in the country but could be easily accessed. Trichoderma harzianum, a single-celled fungus hastens the decomposition of organic materials especially those high in lignin and cellulose like rice straw, coir dust, bagasse and weeds. Commercial inoculants (i.e Greenmix, Mabijon composter) are enriched with other beneficial microbes like the nitrogen-fixing bacteria, Azotobacter. Leguminous plants could be part of the substrate to substitute part of the manure.

## How to Make Organic Fertilizer

### I. Site selection:

The ideal composting site is shaded and well-drained and near a source of water. However, open areas could be used. Four tons of agricultural waste can be composted in a space measuring 4m x 6m.

### II. Preparation of raw materials:

Collect the required amount of coir dust, chicken manure, and swine manure. Discard stones, plastics, metals, and other non-biodegradable materials. Note their moisture content and weights. Divide coir dust into three parts.

### III. Piling of materials

**Step 1.** Spread 1/3 of coir dust as the first layer. Water to about 60% moisture content. Press the sample in your palm and when the water does not fall freely, then it is almost within the right water content. Apply the required amount of inoculant on top (0.5% of the weight of the material in a layer.)

**Step 2.** Spread evenly the chicken manure on top, water and inoculate.

**Step 3.** Repeat steps 1 and 2 but use swine manure instead of chicken manure. Apply the inoculant on top of the fourth layer combining the weight of materials in the fourth and fifth layers.

**Step 4.** As the topmost layer, spread evenly coir dust but do not inoculate. This serves as a buffer for odor.

**Step 5.** Cover the heap with laminated plastic sack to conserve moisture and prevent rainwater from getting into the pile. Incubate for 4-7 days.

### IV. Mixing and turning over

**Step 6.** After 4-7 days, turn and mix thoroughly the materials. Water if needed during turning.Return the cover. Repeat step 6 at weekly interval.

### V. Harvesting, sieving and further processing

**Step 7.** After three or four weeks, harvest the material. Ripe compost has dark brown to black color, no offensive smell, temperature is ambient and with 35% moisture content or lower. Screen the organic fertilizer through manual sieve or mechanical sifter

**Step 8.** Inoculate the sifted material with 0.5% of the inoculant, store for three days under shade.

**Step 9.** Put BOF in 50 kg plastic lined sack and seal. Do not pile directly on concrete flooring but provide wooden platform and stack not more than10 sacks high. Store not more than 6 months in an aerated but dry area.

## QUALITY CONTROL MEASURES

For a good quality bioorganic fertilizer, observe these points:

1) Separate the dry materials from wet ones.
2) Monitor periodically the temperature of the heap. It must be within the right temperature range. The heap must heat up to over 400C 24 hours after heaping. Within the first week, the desired temperature is 40-500C. If this temperature is not reached, check the wetness of the materials. Remove the cover, turn over the heap to allow excess moisture to escape. Temperature must reach up to 620C.
3) For a product to be registered with the FPA as pure organic fertilizer, it must have 5-7% total NPK with at least 1.5% N and at least 10% carbon. The organic matter must be 10% and above with a neutral to slightly alkaline pH.

## PRODUCTION ECONOMICS:

Assumptions:

_ % recovery – 75 operation time – 30 days

_ 4 tons of raw material

| OUTPUT: | | Cost (PhP) |
|---|---|---|
| 60 bags of 50 kg | | |
| **INPUT:** | | |
| A. Raw materials | | |
| 1.) coir dust (2T or 57 bags of 35 kg @ PhP 35) | | 1,200 |
| 2.) chicken dung (1T or 20 bags of 35 kg @ Php50) | | 1,995 |
| 3.) pig manure (1T or 29 bags of 35 kg @ Php7) | | 203 |
| 4.) inoculant (40 kg @ PhP 25) | | 1,000 |
| **sub-total** | | **4,398** |
| B. Capital cost | | |
| 2 pcs rake @PhP130/pc | 260 | |
| 2 pcs spading fork @PhP250/pc | 500 | |
| 2 pcs shovel @ PhP 250/pc | 500 | |
| 2 pcs sprinkler @ PhP 150/pc | 300 | |
| 1 unit wheelbarrow @ PhP2,000/pc | 2,000 | |
| 1 unit siever @ PhP1,000/pc | 1,000 | |
| I unit weighing scale @ PhP1,200/pc | 1,200 | |
| | 5,760 | |
| * depreciation cost (20% of capital cost) | | **1,152** |
| C. Other direct cost( per bag of BOF) | | |
| labor (processing) @PhP 25 | | 1,500 |
| bagging material @ PhP 12 | | 720 |
| miscellaneous @ PhP 3.65 | | 219 |
| utilities @ PhP 6 | | 360 |
| Hauling & transport cost @ PhP 18/bag of raw mat. | | 1,908 |
| **sub-total** | | **4,707** |
| **TOTAL PRODUCTION COST** | | **10,257** |
| **Break-even price (PhP)** | | **170.94** |

**Source:** Philippine Coconut Authority Downloaded from

Bioorganic Fertilizer (BOF) From Coir Dust And Animal Manures January 31, 2021
https://businessdiary.com.ph

# LIVESTOCK INTEGRATION

## SWINE PRODUCTION

The local pig industry contributes about USD5 B or 18.28% to the agricultural output of the Philippines in 2015. The country is the tenth-largest consumer and the eighth-top producer and seventh- largest importer of pork in the world. Due to the increasing population and appetite for pork, consumption of pork per capita is expected to increase from 15.96 in 2020 to 16.7 kg in 2025. Because of this continued rising demand, the country becomes a major importer of pork according to the Philippine Statistics Authority. Thus, to reduce importation, closed the gap, and become self-sufficient, local production efficiency should be improved. The local industry is ripe for innovative techniques of raising pigs such as venturing into raising native pigs.

Native pigs are raised in far-flung areas where housing structures or pens are not provided. They multiply fast because they breed and give birth easily. An average of 5 – 8 piglets is produced per farrowing. The sows care for their young and have natural antibodies against common diseases and parasites.

An advantage of pig farming is the low capital requirement. They are easy to raise and are highly adaptable to local conditions. In addition, native pigs can survive by making use of local feed sources and simple management practices. Their characteristic taste appeals to consumers, which adds to their marketability.

In 2019, the gross value of hog production was PHP 247.48 B which was 10.8% lower than the previous year's PHP 277.53 B gross value (PSA, 2019). Despite the decrease, swine remains to be the subsector with the highest gross value in the livestock and poultry sectors mentioned. Like goat and cattle, the majority of the swine industry in the country is dominated by backyard farm setting. Over 63% of the total 12.8M heads of swine in 2019 are not raised commercially. The total swine inventory in the Philippines has also declined by 7% in the last 10 years while production of pork on the other hand had increased by 22% from 1.88 M to 2.3 M metric tons of pork (Figure 8.1 and 8.2).

FIGURE 8.1. SWINE INVENTORY BY BACKYARD AND COMMERCIAL FARM TYPE, PHILIPPINES (PSA, 2009-2019)

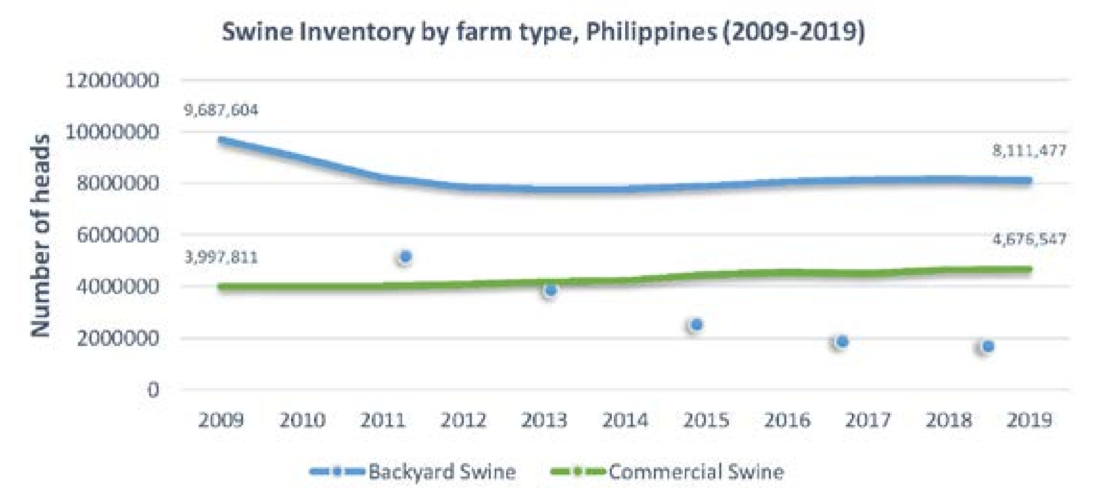



FIGURE 8.2. PORK VOLUME OF PRODUCTION (METRIC TONS), PHILIPPINES (PSA, 2009-2019)


## Community Based Native Pig Production (Dos por Cinco Scheme)

The scheme adopts the strategy of Native Swine Project (funded by DA-BAR and implemented by the team of Dr. Bulatao of UPLB) that has worked well in Bondoc Peninsula communities called the Dos por Cinco approach.

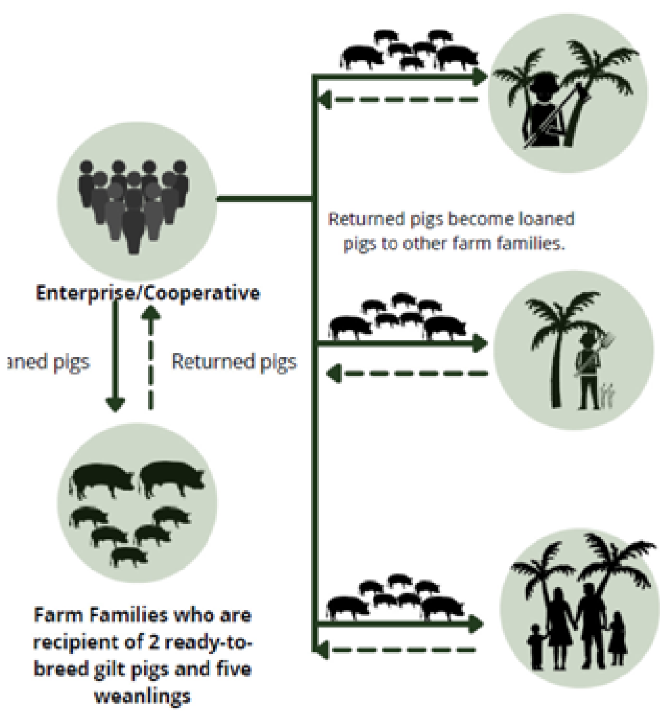
Each coconut farmer beneficiary will receive two ready-to-breed gilts (the Dos part) which will give the farmers a sustainable annual supply of piglets. The piglets will be given by the enterprise which could be sourced from reputable organizations.

Based on the project, a native sow gives birth to piglets two times in 14 months and produces an average of seven piglets in a litter. Thus, a total of 28 piglets will be produced in 28 months.

Additionally, the members will also be provided with five weanling or piglets (the Cinco part) to farmers for immediate fattening. This will provide cash to the farmers in three to four months while waiting for the gilts to give birth.

This initial animal loaned to the farmer will be debt-free and they need to pay it back with the same number of piglets. They will then be re-loaned to new members enabling the program to multiply its beneficiaries. For example, an initial 12 farmer members can be multiplied into 45 beneficiaries (including the 12 original members) showing a 300% growth in a span of 2 years.

## FIGURE 8.3. COMMUNITY BASED NATIVE PIG PRODUCTION (DOS POR CINCO SCHEME)




Note: New farmers will receive the same number of pigs after the prior batch returned the loaned pigs

Farmers can opt to directly sell their pigs to the market to enjoy a higher margin or look for a direct buyer. Another option is the enterprise will act as the middlemen and be in charge of consolidating all available pigs for sale before selling this to the trucker which will deliver them to processors. It is recommended to sell the piglets at the finishing stage to enjoy higher income. The average farmgate price for a native pig with 24.5 kg live weight is PHP 2,161. Thus, using the scheme a farmer can earn a potential of PHP 45,381.00 per two years from the piglets alone. This takes into the assumption that an available local food source is used and the farmer can return back the five piglets and two sows initially loaned.

# DAIRY CATTLE PRODUCTION UNDER COCONUT PLANTATION

The Philippines has more than three M hectares of land under coconut plantations. The available area in between the widely spaced coconuts is suitable for other farming activities such as growing crops and raising livestock to augment the limited income from coconut. Integrating livestock production like dairy cattle farming under coconut plantations maximizes the productivity and profitability of the given land.

A number of public-funded dairy projects were implemented in the past to utilize the area under permanent crops like coconuts, rubber, and mango, among many others to provide additional sources of income for farmers who fully depend on seasonal harvest to support their families.

In the late '70s, the Dairy Trading and Research Institute implemented a dairy project under an orchard setting mainly planted to coconut trees in Calauan, Laguna, in collaboration with the local government. The project served as a demonstration farm to test the suitability of integrating dairy cattle production under coconut plantations. The project which ended in 1992 after the 15-year-contract for the use of property, showed the suitability of raising dairy animals in the area (i.e. availability of pasture for rotational grazing). Proper scheduling of cutting or grazing of pasture was necessary for efficient recovery of harvested nuts. One drawback observed was the death of many coconut trees, which was attributed to beetle infestation in the area. The patches of cattle dung served as breeding grounds for rhinoceros beetle that burrow and eat young coconuts. Proper management of animal wastes such as the regular spreading of manure to the pasture was recommended to prevent this problem.

More recently, the National Dairy Authority launched the Coco-Dairy Project, which aims to convert underutilized coconut plantations in the country for dairy integration. The project was part of their White Revolution program that aims to increase the number of dairy animals through herd build-up and increase local milk production and reduce dependence on dairy imports.

The prevailing condition in coconut plantations is very conducive for dairy farming; integration of livestock production offers a viable option for coconut farmers to increase their income and support the government's call for increased production of milk from a mere 1% to 10% of domestic demand.

To determine if it is logical or not to proceed with community-based dairy project, the following factors should be considered:

- Food and feed security in an integrated-livestock production system
- Available labor – family and nearby communities
- Maximum land utilization for food and feed production
- Possible insect pests from dairy operation to coconuts
- Increase pasture competition between pasture and coconut trees

The approach of the National Dairy Authority's (NDA) Palit-Baka program can be adopted under coconut . A cluster of 10 to 20 farms located within the 20 km radius (dairy zones) of the nearest milk processing plant will be formed and organized into a dairy cooperative. The dairy coop transacts with the NDS, LGU, and other government agencies on matters that concern dairy farming operation e.g. technical assistance, animal loans (pregnant heifers and breeding bulls), marketing, etc.

The dairy cooperative may engage in a business of selling farm supplies like feed concentrates, fertilizers, drugs, sanitizers, etc. to the farmer-members on a credit basis. The accumulated costs of these supplies will be deducted from the proceeds of the sales of milk on a weekly or monthly basis. This scheme makes basic dairy farm supplies readily available to the farmers at a regulated cost. The farmer-members would be receiving some rebates from patronizing the coop at the end of the year.

Communal use of land in the community may also be pursued especially when some of the members have problems with roughage supply. Farm machinery like tractors and land preparation implements, forage chopper, clear may be purchased for communal use of all farmer-members.

The cooperative will be assisted by the NDA-DA on aspects like training on dairy-cattle production and management, animal health care, pasture production, feeds, and feeding management among many others. Procurement of farm equipment i.e. milking machine, forage chopper, milk drums, etc. can be coursed through the NDA to ensure getting the required specifications and avail tax exemptions.

This approach can increase the number of milking cows from 2 milking cows in Year 1 to 12 milking cows in Year 10 daily milk production of 120 kg. The major source of income comes from the sale of raw milk; raw milk is sold at the processing plant for PHP 33.00 per kg in Year 1. A 5% increase in the price of raw milk was used every year until Y10. A yearling bull with an average weight of 120 kg will be sold at PHP 120/kg. Old, unproductive cows with approx. bodyweight of 450 kg is sold also at the same price per kg as that of the yearling bulls.

Other sources of income will come from the harvest of mature nuts. A mature coconut tree in the Philippines produces an average of 45 nuts a year. A hectare of typical coconut plantations with 10m x 10m spacing has about 100 trees. Mature nuts are sold at PHP 7.50 each. A yearly increase of PHP 0.50 can be used in the computation of the selling price of the nuts.

The carrying capacity of improved pastures under coconut is reduced by about 30%; under grazing management of pasture utilization, 2 to 3 A.U. o 2 to 3 mature cattle can be raised in one hectare and 4 to 6 A.U. under the cut and carry system.

Improved forage species such as hybrid Napier, Mulato, and Mombasa grasses can be planted in between coconut trees to occupy about 70% of the total land area. The 3 hectares owned by the farmer is more than enough to support the feed requirement of few animals at the start of the operation. Intercropping of corn and other cash crops/ short-term crops may be done. Residues from crop production will also augment the geed requirement of the animals. The pasture will be established in phases; re-establishment to be done after 5 years.

The three-hectare pasture under coconut can support the increasing number of animals through the cut-and-carry system of utilization and with proper management, i.e. fertilization, weed control, and by following the recommended cutting interval.

Legume supplements e.g. Centrosema, Kudzu, Kakawate, ipil-ipil, and fodder trees like Malunggay, Indigofera, and Tricanthera are added to the daily roughage ration at about 30% of the requirement. Legume vines are mixed in the pasture; trees and shrubs are planted along the perimeter fence of the farm. Mineral- salt mixture is provided as lick. Water should be is available at all times.

Procurement of farm equipment i.e. milking machine, forage chopper, milk drums, etc. can be coursed through the NDA to ensure getting the required specifications and avail tax exemptions.

The financial analysis key performance indicator (i.e. ROI = 38.04%, IRR = 68%, and BCR = 6.19) showed that the integration of dairy cattle production in a coconut plantation is a profitable venture (Table 2). Starting with only two milking cows is very manageable for a family with three hectares of land under mature coconut trees. The spaces under the trees are very ideal for growing pasture crops to support roughage supply for an increasing number of dairy animals until Y7 when there might be a need to outsource additional roughage supply. With the application of intensive feed production in the 3 ha area, the operation may subsist fully from on-farm roughage production. On the other hand, the farmer may also opt to sell pregnant heifers to maintain the optimum number of milking cows and avoid paying for additional labor. However, retaining the replacement heifers until they are producing milk until Y10 and beyond would be more profitable compared to selling them to other farms.

Although dairy farming is a 70-hour a week job, the income generated from it outweighs the investment and hard work to be spent by a coconut farmer. Integrating dairy farming in permanent crops like coconut provides increased farm income and it also ensures daily cash flow especially in the event that the main crop suffers from crop failure due to some unforeseen events like the more recent coconut scale insect infestation and the destruction brought about by Rhinoceros beetle and cadang-cadang disease to coconut trees in the past.

## TABLE 8.2. HERD PROJECTION OF DAIRY CATTLE PRODUCTION AND TOTAL SALES IN 10 YEARS

| | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 | Year 6 | Year 7 | Year 8 | Year 9 | Year 10 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **HERD PROJECTION** | | | | | | | | | | | |
| Milking cows | 2 | 2 | 3 | 4 | 5 | 6 | 8 | 8 | 10 | 10 | |
| Retired cows/culls | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | |
| Pregnant heifers | 0 | 1 | 1 | 2 | 2 | 3 | 1 | 4 | 4 | 5 | |
| Female calves | 1 | 1 | 2 | 2 | 3 | 3 | 4 | 4 | 5 | 5 | |
| Male calves | 1 | 1 | 1 | 2 | 2 | 3 | 4 | 4 | 5 | 5 | |
| **TOTAL** | 4 | 5 | 7 | 10 | 12 | 15 | 17 | 20 | 26 | 27 | |
| | | | | | | | | | | | |
| Sold male calves | 1 | 1 | 1 | 2 | 2 | 3 | 4 | 4 | 5 | 5 | |
| Sold retired cows/culls | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | |
| **SALES** | | | | | | | | | | | |
| Milk produced, kg | 4,800 | 6,000 | 8,400 | 11,400 | 14,400 | 17,400 | 22,800 | 24,000 | 28,800 | 30,000 | 168,000 |
| Milk fed to calves, 4 kg/hd/day for 60 days | 480 | 480 | 720 | 960 | 1,200 | 1,440 | 1,920 | 1,920 | 2,400 | 2,400 | 13,920 |
| Milk sold, kg | 4,320 | 5,520 | 7,680 | 10,440 | 13,200 | 15,960 | 20,880 | 22,080 | 26,400 | 27,600 | |
| Raw milk price, PHP/kg | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 41 | 42 | 43 | |
| Sales from raw milk | 142,560 | 187,625 | 268,874 | 376,466 | 490,272 | 610,566 | 822,749 | 896,135 | 1,103,610 | 1,188,387 | |
| Live weight price, PHP/kg | 120 | 124 | 127 | 131 | 135 | 139 | 143 | 148 | 152 | 157 | |
| Sales from male calves | 24,000 | 24,720 | 25,461 | 52,451 | 54,024 | 83,468 | 114,269 | 118,068 | 152,012 | 156,573 | |
| Sales from culls | - | - | - | - | - | - | - | - | 136,811 | 140,915 | |
| Sales from coconuts, 45 mature nuts per tree, 100 trees per ha, PHP | 30,000 | 30,000 | 30,000 | 30,000 | 30,000 | 30,000 | 30,000 | 30,000 | 30,000 | 30,000 | |
| **TOTAL SALES (excluding sale from coconut)** | **166,560** | **212,345** | **294,336** | **428,917** | **544,296** | **694,034** | **937,179** | **1,014,203** | **1,392,434** | **1,485,876** | **7,170,379** |

## TABLE 8.3. EXPENDITURES/CAPITAL OUTLAY IN EQUIPMENT AND SUPPLY IN 10 YEARS

| | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 | Year 6 | Year 7 | Year 8 | Year 9 | Year 10 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Expenditures/ Capital Outlay** | | | | | | | | | | | |
| Makeshift pen/chute at Y1 | 10,000 | - | - | - | - | - | - | - | - | - | - |
| Shed for 10 head & above at Y4 | - | - | - | 100,000 | - | - | - | - | - | - | - |
| **Animals** | | | | | | | | | | | |
| 2 Pregnant dairy heifers | 200,000 | - | - | - | - | - | - | - | - | - | - |
| **Equipment** | | | | | | | | | | | |
| Portable milking machine at Y7 | - | - | - | - | - | - | 10,000 | - | - | - | |
| Forage chopper 3 - 5 HP at Y7 | - | - | - | - | - | - | 150,000 | - | - | - | |
| Milk container 40 L cap, 4 pcs | 10,000 | - | - | - | - | 10,000 | - | - | 20,000 | - | |
| Pasture Establishment | 30,000 | - | - | - | - | 30,000 | - | - | - | - | |
| **Sub-total** | 50,000 | - | - | - | 100,000 | - | 40,000 | 250,000 | - | 20,000 | 460,000 |
| **Supplies** | | | | | | | | | | | |
| Urea | 8,100 | 16,200 | 16,200 | 16,200 | 16,200 | 24,300 | 24,300 | 24,300 | 24,300 | 24,300 | |
| Complete | 10,800 | 10,800 | 10,800 | 10,800 | 10,800 | 16,200 | 16,200 | 16,200 | 16,200 | 16,200 | |

**Table 8.4.** Feeds and labor expenses in 10 years

| | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 | Year 6 | Year 7 | Year 8 | Year 9 | Year 10 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Feeds** | | | | | | | | | | | |

## TABLE 8.4. FEEDS AND LABOR EXPENSES IN 10 YEARS

| | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 | Year 6 | Year 7 | Year 8 | Year 9 | Year 10 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Lactating concentrates | 60,000 | 75,000 | 105,000 | 142,500 | 180,000 | 217,500 | 285,000 | 300,000 | 360,000 | 375,000 | |
| Grower concentrates | 24,400 | 24,400 | 36,600 | 48,800 | 61,000 | 73,200 | 97,600 | 97,600 | 122,000 | 122,000 | |
| Starter concentrates | 3,360 | 3,360 | 5,040 | 6,720 | 8,400 | 10,080 | 13,440 | 13,440 | 16,800 | 16,800 | |
| Corn silage | | | | | | | | | | | |
| Drugs and biologics | 4,000 | 5,000 | 7,000 | 10,000 | 12,000 | 15,000 | 17,000 | 20,000 | 26,000 | 27,000 | |
| Detergent & Sanitizers | 2,000 | 2,500 | 3,500 | 5,000 | 6,000 | 7,500 | 8,500 | 10,000 | 13,000 | 13,500 | |
| Farm tool e.g. scythe, fork, shovel | 2,000 | - | - | 2,000 | - | - | 2,000 | - | - | - | |
| **Sub-total** | 114,660 | 137,260 | 184,140 | 242,020 | 294,400 | 363,780 | 464,040 | 481,540 | 578,300 | 594,800 | 3,454,940 |
| **Labor** | | | | | | | | | | | |
| Milking assistant | - | - | - | - | - | - | 127,750 | 127,750 | 127,750 | 127,750 | 511,000 |
| Feed gatherer/ laborer | - | - | - | - | - | - | 255,500 | 255,500 | 255,500 | 255,500 | 1,022,000 |
| **Sub-total** | - | - | - | - | - | - | 383,250 | 383,250 | 383,250 | 383,250 | 1,533,000 |
| **TOTAL EXPENSES** | **164,660** | **137,260** | **184,140** | **242,020** | **394,400** | **363,780** | **887,290** | **1,114,790** | **961,550** | **998,050** | **5,447,940** |

# COMMUNITY-BASED POULTRY PRODUCTION

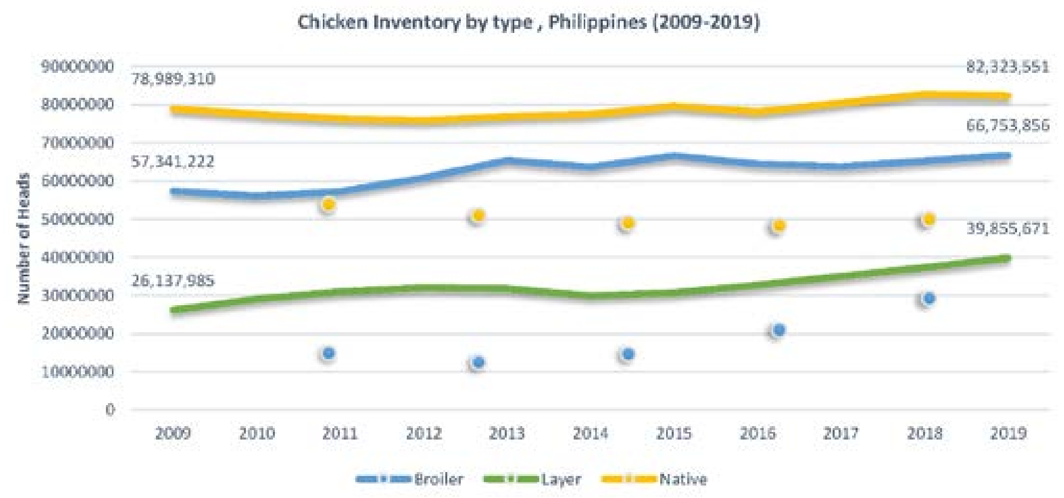
Integrating poultry with coconut can be beneficial to the management of coconut farms in terms of pest management, waste utilization, and improving soil fertility, and that the combined income of the two is greater. The meat and eggs of native chicken are priced higher compared to commercial poultry. Native chicken demand has significantly grown in recent years due to its distinct taste as compared to broilers. Native chicken is known for its adaptability to climate, hardiness, ability to utilize farm by-products, and resistance to diseases. They also require minimal care and farm inputs.

The majority in the animal livestock and poultry sector is made up of small backyard farmers. In 2019, the gross value of chicken production was PHP 173.94 B which was 1.9% higher than the previous year's PHP 170.72 B gross value (PSA, 2019). Chicken is second only to the swine subsector that has the highest gross value of production.

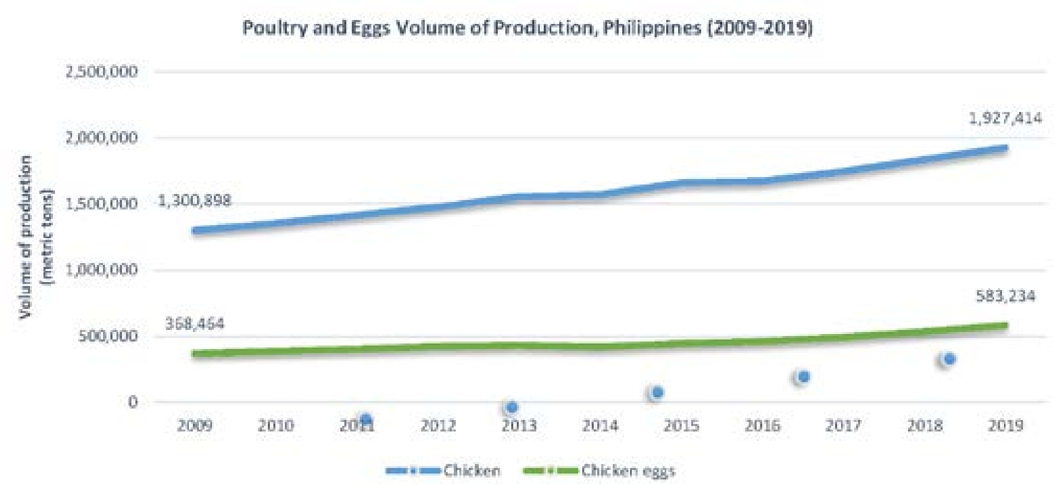
Chicken is one of the popular types of meat for consumption along with swine/hog in the Philippines as they are two of the most common and main ingredients for many Filipino household meals. One million eight hundred twenty million metric tons (1.82 MMT) of chicken meat was consumed in the Philippines in 2019, (statista.com, 2021). Based on PSA data (2019), native chicken accounts for 44% of the total chicken inventory in the Philippines with 82.3 M heads in 2019 followed by broiler chicken (35% of total) at 77.7 M heads (Figure 8.4) with 1.93 M metric tons volume of chickens produced. Almost 40 M heads are layer chickens with 583 thousand metric tons of chicken egg production (Figure 8.5).

Chicken production over the past 10 years grew in the Philippines by 48% while eggs production grew by 58% (PSA data, 2009-2019).

## FIGURE 8.4. CHICKEN INVENTORY BY BROILER, LAYER, AND NATIVE TYPE, PHILIPPINES (2009-2019)




## FIGURE 8.5. POULTRY AND EGGS VOLUME OF PRODUCTION (METRIC TONS), PHILIPPINES (2009-2019)



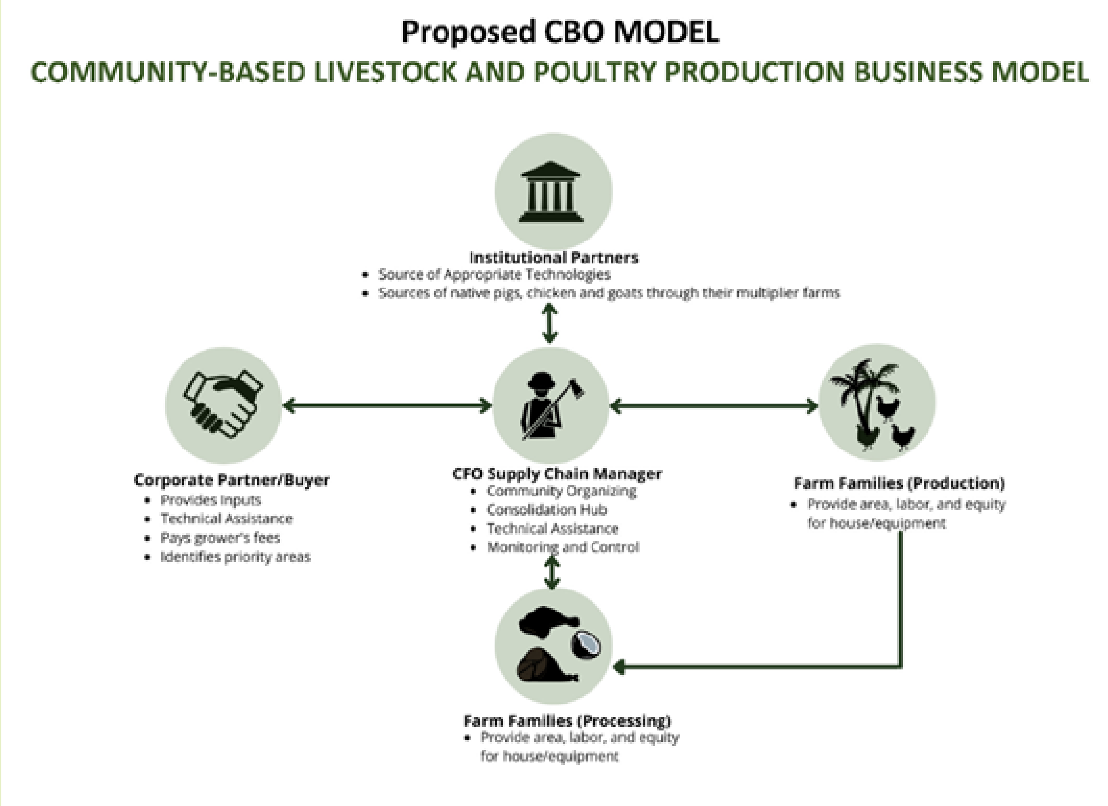

To attain the economies-of-scale and improved farm gate price deals, a community-based livestock and poultry production business model is proposed. They are given chicks to raise at the same age or productive layers to produce eggs. At harvest, all mature native chicken or eggs will be sold at the same time.

The community-based model bring into perspective the benefits of public-private partnership: resource sharing, risk reduction, and reward allocation.

# Proposed CBO MODEL

## COMMUNITY-BASED LIVESTOCK AND POULTRY PRODUCTION BUSINESS MODEL

FIGURE 8.6. PROPOSED CBO MODEL (E.G. NATIVE CHICKEN)




The CBO will be a value chain manager, which will conduct business with the buyers and producers. The CBO will consolidate the produce then pass it to the buyers. If the purchase order is for processed goods (e.g. Marinated Chicken), the same protocol will be followed, but the "production families" will pass it to the "processing families instead". Upon completion of the process, the CBO will consolidate if for delivery to the buyer. The private sector/ corporate partner will the market for the produce. The corporate partner will serve as the buyer.

Institutions such as State Universities, government agencies, and other concerned organizations can be tapped to provide the necessary inputs, farming technologies, and management to help the farmer in poultry production. Their local presence in the area can immediately provide needed technical assistance such as managing pests or diseases on the farm. Furthermore, this is to ensure that the production comply with the regulatory system imposed by the government for quality.

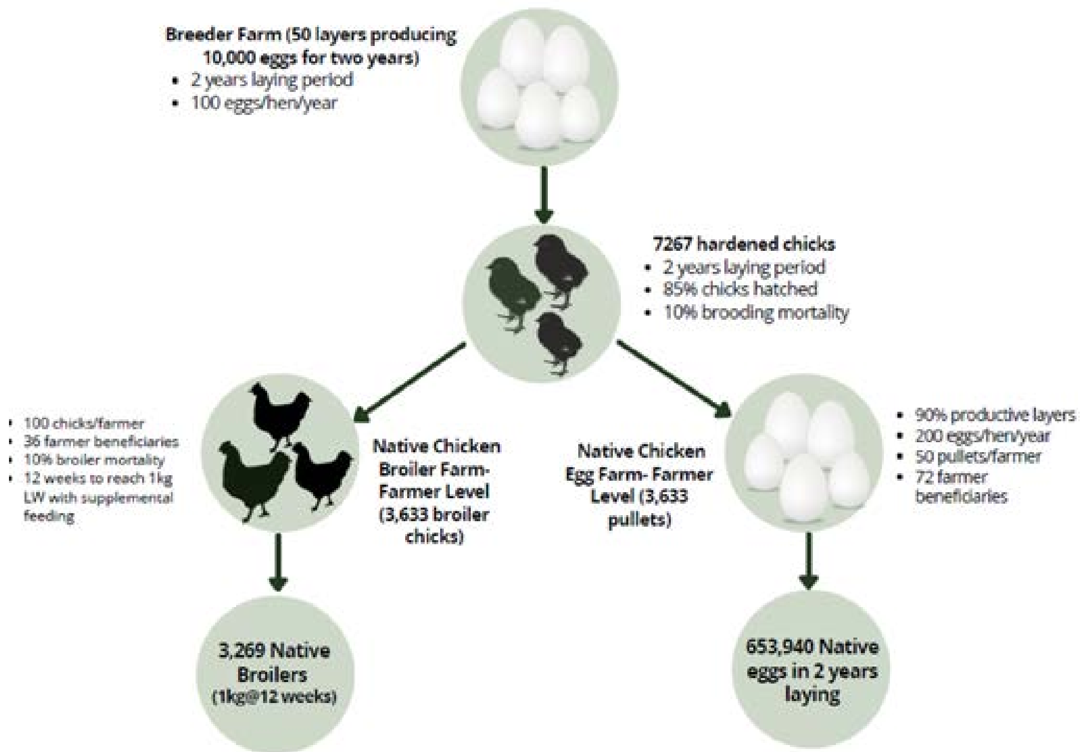
Smallholder coconut farms can increase their income through this model with minor inputs. A number of farmers will be contracted as a cluster to raise the chickens. Each family will be given a certain number of chicks to raise depending on the size of their farm and labor availability. Native chicken requires minimal space and attention, thus will not be a major time-consuming activity for the farmer. Every family will be given chicks of the same age and will harvest together to attain mass production of the same maturity which will be consolidated by the supply chain manager and turn over to the corporate partner.

If the corporate buyer requires a certain processing activity before buying the matured chicken, a group of the family will be contracted to do the job. They will be trained and supervise by the supply chain manager in order to develop a standardized processing procedure and produce the desired product with the same quality.

## Management of Native Chicken under the CBO Model

Marketing of native chicken in urban areas is not a problem since the demand for the product is increasing in recent years and is expected to grow in the coming years as consumers shift towards organic products. Premium prices are paid for native chicken because of their distinct taste and flavor. The CBO will consolidate all the chicken after 12 weeks and sell them to the corporate buyer in bulk or batch. It is a good strategy for the enterprise to raise chicken in batches to ensure available chicken from time to time.

**FIGURE 8.7. SAMPLE SCHEME FOR THE NATIVE AND EGG PRODUCTION MODEL**

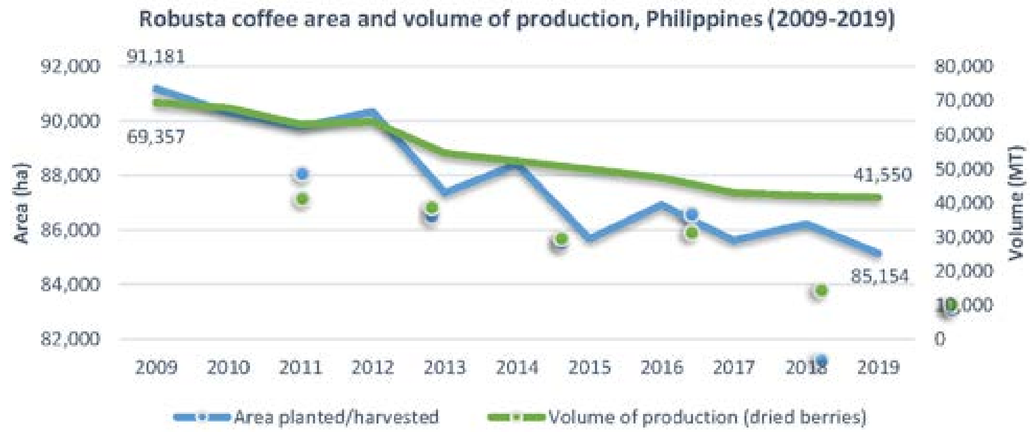



## EXAMPLES OF SUCCESSFUL BUSINESS MODELS THAT CAN BE ADAPTED FOR COCONUT INTERCROPPING

### COFFEE

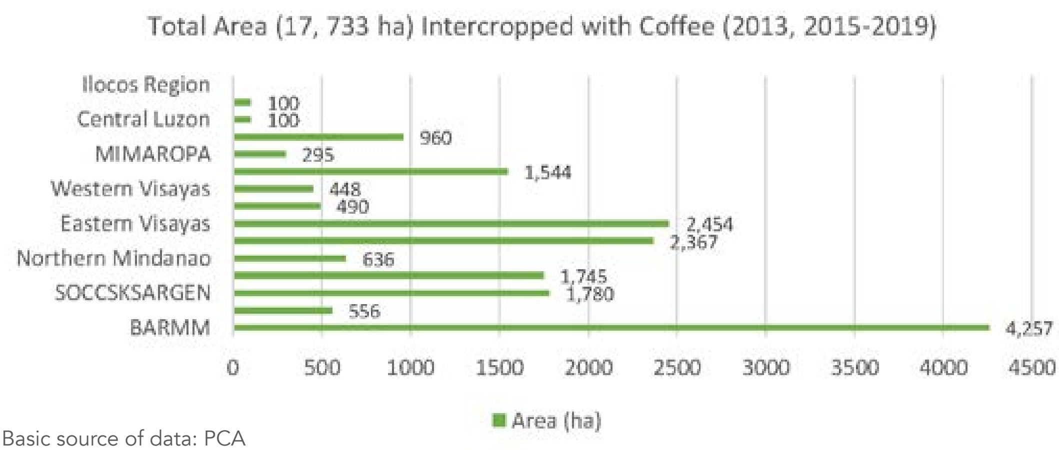
Coffee has a long history of cultivation in the country and it is a suitable intercrop for coconut. There are about 34,000 smallholder coffee farmers in the country at present. The local annual output of green coffee beans is estimated at 23,000 MT, with annual requirements estimated at 64,000 MT (NESTLE 2017). The shortfall in requirements is filled by imports. The average Filipino coffee farmer is 57 years old, owning 1.0 to 1.5 hectares. The average daily income from a one-hectare coffee farm is P168.00 (average of gains from year 4 to year 10 of production divided by 365 calendar days) (NESTLE 2017). Based on PSA 2015 estimates, Robusta accounted for 69% of total production, followed by Arabica with 24%. Robusta coffee production and area has been on the decline, despite the projects supporting its expansion.

## FIGURE 8.1. ROBUSTA COFFEE AREA AND VOLUME OF PRODUCTION, PHILIPPINES (2009-2019)



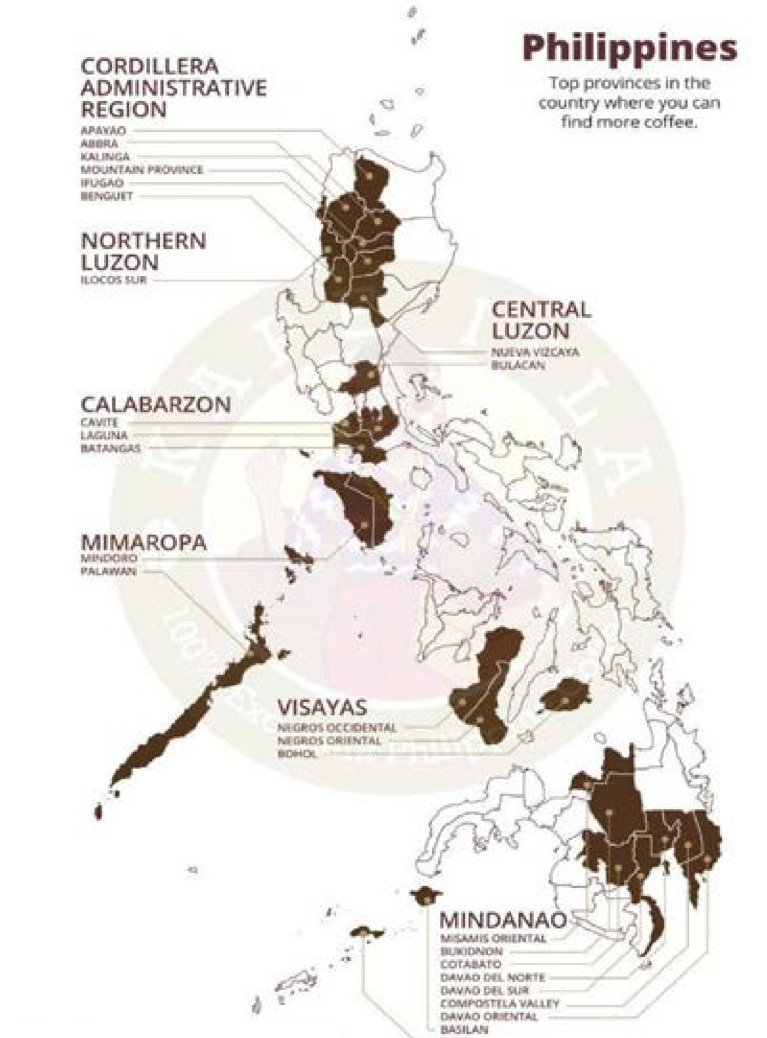

Basic source of data: PSA

## FIGURE 8.2. TOTAL AREA OF COCONUT (17,733 HA) INTERCROPPED WITH COFFEE UNDER KEDP PROGRAM OF PCA (2013, 2015-2019)




Basic source of data: PCA

FIGURE 8.3. TOP COFFEE PRODUCING PROVINCES (COFFEE BOARD)




https://philcoffeeboard.com/wp-content/uploads/2021/01/PHFlyer-MAP-1.pdf

The Coffee roadmap for 2017-2022 targets a total area of 140,552 ha in 2017 and increase to 213,788 ha by 2022. Majority of the target areas for coffee production will be in Mindanao particularly SOCCSKSARGEN and Davao. The KAANIB project has planted almost 3,500 ha of coffee in these regions. KAANIBs in Zamboanga del Norte and North Cotabato are reportedly already producing scion trees.

Additionally, KAANIB projects also planted significant hectarage in the areas where coffee is already dominantly grown as presented in the Philippine coffee board map of coffee areas (Figure 8.3). Coffee plantings in the more successful CFOs and KAANIBs could be further expanded and upscaled to form agri-corridors where support from various government agencies and private sector can converge support towards a standardized sustainable production practices (either GAP or organic) postharvest processing and marketing of berries, the quality of which conforms to standards required by the market to which they will be linked (by DTI).

## COFFEE: A private- farmer/CBO partnership model (NESTLE Coffee + project)

A private-farmer/CBO partnership model that has gained support from coffee farmers in Mindanao, is the NESTLE Coffee + project which reportedly supports farmers' transition from being subsistence farmers to agripreneur. The NESCAFÉ Plan aims to help coffee farmers improve their livelihood by Creating Shared Value (CSV) through the promotion of better farming practices to increase yields and farmers' income. The project provides training to farmers for free helping to sustain coffee bean standards-setting up satellite buying stations near production areas; and propagating and selling at cost, high-quality plantlets to the private sector and the government for distribution to farmers nationwide.

In 2018, a farmer productivity and income acceleration initiative involving 1,500 farmers in Bukidnon and Sultan Kudarat was undertaken by NESTLE with GIZ, the German Agency for International Cooperation. A representative sample of the participating farmers shows that net farm income, on average, has increased from PHP 30,000 in 2018 to PHP 90,000 in 2019, with yield increase from 235 kg/ha to 477 kg/ha, as independently verified by the Rainforest Alliance. Project Coffee+ farmers are adopting profitable and best- integrated farming systems. Farmer groups and organizations of smallholder coffee farmers have noted improvements in accessing services including financing and post-harvest support for processing coffee cherries (https://www.nestle.com.ph/csv/local-initiatives/nescafe-plan/leo-zambrano). NESCAFÉ Plan collaborates with government agencies and other stakeholders i.e., Rural Agro-enterprise Partnership for Inclusive Development and Growth (RAPID Growth) Project, for the coffee sector, DTI, funding partner International Fund for Agricultural Development, and Nestlé have committed to support coffee farmers in expanding production areas and improving productivity. Nestlé will provide a ready market for Robusta beans from local farmers. Nestlé operates 10 satellite coffee buying stations in Silang in Cavite, Lipa City in Batangas, Tuguegarao City in Cagayan Valley, Tagbina in Surigao del Sur, Cagayan de Oro City in Misamis Oriental, Tagum City in Davao del Norte, General Santos City in South Cotabato, Maramag in Bukidnon, Buenavista in Agusan del Norte and Iloilo City in Iloilo. Coffee buying stations enable coffee farmers to sell their coffee harvest based on the prevailing market price (https://www.philstar.com/ business/2015/03/02/1429015/nestle-opens-3-new-coffee-buying-stations). Agri-corridors for coffee or “coffee towns” in areas already planted could be enhanced (i.e., employment of standardized and sustainable production practices, following a quality standard, collective processing, and marketing) and expanded by active collaboration with such projects as NESTLEs’, which already proved successful in increasing farmers’ productivity and income. This does not prevent KAANIB clusters to further process their produce and market their own products for cupping. A detailed feasibility study for these options is needed.

## TABLE 8.1. COSTS AND RETURNS ANALYSIS OF ROBUSTA COFFEE PRODUCTION IN ONE (1) HECTARE AREA

| Item | Unit | Unit Cost | Y1 | | Y2 | | Y3 | | Y4 | | Y5 | | Y6 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Qty | Cost/Value | Qty | Cost/Value | Qty | Cost/Value | Qty | Cost/Value | Qty | Cost/Value | Qty | Cost/Value |
| **CASH INCOME** | | | | | | | | | | | | | | |
| Sales of Green Coffee Beans[a] | kilo | 76.23 | | 0.00 | 350.00 | 26,680.50 | 834.00 | 63,575.82 | 1,250.00 | 95,287.50 | 1,667.00 | 127,075.41 | 1,667.00 | 127,075.41 |
| **Total Cash Income** | | | | | | **26,680.50** | | **63,575.82** | | **95,287.50** | | **127,075.41** | | **127,075.41** |
| **CASH COSTS** | | | | | | | | | | | | | | |
| **Labor[b]** | | | | | | | | | | | | | | |
| Clearing/brushing/ contouring | sqm | 0.30 | 10,000.00 | 3,000.00 | | | | | | | | | | |
| Field Layout/ staking | md | 331.10 | 6.00 | 1,986.60 | | | | | | | | | | |
| Holing | holes | 4.40 | 1,667.00 | 7,334.80 | | | | | | | | | | |
| Basal Fertilization and transplanting | md | 331.10 | 7.25 | 2,400.48 | | | | | | | | | | |
| Replanting | md | 331.10 | 2.50 | 827.75 | | | | | | | | | | |
| Ringweeding/ under brushing | tree | 1.50 | 6,668.00 | 10,002.00 | 6,668.00 | 10,002.00 | 3,334.00 | 5,001.00 | 3,334.00 | 5,001.00 | 3,334.00 | 5,001.00 | 3,334.00 | 5,001.00 |
| Sidress Fertilization | tree | 1.25 | 3,334.00 | 4,167.50 | 3,334.00 | 4,167.50 | 3,334.00 | 4,167.50 | 3,334.00 | 4,167.50 | 3,334.00 | 4,167.50 | 3,334.00 | 4,167.50 |
| Foliar Fertilizer Spraying | md | 331.10 | 8.00 | 2,648.80 | 8.00 | 2,648.80 | 8.00 | 2,648.80 | 8.00 | 2,648.80 | 8.00 | 2,648.80 | 8.00 | 2,648.80 |
| Bio-Pest Control | md | 331.10 | 8.00 | 2,648.80 | 8.00 | 2,648.80 | 8.00 | 2,648.80 | 8.00 | 2,648.80 | 8.00 | 2,648.80 | 8.00 | 2,648.80 |
| Bending/Training of Coffee Multiples | hill | 0.50 | 1,667.00 | 833.50 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 |
| Pruning | md | 331.10 | 0.00 | 0.00 | 3.00 | 993.30 | 5.00 | 1,655.50 | 6.00 | 1,986.60 | 6.00 | 1,986.60 | 6.00 | 1,986.60 |
| Harvesting | md | 331.10 | 0.00 | 0.00 | 7.00 | 2,317.70 | 15.00 | 4,966.50 | 20.00 | 6,622.00 | 25.00 | 8,277.50 | 25.00 | 8,277.50 |
| Floating/Drying | md | 333.10 | 0.00 | 0.00 | 2.00 | 666.20 | 5.00 | 1,665.50 | 10.00 | 3,331.00 | 15.00 | 4,996.50 | 19.50 | 6,495.45 |
| Drying, dehulling, cleaning and bagging | md | 333.10 | 0.00 | 0.00 | 1.00 | 333.10 | 3.00 | 999.30 | 8.00 | 2,664.80 | 10.00 | 3,331.00 | 10.00 | 3,331.00 |
| Stakes | pc | 0.25 | 1,667.00 | 416.75 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 |
| Planting materials | pc | 25.00 | 1,667.00 | 41,675.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 |
| organic fertilizer | kg | 7.00 | 5,838.00 | 40,866.00 | 1,667.00 | 11,669.00 | 3,334.00 | 23,338.00 | 3,334.00 | 23,338.00 | 3,334.00 | 23,338.00 | 3,334.00 | 23,338.00 |
| Foliar Fertilizer | liter | 250.00 | 4.00 | 1,000.00 | 4.00 | 1,000.00 | 8.00 | 2,000.00 | 8.00 | 2,000.00 | 8.00 | 2,000.00 | 8.00 | 2,000.00 |
| Biocontrol repellants | liter | 150.00 | 3.00 | 450.00 | 3.00 | 450.00 | 6.00 | 900.00 | 6.00 | 900.00 | 6.00 | 900.00 | 6.00 | 900.00 |
| Pruning shear | pc | 250.00 | 1.00 | 250.00 | 1.00 | 250.00 | 3.00 | 750.00 | | 0.00 | | 0.00 | | 0.00 |
| Knapsack sprayer | unit | 3,500.00 | 0.00 | 0.00 | 1.00 | 3,500.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 |
| Plastic container for harvesting | pc | 50.00 | 0.00 | 0.00 | 3.00 | 150.00 | 3.00 | 150.00 | 3.00 | 150.00 | 3.00 | 150.00 | 6.00 | 300.00 |
| Drying trays | pc | 300.00 | 0.00 | 0.00 | 2.00 | 600.00 | 3.00 | 900.00 | 3.00 | 900.00 | 2.00 | 600.00 | 4.00 | 1,200.00 |
| Jute Bags | pc | 50.00 | 0.00 | 0.00 | 5.00 | 250.00 | 6.00 | 300.00 | 3.00 | 150.00 | 3.00 | 150.00 | 4.00 | 200.00 |
| **Total Cost** | | | | **120,507.98** | | **41,646.40** | | **52,090.90** | | **56,508.50** | | **60,195.70** | | **62,494.65** |
| **Total Net Income** | | | | **(120,507.98)** | | **(14,965.90)** | | **11,484.92** | | **38,779.00** | | **66,879.71** | | **64,580.76** |
| **Profit-Cost Ratio** | | | | **(1.00)** | | **(0.36)** | | **0.22** | | **0.69** | | **1.11** | | **1.03** |

[a and b] based on Philippine Statistics Office 2019

## TABLE 8.2.COSTS AND RETURNS ANALYSIS OF ARABICA COFFEE PRODUCTION IN ONE (1) HECTARE AREA

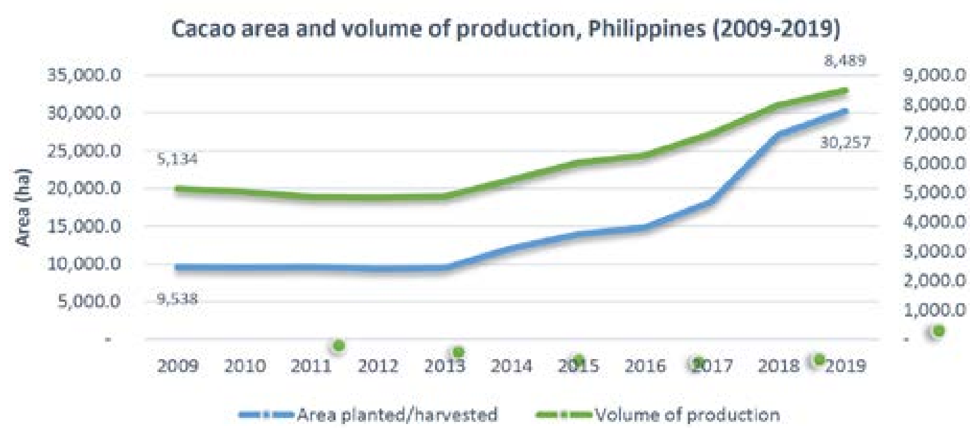
| Item | Unit | Unit Cost | Y1 | | Y2 | | Y3 | | Y4 | | Y5 | | Y6 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Qty | Cost/Value | Qty | Cost/Value | Qty | Cost/Value | Qty | Cost/Value | Qty | Cost/Value | Qty | Cost/Value |
| **CASH INCOME** | | | | | | | | | | | | | | |
| Sales of Green Coffee Beans[a] | kilo | 115.73 | | 0.00 | 400.00 | 46,292.00 | 1,000.00 | 115,730.00 | 1,500.00 | 173,595.00 | 2,000.00 | 231,460.00 | 2,000.00 | 231,460.00 |
| **Total Cash Income** | | | | | | **46,292.00** | | **115,730.00** | | **173,595.00** | | **231,460.00** | | **231,460.00** |
| **CASH COSTS** | | | | | | | | | | | | | | |
| **Labor[b]** | | | | | | | | | | | | | | |
| Clearing/brushing/ contouring | sqm | 0.30 | 10,000.00 | 3,000.00 | | | | | | | | | | |
| Field Layout/ staking | md | 331.10 | 6.00 | 1,986.60 | | | | | | | | | | |
| Holing | holes | 4.40 | 2,000.00 | 8,800.00 | | | | | | | | | | |
| Basal Fertilization and transplanting | md | 331.10 | 10.00 | 3,311.00 | | | | | | | | | | |
| Replanting | md | 331.10 | 2.50 | 827.75 | | | | | | | | | | |
| Ringweeding/under brushing | tree | 1.50 | 8,000.00 | 12,000.00 | 8,000.00 | 12,000.00 | 8,000.00 | 12,000.00 | 4,000.00 | 6,000.00 | 4,000.00 | 6,000.00 | 4,000.00 | 6,000.00 |
| Sidress Fertilization | tree | 1.25 | 4,000.00 | 5,000.00 | 4,000.00 | 5,000.00 | 4,000.00 | 5,000.00 | 4,000.00 | 5,000.00 | 4,000.00 | 5,000.00 | 4,000.00 | 5,000.00 |
| Foliar Fertilizer Spraying | md | 331.10 | 8.00 | 2,648.80 | 8.00 | 2,648.80 | 8.00 | 2,648.80 | 8.00 | 2,648.80 | 8.00 | 2,648.80 | 8.00 | 2,648.80 |
| Bio-Pest Control | md | 331.10 | 8.00 | 2,648.80 | 8.00 | 2,648.80 | 8.00 | 2,648.80 | 8.00 | 2,648.80 | 8.00 | 2,648.80 | 8.00 | 2,648.80 |
| Bending/Training of Coffee Multiples | hill | 0.50 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 |
| Pruning | md | 331.10 | | 0.00 | 3.00 | 993.30 | 5.00 | 1,655.50 | 6.00 | 1,986.60 | 6.00 | 1,986.60 | 6.00 | 1,986.60 |
| Harvesting | md | 331.10 | | 0.00 | 7.00 | 2,317.70 | 15.00 | 4,966.50 | 20.00 | 6,622.00 | 25.00 | 8,277.50 | 25.00 | 8,277.50 |
| Floating/Drying | md | 333.10 | | 0.00 | 2.00 | 666.20 | 5.00 | 1,665.50 | 10.00 | 3,331.00 | 15.00 | 4,996.50 | 15.00 | 4,996.50 |
| Drying, dehulling, cleaning and bagging | md | 333.10 | | 0.00 | 2.00 | 666.20 | 4.00 | 1,332.40 | 6.00 | 1,998.60 | 10.00 | 3,331.00 | 10.00 | 3,331.00 |
| Stakes | pc | 0.25 | 2,000.00 | 500.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 |
| Planting materials | pc | 25.00 | 2,000.00 | 50,000.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 |
| organic fertilizer | kg | 7.00 | 5,838.00 | 40,866.00 | 1,667.00 | 11,669.00 | 3,334.00 | 23,338.00 | 3,334.00 | 23,338.00 | 3,334.00 | 23,338.00 | 3,334.00 | 23,338.00 |
| Foliar Fertilizer | liter | 250.00 | 4.00 | 1,000.00 | 4.00 | 1,000.00 | 8.00 | 2,000.00 | 8.00 | 2,000.00 | 8.00 | 2,000.00 | 8.00 | 2,000.00 |
| Biocontrol repellants | liter | 150.00 | 3.00 | 450.00 | 3.00 | 450.00 | 6.00 | 900.00 | 6.00 | 900.00 | 6.00 | 900.00 | 6.00 | 900.00 |
| Pruning shear | pc | 250.00 | 0.00 | 0.00 | 1.00 | 250.00 | 3.00 | 750.00 | | 0.00 | | 0.00 | | 0.00 |
| Knapsack sprayer | unit | 3,500.00 | 1.00 | 3,500.00 | 1.00 | 3,500.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 |
| Plastic container for harvesting | pc | 50.00 | 0.00 | 0.00 | 3.00 | 150.00 | 3.00 | 150.00 | 3.00 | 150.00 | 3.00 | 150.00 | 6.00 | 300.00 |
| Drying trays | pc | 300.00 | 0.00 | 0.00 | 2.00 | 600.00 | 3.00 | 900.00 | 3.00 | 900.00 | 2.00 | 600.00 | 4.00 | 1,200.00 |
| Jute Bags | pc | 50.00 | 0.00 | 0.00 | 5.00 | 250.00 | 6.00 | 300.00 | 3.00 | 150.00 | 3.00 | 150.00 | 4.00 | 200.00 |
| **Total Cost** | | | | **136,538.95** | | **44,810.00** | | **60,255.50** | | **57,673.80** | | **62,027.20** | | **62,827.20** |
| **Total Net Income** | | | | **(136,538.95)** | | **1,482.00** | | **55,474.50** | | **115,921.20** | | **169,432.80** | | **168,632.80** |
| **Profit-Cost Ratio** | | | | **(1.00)** | | **0.03** | | **0.92** | | **2.01** | | **2.73** | | **2.68** |

[a and b] based on Philippine Statistics Office 2019

## CACAO

The Philippines is a net importer of cacao and the global supply shortfall is expected to be at one million MT (MMT) by 2020. The grinding requirement of local chocolate manufacturers is at 40,000 MT while production at present only stands at 10,000–12,000 MT from the 20,000–25,000 hectares (ha) of land (industry estimate). The said estimate is higher compared with the 2015 Philippine Statistical Authority which was at 13,910 ha only producing 6,020 MT. Figure 8.4 presents the area planted and volume of production of cacao in the Philippines. The industry is dominated by Davao, occupying 64% of the area planted and producing 80% of the country's cacao volume of production (PSA, 2021).

**FIGURE 8.4. CACAO AREA AND VOLUME OF PRODUCTION, PHILIPPINES (2009-2019)**




Basic source of data: PSA

Cacao is a suitable intercrop with coconut, as it requires shade during its vegetative growth. The two (2) million (M) hectares of coconut farms ideal for cacao intercropping to narrow the increasing supply- demand gap. The Philippine Cacao Industry Roadmap, anchored on the Value Chain Approach and aligned with the 2022 Cacao Challenge targets to produce 100,000 MT of dried fermented beans by 2022. PCA KEDP in total contributed 10.6M, (@17,733 ha , 600seedlings/ha; 2013; 2015-2019) (Figure 8.6). By 2016, DAHVCC also has planted 21.7M (2015-2017) and DENR-NGP (13.3M, from 2011-2014). The KAANIB sites planted to cacao, in Mindanao are also within the operating areas of the KENNEMER bean sourcing program, and they hopefully would have benefitted and adopted the new technologies and compliance to global quality standards.

If proper trainings will be provided to beneficiaries and appropriate production protocols will be observed, this will provide a big push for the industry. The genetic expression of the existing varieties is at 3.5 kg per tree per year. Earnings from 1 ha cacao production can lift the coconut farmers beyond the poverty threshold (Figure 8.5, 2017 prices).

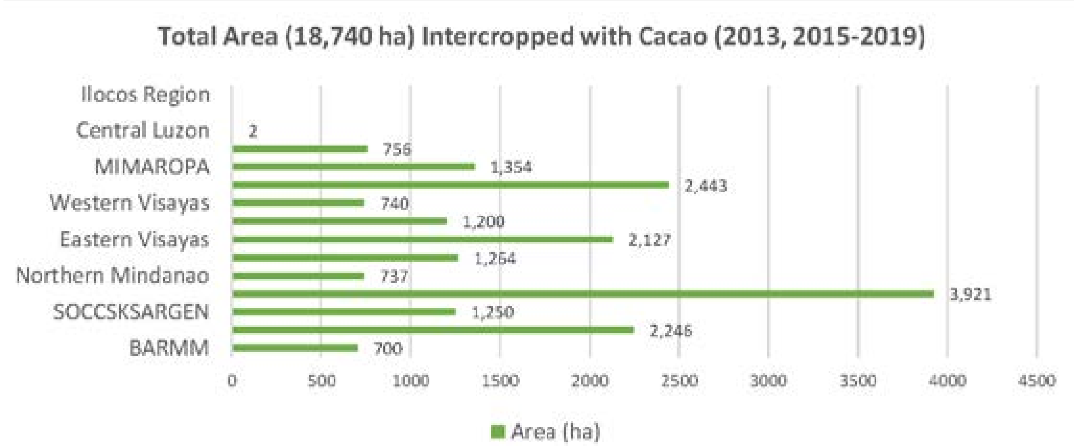
## FIGURE 8.5. COST OF PRODUCTION AND RETURN ON INVESTMENT IN CACAO PRODUCTION AS MONOCROP AND AS INTERCROP

| Particular | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 |
|---|---|---|---|---|---|
| Total Production cost/1100 cacao trees (as monocrop/ha) | 67,320 | 24,530 | 45,650 | 52,690 | 60,610 |
| **Net Income** | **(67,320)** | **8,470** | **91,850** | **167,310** | **214,390** |

| Particular | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 |
|---|---|---|---|---|---|
| Total Production cost/600 cacao trees (as intercrop/ha) | 47,454 | 17,809 | 35,167 | 41,107 | 49,687 |
| **Net Income** | **(47,454)** | **6,171** | **54,813** | **93,893** | **130,313** |

Source: Cacao roadmap, 2017-2022

## FIGURE 8.6. TOTAL AREA OF COCONUT (18,740 HA; 9.37M SEEDLINGS) INTERCROPPED WITH CACAO UNDER KEDP PROGRAM OF PCA (2013, 2015-2019)




Basic source of data: PCA

## FIGURE 8. 7. REGIONAL COMMITMENTS TO THE 2022 CACAO CHALLENGE

| Region | Percent | Production Volume |
|---|---|---|
| BARMM | 1 | 1,000 |
| Negros Island Region | 1 | 1,000 |
| **TOTAL** | **100%** | **100,000 MT** |

| Region | Percent | Production Volume |
|---|---|---|
| Cordillera Administrative Region | 1 | 1,000 |
| National Capital Region, NCR | | |
| Region I – Ilocos Region | 1 | 1,000 |
| Region II – Cagayan Valley | 2 | 2,000 |
| Region III – Central Luzon | 2 | 2,000 |
| Region IV-A – CALABARZON | 2 | 2,000 |
| Region IV-B - MIMAROPA | 3 | 3,000 |
| Region V – Bicol Region | 3 | 3,000 |
| Region VI – Western Visayas | 1 | 1,000 |
| Region VII – Central Visayas | 2 | 2,000 |
| Region VIII – Eastern Visayas | 5 | 5,000 |
| Region IX – Zamboanga Peninsula | 5 | 5,000 |
| Region X – Northern Mindanao | 4 | 4,000 |
| Region XI – Davao Region | 60 | 60,000 |
| Region XII – SOCCSKSARGEN | 4 | 4,000 |
| Region XIII – Caraga | 3 | 3,000 |

### CACAO: A successful model for private company-led inclusive cacao sourcing project.

Kennemer Foods International Inc., an agribusiness company, through its inclusive programs, established a cocoa sourcing network of 12,000 farmers. Kennemer customers — global confectionaries and chocolate companies — are important partners to these projects, both in cocoa-growing techniques and post- harvest technologies as well as in the off-take of almost all of Kennemer's cocoa bean production. In 2018, in partnership with Agri-finance company (Agronomika Finance Corporation), the Dutch development bank (FMO) and IDH, Kennemer's program included an affordable package, targeting

30,000 smallholder coconut farmers, increasing their income to levels equivalent to the Philippine average income per capita, which these farmers are currently estimated to be 80% below. The program claimed that cacao can increase farmers' income by 400%. Farmers that are eligible to receive a loan will also participate in Kennemer's Cocoa Growership Program which enables farmers to gain access to the leading hybrid cocoa varieties as seedlings, extensive agronomic training programs, rigorous farm monitoring procedures, and tools, and centralized cocoa bean drying and fermenting facilities. This combined support capacitates farmers to produce good quality cocoa beans at high-level productivity and in a sustainable way. To qualify for the loan, farmers must be part of a farmer cluster and pass assessments (by a loan officer and validated by a field technician) on both the viability of the farm to grow cocoa and the farmer's ability and desire to grow cocoa. This combined technical support and access to finance will empower farmers, transforming them into entrepreneurs with a positive operational, financial and profitable track record. This will eventually increase the comfort of local and international financial institutions to independently finance smallholder farmers and/or invest in these types of high-impact programs. An important player in the model is the cacao doctor, a private entrepreneur, put in charge of providing the technical and inputs needed by the 15 farmers in his/her cluster. The proigram targets expansion areas to have 40M cacao trees of the KENNEMER program in 5 strategic zones , in Luzon, Visayas, and Mindanao. (as cited by Sugeno et.al., 2016 Source: http://www.iadb.org),

From the gains of the KEDP, the HVCCP and PCA can collaborate with the program for the KAANIBs access to their technical support and complement the common facilities either as part of the growership program or as an open market to provide the KAANIBs option to venture into a higher level of cacao processing, rather than just cooperative / clustered processing and marketing.

## TABLE 8.3. COSTS AND RETURNS OF CACAO IN ONE HECTARE

| Item | Unit | Unit Price | Y1 | | Y2 | | Y3 | | Y4 | | Y5 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Quantity | Cost/Value | Quantity | Cost/Value | Quantity | Cost/Value | Quantity | Cost/Value | Quantity | Cost/Value |
| **CASH INCOME** | | | | | | | | | | | | |
| Sales of Cacao Dry beans | kg | 92.94 | 0.00 | 0.00 | 327.00 | 30,391.38 | 954.00 | 88,664.76 | 1,363.00 | 126,677.22 | 1,909.00 | 177,422.46 |
| **Total Cash Income** | | | | **0.00** | | **30,391.38** | | **88,664.76** | | **126,677.22** | | **177,422.46** |
| **CASH COSTS** | | | | | | | | | | | | |
| **Labor** | | | | | | | | | | | | |
| Clearing | md | 331.10 | 16.00 | 5,297.60 | | | | | | | | |
| Staking | md | 331.10 | 4.00 | 1,324.40 | | | | | | | | |
| Holing | md | 331.10 | 8.00 | 2,648.80 | | | | | | | | |
| Planting | md | 331.10 | 35.00 | 11,588.50 | | | | | | | | |
| Weeding and mulching | md | 331.10 | 8.00 | 2,648.80 | 9.45 | 3,128.00 | 9.45 | 3,128.00 | 9.45 | 3,128.00 | 9.45 | 3,128.00 |
| Fertilizer application | md | 331.10 | 4.00 | 1,324.40 | 4.72 | 1,564.00 | 4.72 | 1,564.00 | 4.72 | 1,564.00 | 4.72 | 1,564.00 |
| Fertilizer application (Spraying) | md | 331.10 | 7.00 | 2,317.70 | 8.27 | 2,737.00 | 8.27 | 2,737.00 | 8.27 | 2,737.00 | 8.27 | 2,737.00 |
| Pruning | md | 331.10 | 8.00 | 2,648.80 | | | 9.45 | 3,128.00 | 9.45 | 3,128.00 | 9.72 | 3,218.00 |
| Pruning harvesting, breaking of pods, fermenting, and drying (45, 70, 100 MD for 3rd, 4th, & 5th) | md | 331.10 | | | | | 53.14 | 17,595.00 | 82.66 | 27,370.00 | 118.09 | 39,100.00 |
| **Material inputs** | | | | | | | | | | | | |
| Seedlings per ha (including 10% for replanting) | pc | 18.00 | 600.00 | 10,800.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 |
| Urea (basal @ 20g/hill) | kg | 19.33 | 12.00 | 231.96 | | 0.00 | 24.00 | 463.94 | 24.00 | 463.94 | 24.00 | 463.94 |
| Duofos (basal @ 50g/hill) | kg | 17.97 | 30 | 539.10 | | 0.00 | | 0.00 | | 0.00 | | 0.00 |
| Fertilizer (Complete) | bag | 979.5 | 2.88 | 2,820.96 | 6.72 | 6,582.24 | 6 | 5,877.00 | 6 | 5,877.00 | 6 | 5,877.00 |
| Fertilizer (Organic) | bag | 400 | 4 | 1,600.00 | 10.5 | 4,200.00 | 14 | 5,600.00 | 17.5 | 7,000.00 | 21 | 8,400.00 |
| Insecticides/fungicides | lt | 1525 | 1 | 1,525.00 | 1 | 1,525.00 | 1 | 1,525.00 | 1 | 1,525.00 | 1 | 1,525.00 |
| Knapsack sprayer | unit | 2500 | 1 | 2,500.00 | 1 | 2,500.00 | 1 | 2,500.00 | 1 | 2,500.00 | 1 | 2,500.00 |
| Bolo | pc | 500 | 1 | 500.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 |
| Spade | pc | 500 | 2 | 1,000.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 |
| Scythe | pc | 450 | 2 | 900.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 |
| Flat bar | pc | 450 | 1 | 450.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 |
| Kaing (Bukag) | pc | 50 | 20 | 1,000.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 |
| Sacks | pc | 15 | | 0.00 | | 0.00 | 20 | 300.00 | 60 | 900.00 | 70 | 1,050.00 |
| Contingency (10% of total production cost) | | | | 5,366.60 | | 2,223.62 | | 4,441.79 | | 5,619.29 | | 6,956.29 |
| **TOTAL COSTS** | | | | **59,032.62** | | **24,459.86** | | **48,859.73** | | **61,812.23** | | **76,519.23** |
| **TOTAL CASH INCOME** | | | | **(59,032.62)** | | **5,931.52** | | **39,805.03** | | **64,864.99** | | **100,903.23** |
| **TOTAL NET INCOME** | | | | **(59,032.62)** | | **5,931.52** | | **39,805.03** | | **64,864.99** | | **100,903.23** |
| **PROFIT-COST RATIO** | | | | **-1** | | **0.24** | | **0.81** | | **1.04** | | **1.31** |

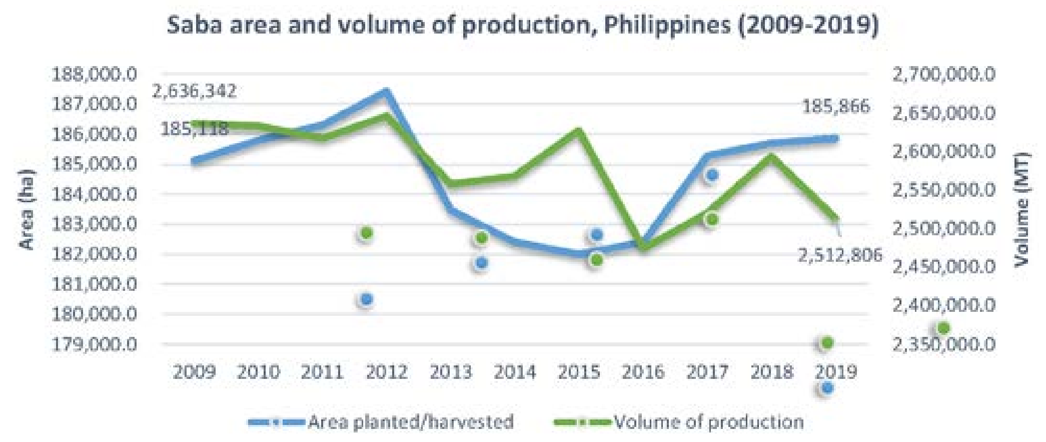
## BANANA (SABA/CARBADA)

Banana is the most popular intercrop under coconuts in the Philippines either as sole intercrop or a component in a multistorey cropping system. Land Equivalent Ratio (LER) of coconut + banana intercropping suggests that production of a one-hectare intercropped farm is equivalent to the production of a 2.13 ha of monocropped coconut (Aguilar, et al., 2016).

Banana is healthy, nutritious, and affordable. It is one of the few locally grown fruits available year- round. Banana is the most popular fruit consumed by Filipinos contributing 75% of the total fruit intake. Cavendish is the export cultivar, and its production is concentrated in Mindanao. Cardaba, is the cooking type of banana and its production has gained importance as an export-oriented agro-industry in the country. Cardaba banana has special qualities required for banana chips for export, with its texture and taste. The market for banana chips is expanding. Demand for banana chips in US is actually much bigger than its demand for fresh Cavendish Bananas (Antig S, PBGEA, 2021) Supplies lag behind the growing demand. Vietnam's imports have increased significantly, as it is a trans-shipment point for Philippine banana chip exports to China. because it enjoys preferential tariff rates with China due to long-standing bilateral agreements between the two countries. (www.mindanews.com).

In 2014, there were 41 banana chip processors in the country, 6 in Metro Manila, 4 in the Visayas (Metro Cebu), 2 in Cagayan de Oro, 1 in South Cotabato, 1 in Zamboanga City, and the rest (27) are in Davao Region (Briones RM, 2014) generally, operating below capacity due to supply limitations. Increase production around the processing plants to bridge the supply-demand gap of 30-70% of the plant's capacities. Saba/Cardaba production is well distributed in the country, with the largest area in Davao occupying 13% of the area but contributing 20% to national production. Other and BARRM in Mindanao, all regions in Visayas and Calabarzon, Cagayan Valley. Saba/Cardaba bananas agri-business corridors engaging clustered farmers and CFOs could focus on these already established markets, given equitable arrangements benefitting the farmers.

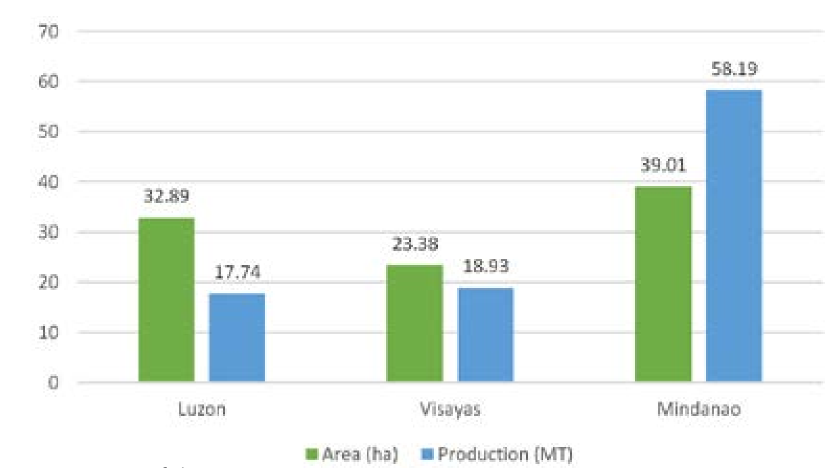
## FIGURE 8.10. CARBADA/SABA BANANA PRODUCTION IN THE PHILIPPINES (2009-2019)




Basic source of data: PSA

Saba/Cardaba banana production has been fluctuating due reduction of area planted/ harvested caused by a series of typhoons and severe drought o 2015-2016. Reliability of supply needs to be improved by expanding production to buffer the impacts of reduced volume by supply from other areas. Banana rehabilitation technology can make banana plantations productive again within one year if done immediately. Figure 8.11 presents the relative contribution of Luzon, Visayas, and Mindanao in terms of area and production.

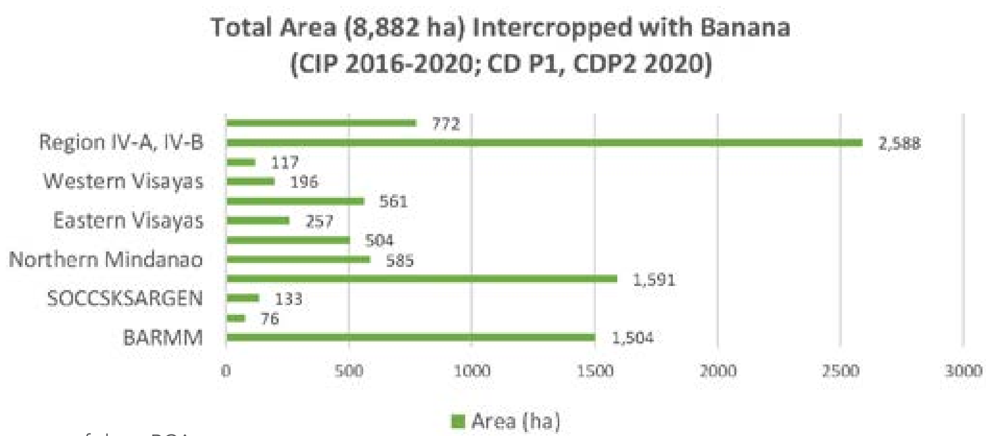
## FIGURE 8.11. PERCENTAGE CONTRIBUTION OF LUZON, VISAYAS AND MINDANAO TO SABA/CARDABA BANANA AREA (HA) AND VOLUME OF PRODUCTION (MT).




Basic source of data: PSA

PCA intercropping program has contributed 8,882 ha of banana to from 2016-2020. The banana varieties planted cannot be determined form the data made available to COCOFIRM.

FIGURE 8.12. TOTAL COCONUT AREA (8,882 HA ) INTERCROPPED WITH BANANA UNDER THE PCA INTERCROPPING PROGRAMS CIP 2016-2020 AND CDP1, CDP2 2020.




Basic source of data: PCA

Saba/Cardaba (ABB) Banana flow of materials is multi-layered and inefficient resulting in significant postharvest losses. Major challenges for future market growth appear to be associated with a coordinated approach to managing the field-to-market supply chain, for both fresh and processed products (FAO, 2011).

The following section describes business models/approaches for clustering the produce of small banana growers into successful enterprises.

1. **"Good enough model "** -incremental changes in production practices Banana Agrichain Competitiveness Enhancement (B-ACE) Program adopted SDCAsia's "good enough" approach to Good Agricultural Practices (GAP) in the banana chip value chain in the Philippines—a choice to promote feasible upgrades and incremental improvements in agricultural practices that resulted in the largest possible increases in yields and profits (i.e., picking and choosing parts of GAP, rather than attempting to achieve full GAP certification for all value chain participants) (Idrovo and Boquiren, 2009). The following benefits to farmers were reported by the program: 1) Incremental improvements in

agricultural practices—e.g., seed quality or variety, planting techniques, irrigation—address issues of productivity, efficiency, and quality. 2) improve producers' profit margins and help banana chip processors promote a steady supply of quality inputs. However, neither chip processors nor other buyers required certification; 3) Increase the incomes of small-scale Cardaba banana producers and processors – targeted 30% over 3 years but achieved nearly 80% increase over the control group.

For the export market, certification—for example, organic certification or HACCP is important to at least some buyers and could have resulted in gains to producers.

**2. Linking Agrarian Reform Beneficiaries to Corporate Supply Chain**

DAR CRS Misamis Oriental Agroenterprise (Banana Cardava Marketing) 2014 - Linking Agrarian Reform Beneficiaries to Corporate Supply Chain. The following eight steps in the agro-enterprise clustering approach were implemented by the Catholic Relief Services (CRS) to increase the production and income of ARBs and their household through Agricultural Extension, Marketing Assistance, and Capacity-building, the project brought together the CRS, DAR, LGUs ARBs: 1) Site selection partnership building and TWG formation; 2) Product supply assessment and product selection; 3) Market chain study; 4) Cluster formation;

5) Cluster plan formulation; 6) test marketing; 7) Scaling up and 8) cluster strengthening.

**3. Linking farmers to banana chips processing**

Another proposed model is a direct link between farmers and processors such as in banana chips processing in Pagsanjan Laguna. This model expects that farmers are to benefit greater by receiving higher prices and having an institutional buyer for their product. The direct linkage between the enterprise and the farmers mean a more transparent flow of information, easier access of farmers to resources, and an effective relationship. Farmers need not to worry about where to sell their products as the time is reduced in this model. The enterprise is also assured of fresh harvest which can be processed into banana chips immediately. The enterprise can turn the raw banana into chips in 24-hrs times which increases the quality of the chips and reduced harvest losses due to quality deterioration.

While the farmer will be in charged with managing their farms, the wife can work in chips factory, increasing the family income. Jobs can range from quality checking the banana fruits, cooking them into chips, and packaging them. This is one of the essences of the social enterprise model. This further improves the relationship of the enterprise with the farmer family.

The robust potential of the banana chip industry and its emerging market is a great opportunity for establishing the model. Aside from the profit is the livelihood it will give to families of farmers and improving the social and economic status of the farmers. A premium price can be given to the harvested bananas of the farmer that meets the fruit quality specifications.

## TABLE 8.4. COSTS AND RETURNS ANALYSIS OF LAKATAN IN ONE (1) HECTARE AREA

| Item | Unit | Unit Price | 2019 | | 2020 | | 2021 | |
|---|---|---|---|---|---|---|---|---|
| | | | Quantity | Cost/Value | Quantity | Cost/Value | Quantity | Cost/Value |
| CASH INCOME | | | | | | | | |
| Sales of Lakatan Banana | kg | 24.50 | 25,600.00 | 627,200.00 | 70,400.00 | 1,724,800.00 | 86,400.00 | 2,116,800.00 |
| **Total Cash Income** | | | | **627,200.00** | | **1,724,800.00** | | **2,116,800.00** |
| CASH COSTS | | | | | | | | |
| Labor[b] | | | | | | | | |
| Land clearing | md | 331.10 | 12.00 | 3,973.20 | | | | |
| Plowing and harrowing | mad | 496.65 | 16.00 | 7,946.40 | | | | |
| Field Layout/ staking and holing | md | 331.10 | 6.00 | 1,986.60 | | | | |
| Basal fertilization | md | 331.10 | 4.00 | 1,324.40 | | | | |
| Construction of drainage | md | 331.10 | 6.00 | 1,986.60 | | | | |
| Maintenance of drainage canal | md | 331.10 | 2.00 | 662.20 | 2.00 | 662.20 | 2.00 | 662.20 |
| Planting | md | 331.10 | 12.00 | 3,973.20 | | | | |
| Replanting | md | 331.10 | 2.00 | 662.20 | | | | |
| Weed control - Ringweeding | md | 331.10 | 24.00 | 7,946.40 | 24.00 | 7,946.40 | 24.00 | 7,946.40 |
| Weed control - Underbrushing | md | 331.10 | 8.00 | 2,648.80 | 8.00 | 2,648.80 | 8.00 | 2,648.80 |
| fertilizer application | md | 331.10 | 12.00 | 3,973.20 | 16.00 | 5,297.60 | 16.00 | 5,297.60 |
| Watering/Irrigation | md | 331.10 | 12.00 | 3,973.20 | 12.00 | 3,973.20 | 12.00 | 3,973.20 |
| Chemical spraying | md | 331.10 | 12.00 | 3,973.20 | 12.00 | 3,973.20 | 12.00 | 3,973.20 |
| Sucker control/Desuckering | md | 331.10 | 4.00 | 1,324.40 | 4.00 | 1,324.40 | 4.00 | 1,324.40 |
| De-leafing | md | 331.10 | 24.00 | 7,946.40 | 24.00 | 7,946.40 | 24.00 | 7,946.40 |
| Stem/Mat sanitation | md | 331.10 | 20.00 | 6,622.00 | 20.00 | 6,622.00 | 20.00 | 6,622.00 |
| Bud removal/debudding | md | 331.10 | 4.00 | 1,324.40 | 4.00 | 1,324.40 | 4.00 | 1,324.40 |
| Bunch spraying | md | 331.10 | 6.00 | 1,986.60 | 6.00 | 1,986.60 | 6.00 | 1,986.60 |
| Fruit bagging | md | 331.10 | 20.00 | 6,622.00 | 20.00 | 6,622.00 | 20.00 | 6,622.00 |
| Propping | md | 331.10 | 20.00 | 6,622.00 | 20.00 | 6,622.00 | 20.00 | 6,622.00 |
| Harvesting and postharvest handling | md | 331.10 | 30.00 | 9,933.00 | 70.00 | 23,177.00 | 70.00 | 23,177.00 |
| **Material Inputs** | | | | | | | | |
| Planting materials (tissue cultured) | pc | 15.00 | 2,200.00 | 33,000.00 | | 0.00 | | 0.00 |

## TABLE 8.4. COSTS AND RETURNS ANALYSIS OF LAKATAN IN ONE (1) HECTARE AREA, CONTINUED

| Item | Unit | Unit Price | 2019 | | 2020 | | 2021 | |
|---|---|---|---|---|---|---|---|---|
| | | | Quantity | Cost/Value | Quantity | Cost/Value | Quantity | Cost/Value |
| Fertilizer - Chicken dung (basal, 1kg/hill) | bag | 60.00 | 67.00 | 4,020.00 | | 0.00 | | 0.00 |
| Fertilizer - 14-14-14 (basal, 100 g/hill) | kg | 1,200.00 | 4.00 | 4,800.00 | | 0.00 | | 0.00 |
| Fertilizer - 46-0-0 | bag | 1,000.00 | 13.20 | 13,200.00 | 56.00 | 56,000.00 | 56.00 | 56,000.00 |
| Fertilizer - 21-0-0 | bag | 900.00 | 4.00 | 3,600.00 | | 0.00 | | 0.00 |
| Fertilizer - 0-0-60 | bag | 1,600.00 | 30.00 | 48,000.00 | 56.00 | 89,600.00 | 56.00 | 89,600.00 |
| Pesticide - Fungicide | kg | 1,200.00 | 3.00 | 3,600.00 | 3.00 | 3,600.00 | 3.00 | 3,600.00 |
| Pesticide - Insecticide | lt | 1,500.00 | 3.00 | 4,500.00 | 3.00 | 4,500.00 | 3.00 | 4,500.00 |
| Bagging materials | pc | 5.00 | 2,000.00 | 10,000.00 | 4,000.00 | 20,000.00 | 6,000.00 | 30,000.00 |
| Water | | | | | | 0.00 | | 0.00 |
| Propping materials - Bamboo poles | pc | 8.00 | 4,000.00 | 32,000.00 | | 0.00 | | 0.00 |
| Propping materials - Tying materials | kg | 250.00 | 10.00 | 2,500.00 | | 0.00 | | 0.00 |
| Packing materials (cartoon boxes) | pc | 25.00 | 854.00 | 21,350.00 | 2,347.00 | 58,675.00 | 2,880.00 | 72,000.00 |
| Tools and equipment | | | | | | 0.00 | | 0.00 |
| Knapsack sprayer | pc | 3,500.00 | 1.00 | 3,500.00 | | 0.00 | | 0.00 |
| Deleafing knife | pc | 150.00 | 6.00 | 900.00 | | 0.00 | | 0.00 |
| Tumbling bolo | pc | 300.00 | 4.00 | 1,200.00 | | 0.00 | | 0.00 |
| Slashing bolo | pc | 300.00 | 4.00 | 1,200.00 | | 0.00 | | 0.00 |
| Harvesting knife | pc | 60.00 | 4.00 | 240.00 | | 0.00 | | 0.00 |
| Grasshook | pc | 350.00 | 2.00 | 700.00 | | 0.00 | | 0.00 |
| Shovel | pc | 350.00 | 2.00 | 700.00 | | 0.00 | | 0.00 |
| Spade | pc | 350.00 | 2.00 | 700.00 | | 0.00 | | 0.00 |
| **Total Costs** | | | | **277,120.40** | | **312,501.20** | | **335,826.20** |
| **Total Net Income** | | | | **350,079.60** | | **1,412,298.80** | | **1,780,973.80** |
| **Profit-Cost Ratio** | | | | **1.26** | | **4.52** | | **5.30** |

[a] Farmgate price sourced from PSA 2019

[b] PSA Farm wage rate 2019

## TABLE 8.5. COSTS AND RETURNS ANALYSIS OF SABA IN ONE (1) HECTARE AREA

| Item | Unit | Unit Price | Y1 | | Y2 | | Y3 | | Y4 | | Y5 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Quantity | Cost/Value | Quantity | Cost/Value | Quantity | Cost/Value | Quantity | Cost/Value | Quantity | Cost/Value |
| **CASH INCOME** | | | | | | | | | | | | |
| Sales of Cardaba Banana[a] | kg | 10.99 | | 0.00 | 42,451.08 | 466,537.37 | 50,925.00 | 559,665.75 | 50,925.00 | 559,665.75 | 50,925.00 | 559,665.75 |
| **Total Cash Income** | | | | **0.00** | | **466,537.37** | | **559,665.75** | | **559,665.75** | | **559,665.75** |
| **CASH COSTS** | | | | | | | | | | | | |
| **Labor[b]** | | | | | | | | | | | | |
| Land clearing | md | 331.10 | 12.00 | 3,973.20 | | | | | | | | |
| Plowing and harrowing | mad | 496.65 | 16.00 | 7,946.40 | | | | | | | | |
| Field Layout/ staking and holing | md | 331.10 | 6.00 | 1,986.60 | | | | | | | | |
| Basal fertilization | md | 331.10 | 2.00 | 662.20 | | | | | | | | |
| Construction of drainage | md | 331.10 | 6.00 | 1,986.60 | | | | | | | | |
| Maintenance of drainage canal | md | 331.10 | 2.00 | 662.20 | 2.00 | 662.20 | 2.00 | 662.20 | 2.00 | 662.20 | 2.00 | 662.20 |
| Planting | md | 331.10 | 3.00 | 993.30 | | | | | | | | |
| Replanting | mhr | 41.38 | 3.00 | 124.13 | | | | | | | | |
| Weed control - Ringweeding | md | 331.10 | 18.00 | 5,959.80 | 18.00 | 5,959.80 | 18.00 | 5,959.80 | 18.00 | 5,959.80 | 18.00 | 5,959.80 |
| Weed control - Underbrushing | md | 331.10 | 12.00 | 3,973.20 | 12.00 | 3,973.20 | 12.00 | 3,973.20 | 12.00 | 3,973.20 | 12.00 | 3,973.20 |
| fertilizer application | md | 331.10 | 6.00 | 1,986.60 | 8.00 | 2,648.80 | 8.00 | 2,648.80 | 8.00 | 2,648.80 | 8.00 | 2,648.80 |
| Waterin/Irrigation | md | 331.10 | 12.00 | 3,973.20 | 12.00 | 3,973.20 | 12.00 | 3,973.20 | 12.00 | 3,973.20 | 12.00 | 3,973.20 |
| Chemical spraying | md | 331.10 | 12.00 | 3,973.20 | 12.00 | 3,973.20 | 12.00 | 3,973.20 | 12.00 | 3,973.20 | 12.00 | 3,973.20 |
| Sucker control/Desuckering | md | 331.10 | 8.00 | 2,648.80 | 8.00 | 2,648.80 | 8.00 | 2,648.80 | 8.00 | 2,648.80 | 8.00 | 2,648.80 |
| De-leafing | md | 331.10 | 12.00 | 3,973.20 | 12.00 | 3,973.20 | 12.00 | 3,973.20 | 12.00 | 3,973.20 | 12.00 | 3,973.20 |
| Stem/Mat sanitation | md | 331.10 | 10.00 | 3,311.00 | 10.00 | 3,311.00 | 10.00 | 3,311.00 | 10.00 | 3,311.00 | 10.00 | 3,311.00 |
| Bud removal/debudding | md | 331.10 | | | 8.00 | 2,648.80 | 8.00 | 2,648.80 | 8.00 | 2,648.80 | 8.00 | 2,648.80 |
| Harvesting and postharvest handling | md | 331.10 | | | 32.00 | 10,595.20 | 32.00 | 10,595.20 | 32.00 | 10,595.20 | 32.00 | 10,595.20 |
| **Material Inputs** | | | | | | | | | | | | |
| Planting materials (tissue cultured) | pc | 15.00 | 688.00 | 10,320.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 |
| Fertilizer - Chicken dung | bag | 60.00 | 21.00 | 1,260.00 | 42.00 | 2,520.00 | 63.00 | 3,780.00 | 83.00 | 4,980.00 | 104.00 | 6,240.00 |
| Fertilizer - 14-14-14 | kg | 1,200.00 | 4.38 | 5,256.00 | 15.00 | 18,000.00 | 18.75 | 22,500.00 | 7.50 | 9,000.00 | 7.50 | 9,000.00 |
| Fertilizer - 45-0-0 | bag | 1,000.00 | 7.50 | 7,500.00 | | 0.00 | 18.75 | 18,750.00 | 26.00 | 26,000.00 | 26.00 | 26,000.00 |
| Fertilizer - 0-0-60 | bag | 1,600.00 | | 0.00 | 18.75 | 30,000.00 | 18.75 | 30,000.00 | 26.00 | 41,600.00 | 26.00 | 41,600.00 |
| Pesticide - Fungicide | kg | 900.00 | 1.00 | 900.00 | 1.00 | 900.00 | 2.00 | 1,800.00 | 2.00 | 1,800.00 | 2.00 | 1,800.00 |
| Pesticide - Insecticide | lt | 1,200.00 | 1.00 | 1,200.00 | 1.00 | 1,200.00 | 2.00 | 2,400.00 | 2.00 | 2,400.00 | 2.00 | 2,400.00 |
| Water | | | | | | | | | | | | |
| Tools and equipment | | | | | | | | | | | | |
| Knapsack sprayer | pc | 3,500.00 | 1.00 | 3,500.00 | | | | | | | | |
| Deleafing knife | pc | 150.00 | 6.00 | 900.00 | | | | | | | | |
| Tumbling bolo | pc | 300.00 | 4.00 | 1,200.00 | | | | | | | | |
| Slashing bolo | pc | 300.00 | 4.00 | 1,200.00 | | | | | | | | |
| Harvesting knife | pc | 60.00 | 4.00 | 240.00 | | | | | | | | |
| Grasshook | pc | 350.00 | 2.00 | 700.00 | | | | | | | | |
| Shovel | pc | 350.00 | 2.00 | 700.00 | | | | | | | | |
| Spade | pc | 350.00 | 2.00 | 700.00 | | | | | | | | |
| **Irrigation facilities** | | | | 60,000.00 | | | | | | | | |
| **Total Costs** | | | | 143,709.63 | | 96,987.40 | | 123,597.40 | | 130,147.40 | | 131,407.40 |
| **Total Net Income** | | | | **(143,709.63)** | | **369,549.97** | | **436,068.35** | | **429,518.35** | | **428,258.35** |
| **Profit-Cost Ratio** | | | | **(1.00)** | | **3.81** | | **3.53** | | **3.30** | | **3.26** |

a Farmgate price sourced from PSA 2019

b PSA Farm wage rate 2019

# FARM SERVICE CREW (FOR 115 HECTARES)

## Goals:

To professionalize coconut farm workers into a farm service crew, that will be provided with decent income, and elevate their status as skilled workers qualified for SSS and other social benefits

## Services

- Harvesting, dehusking, and transport of nuts to roadside
- Regular farm maintenance services such as weeding and clearing of undergrowth, fertilization/mulching, removal of dried/diseased fronds, land preparation for intercrops
- Service 2 ½ hectares/day, harvesting about 2100 nuts per day
- Special skills - Harvesting at right maturity e.g., for copra and whole nuts for VCO or DCN

**Investments PHP 2.155 M** (Orchard Tractor, truck, tools, carts, etc: PHP 1.815 M; shed for tractor/truck PHP 0.30 M)

Financial Ratios: FIRR = 41%; NPV = 3,230; ROI = 34%

**Daily Revenues**

Crew to harvest at most 2 bunches per tree/ harvest, harvest 6x per year

Harvesting, dehusking, haul to roadside 2000 nuts @ P3.50/nut = PHP 7,000.00

**Daily Expenses**

(2 harvesters, 2 collectors, 2 dehuskers, 5 farm maintenance, 1 driver/foreman)

| | | |
|---|---|---|
| Wages PHP300 x 12 workers | = | PHP 3,600.00 |
| Fuel | = | PHP 800.00 PHP 4,400.00 |
| **Net per Day of service crew** | = | 7,000 - 4,400 = PHP 2,600.00 |

**Landowner**

| | | |
|---|---|---|
| Will pay services in kind | | |
| Number of nuts | = | PHP 7,000.00 / PHP 7/nut = 1,000 nuts |
| Balance nuts | = | 2100 – 1000 = 1,100 nuts |
| Land owners' income | | |
| 1,100 nuts x PHP 7/nut | | PHP 7,700.00 |


Figure adapted from www.kubota.co.in

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(042) 795-5472
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(033) 396-4080
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(032) 232-2843
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(053) 323-9460
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(062) 925-1918
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(088) 857-3706
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Region XI
(082) 293-0114/293-0384
PCA Complex, Bago Oshiro,
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(083) 554-6263/302-1476
Vensu Bldg., National Highway,
General Santos City 9500

**Joel B. Oclarit**
Region XIII
(085) 342-2687/225-0382
2nd Floor Yu Bldg., South Montilla
Blvd., Butuan City

**Marina B. Wahab**
BARMM
(064) 421-6680
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Extension Center and Business Hub,
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