PHILIPPINE

BANANA INDUSTRY

ROADMAP 2021-2025

DEPARTMENT OF AGRICULTURE

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PHILIPPINE BANANA INDUSTRY ROADMAP 2021-2025

Department of Agriculture

HIGH VALUE CROPS DEVELOPMENT PROGRAM

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ACRONYMS AND ABBREVIATIONS

ACPC	Agricultural Credit Policy Council
AEBE	Association of Banana Exporters of Ecuador
AFF	Agriculture, Forestry and Fisheries
ANFLOCOR	Anflo Banana Corporation
ASEAN	Association of Southeast Asian Nation
ATI	Agricultural Training Institute
BAR	Bureau of Agricultural Research
BBrMv	Banana bract mosaic virus
BBTV	Banana bunchy top virus
BFAD	Bureau of Food and Drug
BIDC	Banana Industry Development Council
BPI	Bureau of Plant Industry
BSWM	Bureau of Soils and Water Management
CHED	Commission on Higher Education
CORBANA	Costa Rica – Corporacion Bananero Nacional
DA	Department of Agriculture
DAR	Department of Agrarian Reform
DENR	Department of Environment and Natural Resources
DILG	Department of Interior and Local Government
DNCRDC	Davao National Crops Research Development Center

DOLE	Department of Labor and Employment
DOST	Department of Science and Technology
DPWH	Department of Public Works and Highways
DTI	Department of Trade and Industry
FAO	Food and Agriculture Organization
FDA	Food and Drug Administration
FOB	Freight on Board Basis
FPA	Fertilizer and Pesticide Authority
GAP	Good Agricultural Practices
GCTCV	Giant Cavendish Tissue Culture Variant
GMP	Good Manufacturing Practices
GVA	Gross Value Added
HA	Hectare
IFTR-GDAAS	China – Institute for Fruit Tree Research – Guangdong Academy of Agricultural Sciences
IQF	Individually Quick Freeze
ITC	International Trade Centre
MBFEA	Mindanao Banana Farmers and Exporters Association
MEGA	Mindanao Direct Exporters and Growers Association
MNCs	Multi-national Companies
MRL	Maximum Residue Limits
MT	Metric ton
NEDA	National Economic Development Authority
NEH	Nader and Ebrahim Hassan Philippines
NFSS	National Food Security Summit
NPGRL	National Plant Genetic Resources Laboratory

NRCB	India – National Research Center for Banana
OBEX	Organization of Banana Chips Exporters Association
PBGEA	Philippine Banana Growers and Exporters Association
PBRI	Philippines Banana Research Institute
PCAARRD	Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development
PCIC	Philippine Crop Insurance Corporation
PhilMECH	Philippine Center for Postharvest Development and Mechanization
POT	Package of Technology
PRDP	Philippine Rural Development Project
PSA	Philippine Statistics Authority
ROI	Return of Investment
SFI	Sagrex Food Incorporated
SSNM	Site-specific Nutrient Management
SUCs	State Colleges and Universities
TADECO	Tagum Agricultural Development Cooperative
TBRI	Taiwan Banana Research Institute
TR4	Tropical Race 4
VAM	Vesicular-Arbuscular Mycorrhizae
VCA	Value Chain Analysis

MESSAGE

In the wake of unprecedented events and emerging crises, the Department of Agriculture (DA) launched the Plant, Plant, Plant Program to ensure that all Filipino families would have adequate supply of nutritious, healthy, accessible and affordable food to meet the demands of these challenging times.

As a testament of our firm resolve to triumph over this formidable foe, the DA was re-energized to act as one, but is committed at the same time to delivering results from various projects under the different major programs of the Department.

In light of this, I wish to congratulate all the principal actors who paved the way for the crafting and updating of High Value Crops Development Program (HVCDP) Roadmap. Through the completion and publication of this HVCDP Roadmap, we enshrine the spirit of excellence, collaboration, and resilience as inherent characteristics of our agricultural inheritance and legacy.

The progressive cross-cutting and continuing collaboration among all stakeholders in pursuit of attaining competitive advantage and relevant growth is an output designed into the pages of this roadmap.

I am proud and grateful that such a focused work on this commodity could be undertaken to ensure that a brighter future for the industry can reasonably be expected and attained because this blueprint already exists to assure it.

Marami pong salamat at Mabuhay!

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

FOREWORD

The Covid-19 pandemic that ravaged life and livelihood in the country for almost 2 years now proved to be an existential threat to our way of life. On the positive side, it elicited generosity and a sense of community in all of us, and became a catalyst of change in many areas of our lives.

It is in these multi-faceted circumstances that the High Value Crops & Rural Credit (HVCRC) of the Department of Agriculture (DA), working collaboratively with various stakeholders and industry experts, undertook the needed updating of this industry roadmap as an integral part of the Secretary of the Department of Agriculture, Dr. William D. Dar's 18 transformative strategies, and formulated in alignment to his **One-DA to Transform Vision** of Philippine Agriculture, in order to achieve a Food Secure and Resilient Philippines, with empowered and prosperous farmers and fisher-folk. While this industry roadmap is the handiwork of many minds and multi-stakeholders, in its core it subscribes to the interdependent and inter-related approaches of **Industrialization, Farm Consolidation, Mechanization, and Professionalization** as pillars of its foundation.

This roadmap is envisioned to serve as a guide to all industry stakeholders for the realization of the targets set in it for 2021 – 2025. It is an embodiment of how the industry will achieve its goals of transformative growth through the value chain approach, as well as increase in quality and sustained yields and incomes. It is with pride and pleasure that I express my heartfelt gratitude to everyone both in the private sector and government, who unselfishly lent their time and talent for this timely and necessary endeavor. More than the lofty legacy and memorable milestone we shall leave behind because of this worthwhile work, it is more the comfort in the knowledge that the entire industry would have a clear pathway to follow in the years ahead to realize its vision that is truly more meaningful to remember us all by. Thank you.

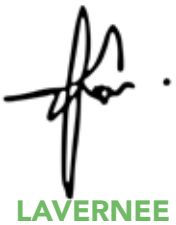
EVELYN G. LAVIÑA
Undersecretary for High Value Crops and Rural Credit
Department of Agriculture

PREFACE

Banana is one of the top commodity industry of the Philippines, providing both local and international revenues for the country. As they say, it is more difficult to stay on top than to get there. Because of that, we need to think ahead, appraise our current situation, assess scenarios of possible futures, and continue to seek new goals toward a banana industry not just reaching the top but to remain as the top commodity industry for the country.

It is our hope that this commodity roadmap will be instrumental for a more robust banana industry as we face numerous challenges and opportunities resulting from various disruptive forces like climate change, precision agriculture, food safety and traceability, to include the global health crisis, among others. Crafting the roadmap brought together key stakeholders to come up with potential strategies and development entry points which could facilitate growth and sustainability amid these disruptive forces.

On behalf of the Banana Roadmap Development Team and the PCAF Committee on Banana, I would like to thank my co-chair and members the Banana Industry Roadmap Development Team, Office of the DA Undersecretary for Banana and the Philippine Council for Agriculture and Fisheries for sharing their time, talent and expertise.



LAVERNEE S. GUECO, Ph.D., UPLB - Institute of Plant Breeding
Team Leader
Banana Industry Roadmap Development Team

EXECUTIVE SUMMARY

The banana is one of the most economically important fruit crop commodities in the Philippines. Majority of banana varieties grown in the country are Cavendish, followed by Saba and Lakatan. Other varieties include Latundan, Bungulan and Señorita, among others. Cavendish is mainly produced as an export product. The Saba/Cardaba variety is usually processed into banana chips for export while Lakatan is consumed mostly as fresh fruit in the local market.

Mindanao region ranks first as the top producing area for bananas. Cavendish accounts for only 19% of the aggregate land area (86,000 hectares) but due to its high plant density per hectare and higher productivity, it accounts for 50% to 60% of the total banana production. Saba accounts for 41% (186,148 hectares) and the remaining 14% are planted to Lakatan, Latundan and other banana varieties (PSA, 2020).

In terms of industry players, most of the banana growers of Saba, Lakatan and other varieties are small growers/landholders while the Cavendish are planted and managed by small, medium growers and large multinational companies. The Cavendish export industry has been a significant source of foreign exchange for many years. The banana is grown all over the country by small and medium scale growers, sold to local entrepreneurs and consumed locally as fresh bananas or as processed bananas. Thus, making the banana crop an important part of food security and livelihood of the rural poor. The banana ranks as one of the top 5 crop commodities being produced in the country, next to our staples like rice, corn, coconut and mango (PSA, 2020). In 2020, the Philippines produced a total of 9.06 million MT of banana, 52% of which is Cavendish – produced mainly for export. Other major banana varieties being cultivated are Saba (27%) for cooking and processing, Lakatan (10%) and other popular dessert varieties such as Latundan, Bungulan, and Senorita among others.

Majority of the banana growers of Saba, Lakatan and other local banana varieties are small-scale backyard growers while the Cavendish are planted and managed by small to large commercial plantations (>100 ha) for the export market. Commercial plantations are commonly managed by Filipino owned firms: Lapanday Food Corporation (6000 ha), Tagum Agricultural Development Cooperative (TADECO) (6600 ha), ANFLO Banana Companies (1200 ha) to name a few, and multinational companies such as DOLE

Philippines, Del Monte Fresh Produce, Unifrutti Tropical Philippines, Marsman Drysdale Group of Companies, Sumifru Philippines and Nader & Ebrahim s/o Hassan Philippines (NEH). These companies are all members of the Pilipino Banana Growers and Exporters Association (PBGEA). Small growers and exporters are represented by the Mindanao Banana Farmers and Exporters Association (MBFEA) and the Mindanao Direct Exporters and Growers Association (MEGA). Organization of Banana Chips Exporters Association (OBEX) – processors.

Banana production in the country is affected by various factors, mainly by biotic stresses and abiotic factors – such as typhoons bringing with it strong winds and high amounts of rainfall that leads to flooding. Common banana diseases affect the production of banana both in small scale plantations and large commercial plantations. Among the most common economically important banana diseases in the Philippines are the following: Banana bunchy top virus (BBTV), black sigatoka, bacterial wilt (bugtok and moko), banana bract mosaic virus (BBrMv) and Fusarium wilt (Foc Race 1 and Foc TR4). Fusarium wilt caused by Foc TR4 is one of the major concerns of the Cavendish industry in the recent years.

With the pressing concerns of the Philippine banana industry, the following are specific concerns that needs to be addressed to attain the Vision of the Banana Industry for each commodity (banana variety).

General strategies to improve productivity and competitiveness of the industry are as follows:

1. Increase production areas,
2. Rehabilitation of existing production areas,
3. Marketing of bananas in the local and export sector,
4. Support for small growers, and
5. Pest and disease management.

Adaption and implementation of the defined strategies are expected to result for the attainment of industry goals and objective, contribute to inclusive growth among competitiveness, sustainability, overall development of the banana industry.

INTRODUCTION

Rationale

One of the identified strategies to "level up" Agriculture is Roadmap Development, this is a key strategy to acknowledge the role and promote inclusivity of the farmers, public and private stakeholders in the development of an industry. The Department of Agriculture thru the High Value Crops Development Program have spearheaded the Banana Industry Roadmap 2022 – 2040 that aims to serve as a guide to all industry stakeholders to realize the targets set for the short- (2022-2025), medium- (2026-2030) and long-term (2031-2040) direction of the commodity industry.

Objectives

The roadmap is envisioned as the embodiment of how the industry will achieve its goals and inclusive growth through a value chain approach taking into consideration the development of the current situation of the industry. Specifically, the roadmap aims to:

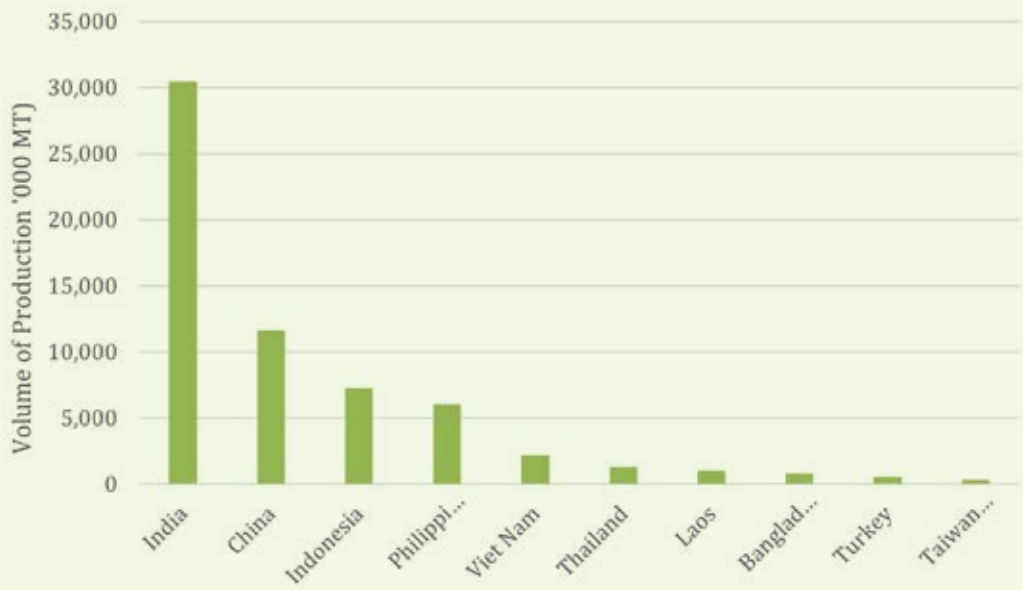
a. Identify the key industry players and build strategic partnerships, and
b. Identify areas for investment, strategies, policies, and programs for the short, medium and long-term growth of the industry.
c. to ensure that the Philippine banana industry continue to be a major player in the world banana market

INDUSTRY SITUATION AND OUTLOOK

Philippine Banana International Data

The Philippines ranked 4th among the top banana growers in Asia as shown in Figure 1 (FAOStat, 2021). While India, China, and Indonesia produced more bananas, most of them are locally consumed as fresh, cooked & processed bananas. Incidentally, the top 3 Asian banana producers are also the top 3 countries in Asia with the most population (UN, Population Division, 2021).

FIGURE 1. TOP 10 BANANA PRODUCERS AMONG THE ASIAN COUNTRIES

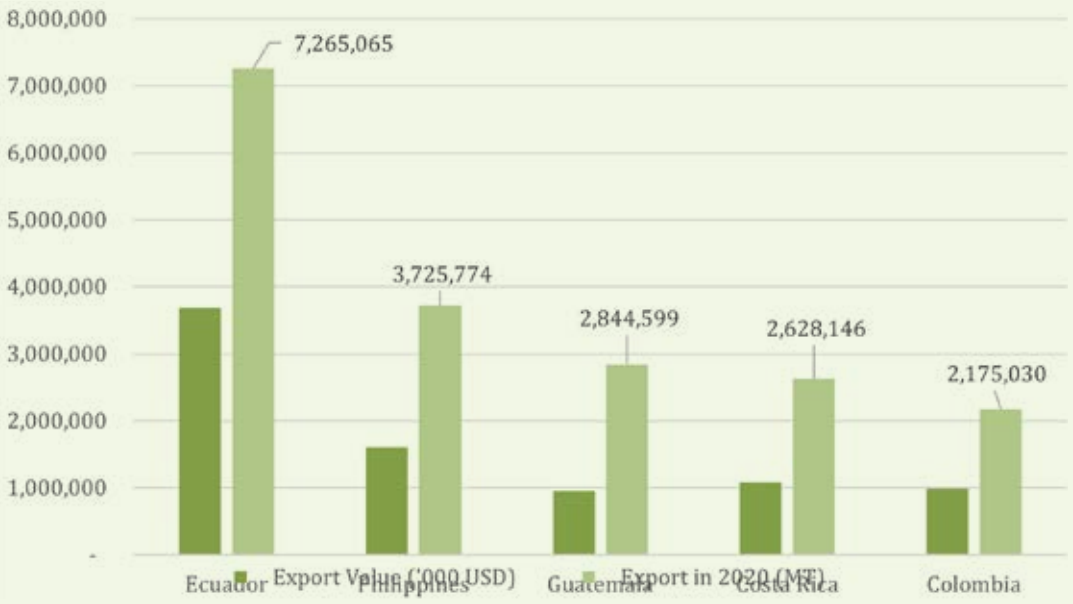


Source: Philippine Statistics Authority (2020)

In the international export market, the Philippines ranked 2nd next to Ecuador and is the only Asian country on the list of the major banana exporters in Latin American countries - Costa Rica, Colombia and Guatemala in the past decades (Figure 2).

The banana export industry of the Philippines provides for approximately 11% share of the world banana trade (includes fresh banana and processed bananas), and its export value is estimated at $1.6 billion in 2020 despite the decline in production from 2019 (ITC, 2021). The Latin American countries export Cavendish to North America and Europe, while the Philippines exports Cavendish to the Asian Markets (Japan, Korea and China) and the Middle East Markets.

FIGURE 2. VOLUME (MT) AND VALUE (USD) OF EXPORTED BANANAS FROM THE TOP 5 EXPORTING COUNTRIES IN THE WORLD MARKET (ITC, 2021)



Source: Philippine Statistics Authority (2020)

Philippine Banana Production

Banana is one of the most economically important fruit crop commodity in the Philippines. From 2001-2020, banana subsector contributed an average of PHP123.3 billion per year or 8.2 percent of the total gross value added (GVA) in agriculture, forestry and fisheries (AFF) sector (PSA, at constant 2018 prices). It accounted for the second highest share to the total GVA in AFF, next to palay Banana is consumed locally as fresh and processed bananas and it is known as a good source of fiber, vitamin C, and potassium. These makes the banana crop an important part of food security for Filipinos.

The varieties mentioned below are the ones that are widely cultivated in the country:

Cavendish bananas are produced in the country for the export market. Gran naine and Williams are among the most common strains of Cavendish variety in Mindanao. It produces large bunches and fingers despite its relatively small stature of less than 3m. It is sensitive to drought, flooding and other adverse soil conditions, and may be grown in high-altitude locations due to its tolerance to strong winds. This cultivar is moderately susceptible to banana bunchy top disease, highly susceptible to black sigatoka disease, nematodes, and Fusarium Wilt TR4. The fruit is a table-type banana with yellow to bright green peel color at maturity. The fruit peels off easily from the pulp, which is yellow when ripe. The flesh is soft and the predominant taste is sweet. Cavendish fruits are persistent; fingers do not easily fall from hands thus making it the most suitable variety for the long-haul travels to the export market destinations around the world. In recent years, the Giant Cavendish Tissue Culture variant (GCTCV) 218, which is moderately resistant to Fusarium wilt is becoming popular in areas that are highly infested with Foc TR4.

Saba The term "Saba" is being used differently in different local dialects in the country. In the Ilocos region, "Saba" refers to all types of bananas, while "Sab-a" in Mindanao refers to a cooking banana cultivar with small fruits and erect leaf habits. For this Road Map, it was agreed that the Saba variety would refer to all varieties under the "Saba Sub group" (as suggested by Dela Cruz, et. al 2008) to include varieties such as Dippig in Ilocos and Cardaba which is more popular in Visayas and Mindanao. The Saba is both for the export market and for local consumption - produced for (1) banana chips and banana flour processing for the domestic and export market and (2) snack food and as carbohydrate staple. The mature pulp is sweet and edible even when uncooked. However, it tastes better when cooked. This cultivar can be cooked as turon (fried banana with starchy wrapper), banana cue (deep fried bananas coated with brown sugar), maruya (fried bananas with flour and butter). These are popular local snacks. The plant is sturdy to drought and other common banana diseases. However, it is susceptible to banana bract mosaic virus and the 'bugtok' disease, which causes hardening of the fruit pulp and renders the pulp inedible.

Lakatan is produced for the domestic market due to its sweet aroma and excellent eating quality. It is highly susceptible to banana bunchy top disease, sigatoka diseases, and nematodes. It bears large fruits the pulp is pale orange-yellow when ripe, which is associated with high Vitamin A content.

Latundan is a popular table banana that is small to medium in size and has white pulp and yellow peel. It is sweet with mild sub-acid taste, fine texture with sweet delicious flavor. The variety is highly susceptible to Race 1 of Fusarium Wilt, Sigatoka and is susceptible to nematodes (R. similis and M. incognita)

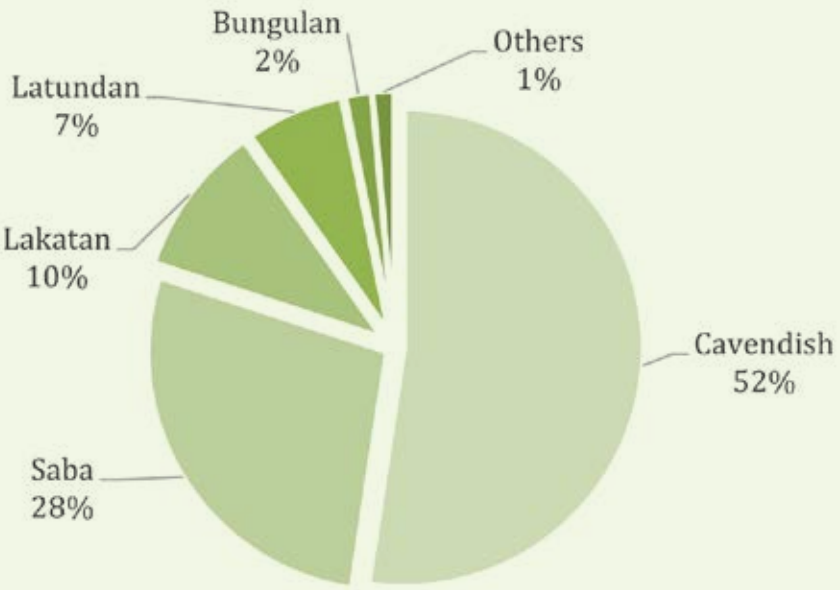
Bungulan is a popular dessert variety, produced mainly in small hold backyard plantations and is best used in making banana breads. The pulp is pale orange-yellow when ripe, which may be associated with a high Vitamin A content. It is sweet and aromatic, and is of excellent eating quality. The peel color is yellow-green when ripe and pulp is sweet, is very aromatic, and has a unique. This variety exhibits moderate resistance to banana bunchy top virus and is susceptible to nematodes.

Seniorita (Cuarenta Dias) is a popular table type banana in Laguna and Cavite (particularly in Tagaytay). This cultivar is popular for its sweet and aromatic fruits but they are small and weakly attached to the pedicel. This trait makes it unacceptable to the export market. It is highly susceptible to banana bunchy top virus and sigatoka diseases, but moderately resistant to nematodes.

Other varieties such as Latundan (2nd most popular local dessert banana), Bungulan (also called as the green ripe Cavendish), Morado (red bananas), Inabaniko (an alternative for the cooking bananas) and Senorita (Cuarenta Dias) are less popular in the local market but they pose potential significance in the international market for export. Less popular banana varieties are also important for food security and as an affordable source of nutrition.

In 2020, the Philippines produced a total of 9.06 million MT of banana, 52% of which is Cavendish. Other major banana varieties being cultivated are Saba (27%) Lakatan (10%) and other popular dessert varieties such as Latundan, Bungulan, and Senorita among others (Figure 1).

FIGURE 3. BANANA VARIETIES PRODUCED IN THE PHILIPPINES

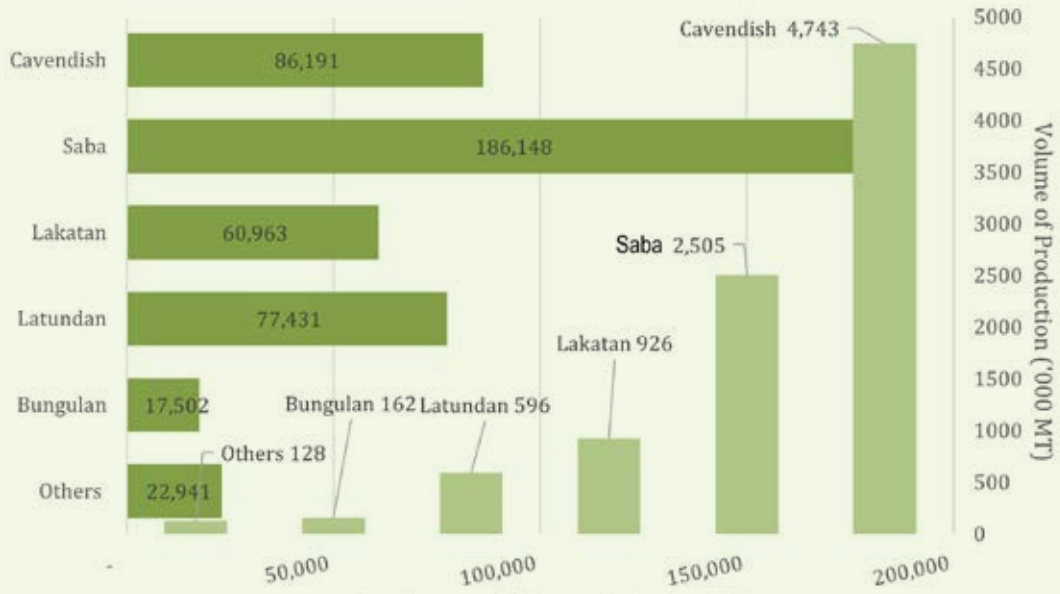


Source: Philippine Statistics Authority (2020)

It is important to note, that while half of the country's banana production is Cavendish, only 19% (86,000 has) of the total production area (~451,000 has) is allotted to it. Majority of our productive land area for bananas are allotted for Saba (41%) with 186,148 hectares. This denotes that more fruits are harvested from the Cavendish banana plantations (54 MT/ha) than the Saba plantations (13 MT/ ha) (Figure 2).

Most cavendish plantation are commonly managed by Filipino owned firms that has enough capital for the required inputs and has the technical capacity for the application of good management practices while majority of the banana growers of Saba, Lakatan and other Banana Varieties are managed by small-scale backyard growers that has limited capital for inputs and maintenance of their plantations.

FIGURE 4. COMPARISON ON THE VOLUME OF PRODUCTION ('000 MT) AND AREA HARVESTED (HAS) FOR THE BANANA VARIETIES PLANTED IN THE PHILIPPINES



Source: Philippine Statistics Authority (2020)

Volume of Production for Bananas

Table 1 shows the most recent data for banana production in the country by regions. In 2020, 85% of the total bananas in the Philippines were produced in the island of Mindanao (Figure 5), with Davao Region (Region XI), Northern Mindanao (Region X) and SOCCSKSARGEN (Region XII) as the top three producing regions. Very small percentages of the total bananas produced in the country come from Luzon (7%) and the Visayas (8%).

TABLE 1. VOLUME OF BANANA PRODUCTION (MT), BY VARIETY AND BY REGION IN THE PHILIPPINES (YEAR 2020)

	Cavendish	Saba	Lakatan	Latundan	Bungulan	Others	Total
CAR	-	7,594	3,265	4,698	4,400	531	20,487
REGION I	-	22,263	700	15,214	1,700	3,722	43,599
REGION II	335	242,973	30,928	45,399	5,385	2,277	327,297
REGION III	-	27,383	10,886	10,548	2,780	3,059	54,656
REGION IV-A	1,037	64,253	6,156	20,702	2,959	2,650	97,756
MIMAROPA	231	39,617	8,915	11,081	1,521	1,209	62,575

	Cavendish	Saba	Lakatan	Latundan	Bungulan	Others	Total
REGION V	-	33,377	3,211	13,120	6,889	7,753	64,350
Sub Total Luzon	**1,603**	**437,459**	**64,061**	**120,761**	**25,635**	**21,201**	**670,720**
REGION VI	5,081	172,849	22,796	42,905	34,250	15,538	293,419
REGION VII	662	134,467	17,935	39,079	10,510	4,531	207,184
REGION VIII	85	164,120	11,133	23,244	17,149	18,058	233,788
Sub Total Visayas	**5,828**	**471,436**	**51,864**	**105,227**	**61,909**	**38,127**	**734,391**
REGION IX	169	130,669	64,820	35,356	12,241	12,831	256,086
REGION X	1,337,798	312,368	177,132	126,182	13,082	10,596	1,977,157
REGION XI	2,505,525	520,930	220,125	81,556	806	20,636	3,349,576
REGION XII	571,724	324,322	182,522	56,601	9,495	9,393	1,154,058
REGION XIII	121,532	121,282	22,584	48,011	1,040	4,469	318,920
ARMM	198,896	186,317	142,407	22,361	34,040	11,220	595,241
Sub Total Mindanao	**4,735,643**	**1,595,887**	**809,590**	**370,068**	**70,705**	**69,146**	**7,651,038**
Total Banana Production	**4,743,074**	**2,504,782**	**925,515**	**596,057**	**158,248**	**128,474**	**9,056,149**

Source: Philippine Statistics Authority (2020)

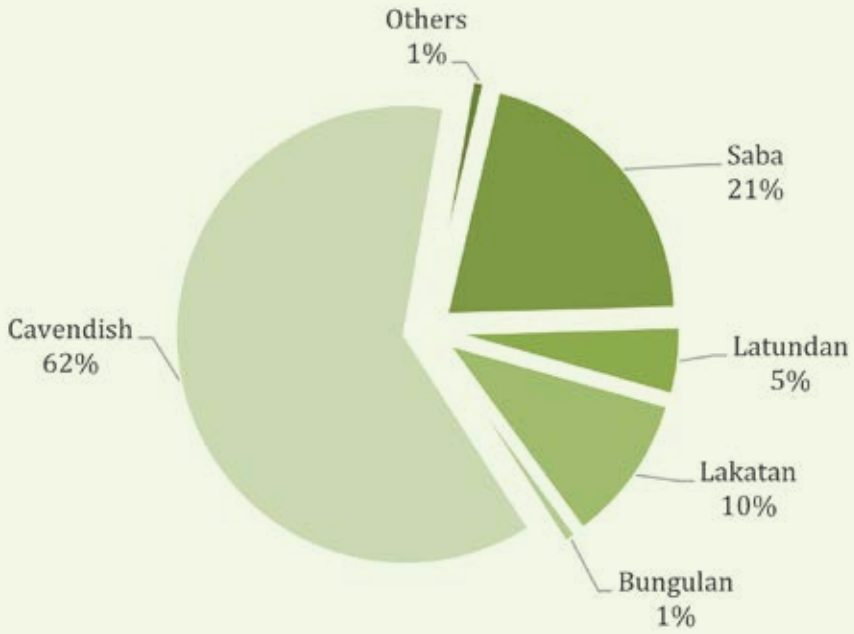
Mindanao Island alone produces 85% of the total bananas produced in the country, 62% of which is Cavendish mainly for the export market (Figure 5). The island also produces Saba mostly for banana processing (21%), Lakatan (10%) as dessert banana and other varieties produced for the local market (7%). (Figure 6)

In 2020 the Visayas region produces 64% of Saba bananas. This is followed by Latundan (14%), Bungulan (9%) and Lakatan (7%). Luzon region had an annual production of 670,000 metric tons in the same year. Major banana producing regions in Luzon are Region II, Region IV-A, Bicol Region and MIMAROPA. Majority of the banana varieties planted in these areas are Saba, Latundan and Lakatan for the local market. Saba variety accounts for 65% of the total bananas produced in Luzon, 18% of the bananas produced were Latundan and 10% were Lakatan (Figure 7).

FIGURE 5. BANANA VOLUME OF PRODUCTION DISTRIBUTION IN THE THREE MAJOR ISLANDS OF THE PHILIPPINES

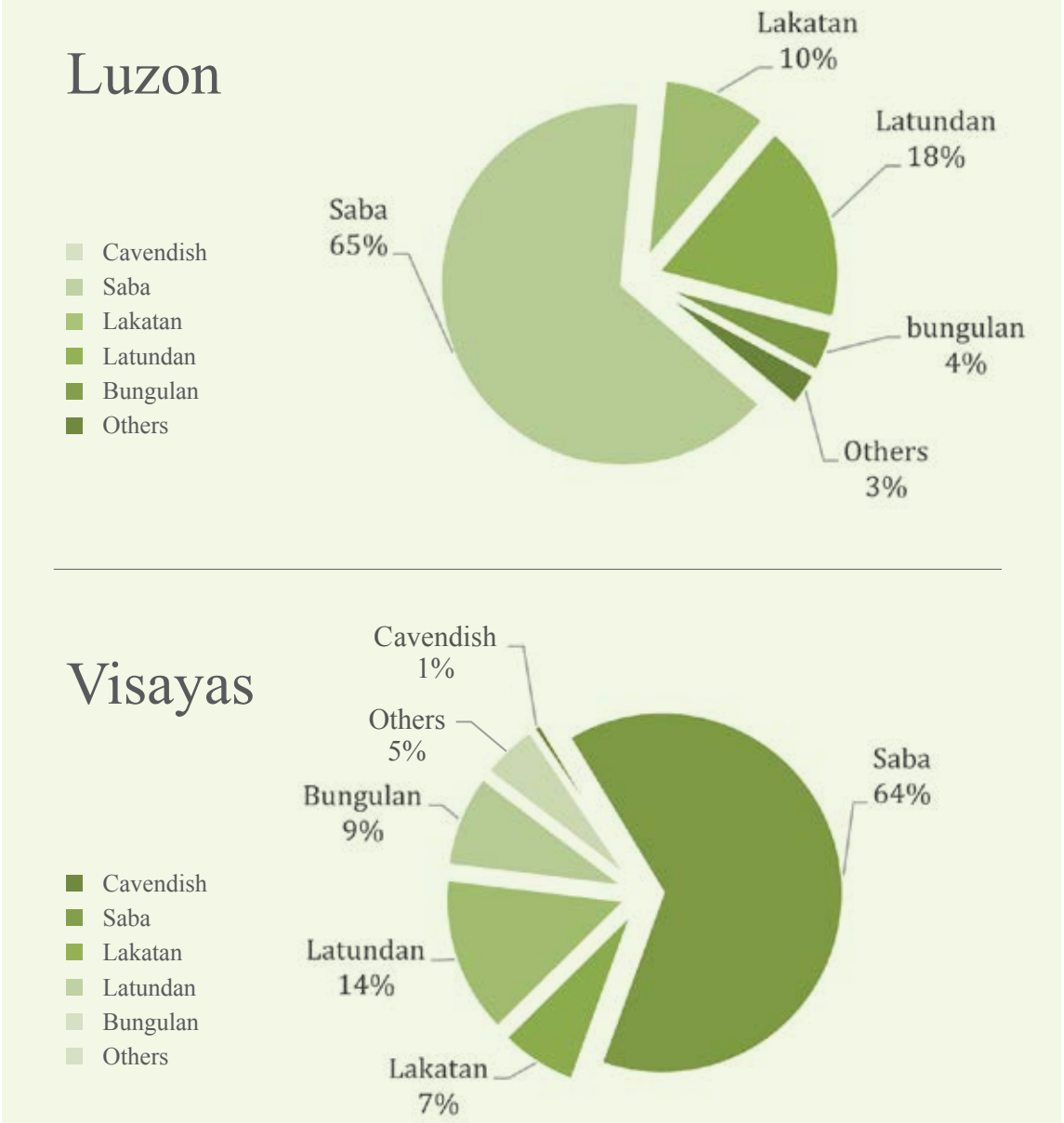
Source: Philippine Statistics Authority (2020)

FIGURE 6. BANANA PRODUCTION DISTRIBUTION ACCORDING TO VARIETY IN THE ISLAND OF MINDANAO



Source: Philippine Statistics Authority (2020)

FIGURE 7. BANANA PRODUCTION DISTRIBUTION IN THE ISLAND OF LUZON AND VISAYAS REGION ACCORDING TO VARIETY

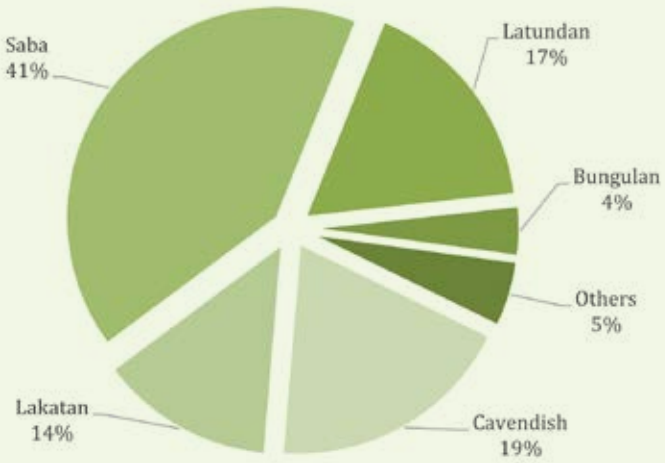


Source: Philippine Statistics Authority (2020)

Area Harvested for The Bananas in the Philippines

Based on the 2020 data (Table 2), total agricultural land area planted with bananas all over the country is approximately 451,000 hectares (PSA, 2021). A large percentage of this area is planted with Saba (~186,000 hectares) which accounts for 41% of the total land area planted with bananas, followed by Cavendish with approximately 86,000 (19%), Latundan with 77,000 hectares of plantation and Lakatan with approximately 60,000 hectares (14%) (Figure 8).

FIGURE 8. DISTRIBUTION AGRICULTURAL LAND AREA FOR PRODUCTION OF BANANA ACCORDING TO VARIETY IN THE PHILIPPINES



Source: Philippine Statistics Authority (2020)

TABLE 2. AREA OF BANANA PRODUCTION (HECTARES), BY VARIETY AND BY REGION IN THE PHILIPPINES (YEAR 2020)

	Cavendish	Lakatan	Saba	Latundan	Bungulan	Others	Total
CAR	-	369	924	618	710	208	2,829
REGION I	-	235	3,008	3,011	280	935	7,469
REGION II	21	3,269	15,952	5,466	569	420	25,697
REGION III	-	900	2,908	1,843	436	478	6,565
REGION IV-A	37	2,273	16,346	5,645	1,226	1,466	26,993
MIMAROPA	83	4,113	12,283	5,185	569	633	22,868
REGION V	-	1,072	9,917	4,375	1,551	2,103	19,017

	Cavendish	Lakatan	Saba	Latundan	Bungulan	Others	Total
SubTotal Luzon	**141**	**12,232**	**61,338**	**26,143**	**5,340**	**6,243**	**111,437**
REGION VI	317	1,908	17,324	7,403	3,772	2,064	32,788
REGION VII	81	2,416	12,461	4,238	1,069	653	20,918
REGION VIII	25	1,339	13,703	5,342	1,614	5,474	27,497
SubTotal Visayas	**423**	**5,663**	**43,488**	**16,983**	**6,455**	**8,191**	**81,202**
REGION IX	17	4,419	8,780	3,765	693	2,145	19,819
REGION X	17,735	6,735	14,841	12,177	981	1,146	53,614
REGION XI	47,082	12,696	23,970	4,811	40	1,702	90,302
REGION XII	12,792	10,175	9,629	2,730	473	575	36,374
REGION XIII	2,985	3,218	8,537	8,542	221	1,099	24,601
ARMM	5,018	5,825	15,565	2,280	3,299	1,841	33,828
SubTotal Mindanao	**85,628**	**43,068**	**81,322**	**34,305**	**5,707**	**8,508**	**258,538**
Total Area of Production	**86,192**	**60,963**	**186,148**	**77,432**	**17,502**	**22,942**	**451,178**

Different Production Systems in the Philippines

Different Production Systems in the Philippines

In the recent year, a total of more than 9 million metric tons of banana were produced on approximately 451,000 hectares of land in the Philippines. A large portion of the agricultural land area for fruit trees are planted with bananas, from small scale backyard subsistence farming to large commercial multinational banana plantations.

Cavendish. The Cavendish bananas account for approximately 50% of the total banana production of the Philippines. They are grown as monoculture crop in small to large commercial plantations mostly in the Davao Region, Northern Mindanao and SOCCKSARGEN - for the domestic and export markets. Majority of the planting materials in these plantations are tissue cultured seedlings. The plantation areas for Cavendish bananas are usually flat to hilly, clay loam soil with good water drainage or series of canals to prevent flooding inside the plantation. The plantations make use of the good agricultural practices (GAP) recommended by the Department of Agriculture, while the large multinational companies make use of the banana growing protocols established

by their mother companies. Plantations can be categorized to small, medium and large commercial plantations – these are the Filipino owned firms and internationally managed corporations. The small- and medium-scale farmers are usually grouped in banana grower's cooperatives that also support the banana growers in the technical aspect of banana production and also supports their consistent need for market. The growers' cooperatives are usually contracted with multinational companies for 5 to 10years. Small independent banana growers usually sell directly to consolidators, and they demand the price depending on the fluctuating prices in the market. A small portion of the country's exports are organic bananas.

Saba. The Saba banana is highly resistant to several banana diseases, and this makes it very resilient against biotic stresses and also some abiotic stresses. Saba is known to be resistant to Fusarium Wilt Tropical Race 4. Highest production and efficient yields per hectare were observed in Mindanao, followed by the plantations in Cagayan Valley up north of Luzon and the Visayas. Saba plantations in the south are very similar to Cavendish plantations, they are large monoculture plantations. Large plantations for banana chips usually make use of tissue cultured seedlings for uniformity of Saba plants, resulting to uniform size of Saba fruits, making it easy for chips processing in Mindanao. In contrast to the usual small to medium scale plantations in Cagayan Valley and the Visayas the variety are smaller and most likely are exposed to adverse weather conditions like typhoons. Saba plantations in Luzon are small scale independent banana plantations, using suckers to re-plant, mixed culture with other fruit trees and vegetables around the area, barely applying the recommended GAP by DA. Most growers do not invest in fertilizer inputs and other foliage applications that may increase the yield of their crop. This is the common production system in CALABARZON, MIMAROPA, Quezon.

Lakatan and other Bananas. Smallholder farmers in Luzon and the Visayas grow bananas primarily for home consumption in backyard gardens. They grow a diversity of dessert and cooking cultivars depending on their preferences and the ease with which they can be produced.

In small plantations, bananas are grown as monocrops in areas ranging from 2 to 20 hectares. The cultivars are selected based on local consumer preferences, the prevailing agro-climatic conditions and the types of pests and diseases present. Majority of the small growers do not use TC seedlings in their plantations and still make use of suckers.

Economically Important Banana Diseases

Banana production in the country is affected by various factors, mainly by biotic stresses and abiotic factors – such as typhoons. Diseases play a major role in the production of banana both in small scale plantations and large commercial plantations. Among the most common banana diseases are the following: Banana bunchy top virus, black sigatoka, bacterial wilt (bugtok and moko), banana bract mosaic and Fusarium wilt are some of the major diseases of banana in the Philippines.

Banana Bunchy Top Virus (BBTV)

Banana bunchy top disease is caused by banana bunchy top virus (BBTV), a plant virus transmitted by a small black insect called the banana aphid (Pentalonia nigronervosa). Banana bunchy top causes banana leaves to have a 'bunched' appearance, leaves and stem sheaths appear with dark green and light green dot-dash pattern. Infected plants rarely produce fruit, which may result in significant production losses on commercial farms if infected plants are not removed quickly because they become source of virus for the remaining plants. If not properly managed the disease poses a potential threat to the Philippine banana industry specifically for Lakatan, Cavendish, Latundan, Señorita - as it can wipe out a whole plantation if infected plants are not eradicated immediately. Management of BBTV includes the use of tissue culture planting materials and immediate identification and eradication of diseased banana plants. Most recently, 5 promising lines of Lakatan from the Institute of Plant Breeding are under study for their resistance to BBTV (Damasco, 2019). Banana bunchy top can be found all over the country.

Banana Bract Mosaic Virus (BBrMv)

Bract mosaic is a viral disease caused by the Banana bract mosaic virus (BBrMV) and transmitted by aphids Pentalonia nigronervosa, Aphis gossypii and Rhopalosiphum maidis. Typical symptoms of the disease include green or red streaks or spindle-shaped lesions that characterized the mosaic symptoms on the flower bracts and on pseudostem, leaf petiole and sometimes on the midrib of the leaves. Chlorotic streaks on the leaf blade can also indicate infection. Early infection in the field can lead to slight damage

that affected plants can still bear fruits. However, succeeding cropping of the infected plants gradually develop severe symptoms. Severe infection characterized by growth defects, unfilling of fingers in the fruit, and misshapen fruit. These will cause fruit rejection and consequently to economic losses. Aside from insect transmission, the virus can also be transmitted by infected planting.

BBrMV can infect most of the cultivated banana varieties but the cooking type 'Saba' are the most susceptible to banana bract mosaic. The management of the disease include early detection and eradication of the infected plants to remove the source of the viral inoculum and insecticide application to reduce the population of aphids as the carrier of the virus. Removal of infected plants in farm rehabilitation should be done. Likewise, the use of disease free planting material should be considered.

Black Sigatoka

Black Sigatoka is a foliar disease of banana caused by the fungus Mycosphaerella fijiensis. It is a common disease problem in large Cavendish plantations and not very much of a concern in subsistence banana farms of Saba. In many Cavendish growing countries, it is an important banana disease because severely infected leaves turn necrotic, significantly reducing fruit yield, and causing mixed and premature ripening of fruit bunches. Early leaf symptoms are tiny reddish-rusty brown flecks that are most evident on the underside of leaves. These gradually lengthen, widen and darken to form reddish-brown leaf streaks. The early streaks run parallel to the leaf veins and are more evident on the underside of the leaf. The streaks expand and become more oval shaped and the center of the lesion becomes sunken and turns grey over time. In susceptible banana cultivars, high levels of disease can cause large areas of the leaf to die, which can lead to total leaf collapse. The disease is very significant because Cavendish banana plants infected with Black Sigatoka have reduced yield and bunches ripen unevenly, which is a big problem for the export market. The fungal leaf disease is managed by frequent aerial spraying of fungicides in Cavendish plantations in the country. The leaf disease is also managed by cultural practices such as the removal of infected leaves to reduce inoculum levels in a plantation, adequate spacing of banana mats and efficient drainage in the plantation. These management practices for the fungal disease incur high cost in production, it requires

the use of airplanes, landing strips and facilities for mixing and loading the fungicides and also the high price of the spray materials themselves. The annual estimate for cost of fungicide applications in export plantations is about $1,000 per hectare having more than 40 applications per year.

Bacterial Wilt (Moko/Bugtok)

Bugtok is a common disease of cooking bananas in the Philippines, caused by Pseudomonas solanacearum. The strain of the bacterium causing bugtok is identical with that causing Moko disease (bacterial wilt) of Cavendish banana. Plants infected with bugtok appear outwardly normal except those bracts of the male inflorescence fail to dehisce. Internally the fruit pulp is discoloured and there are brown vascular streaks in the fruit stem and pseudostem. There is evidence that cultivars with the Musa balbisiana genome are susceptible to the disease, and that transmission is by insects. Bugtok can be controlled by bagging the inflorescence at the bending stage and the bags can be removed after all the fruits have set, if followed by removal of the male inflorescence (Soguilon et al., 1995).

Moko is a bacterial disease that causes rotting and wilting of Cavendish pseudostems. Moko causes yellowing and wilting of leaves that eventually die and collapse. Younger leaves may develop pale green or whitish panels, before dying. Suckers may wilt. The internal part of the stem becomes progressively discolored, cream to yellow, eventually turning brown to black. This discoloration can extend into the fruit stems and bases of younger leaves. When cut, the stem will exude bacterial ooze. Bacterial ooze may also be seen on diseased peduncle cushions. This is managed in banana plantations by early detection and eradication of the infected mat by burning the whole mat of bananas.

Fusarium Wilt (Tropical Race 4)

Fusarium wilt, also known as the Panama Disease of banana is a lethal fungal disease caused by the soil-borne fungus Fusarium oxysporum f.sp. cubense (Foc). Fusarium wilt TR4 has spread to most banana-producing countries in Asia including the Philippines. In 2013, it was reported in Mozambique and in 2019 in Colombia. The fungus enters

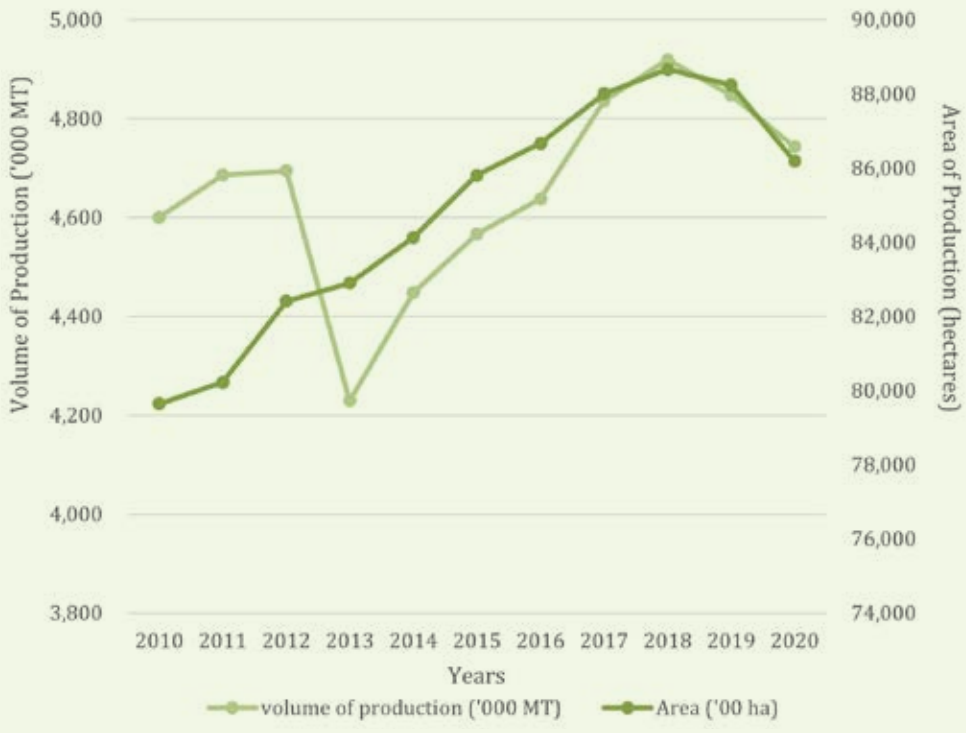
the plant through the roots and colonizes the xylem vessels thereby blocking the flow of water and nutrients resulting to the wilting of older leaves. Disease progression results in the collapse of leaves at the petiole, the splitting of the pseudostem base and eventually plant death. Based on most recent research, the fungus cannot be managed using chemical fungicides. As a result, the spread of TR4 has led to an increase in research in the Philippines on the use of biological control and the role of the soil microbial community in suppressing the pathogen. The solution best adapted to the continued production of bananas in infested soils is replacing susceptible cultivars by resistant ones. TR4 has a wider host range than just Cavendish cultivars and so it is important to prevent further spread in the plantations. The capacity of TR4 to survive indefinitely in the soil, along with its lethal impact and wide host range, are among the main reasons it was ranked as the greatest threat to banana production. This disease has particularly increased the risks to global banana supply, a world food security concern. The following local varieties are also susceptible to Foc TR4: Lakatan, Latundan and Señorita. Saba variety is found resistant to Foc TR4 (Molina et al., 2016), thus several banana growers in Mindanao shifted to growing Saba instead of Cavendish when their plantations became infested with Fusarium Wilt.

Fusarium wilt (Foc TR4) is one of the major concerns of the Cavendish industry in the recent years. It was reported by Molina (2009) that Fusarium Wilt TR4 has been in the island of Mindanao, the Philippines even before 2006. It has spread dramatically across the island, spreading in major banana plantations in the following years. It's impact on the banana production was realized in 2012-2013, spreading first in the Davao region and then moved further to parts of Northern Mindanao and SOCCKSARGEN. Cavendish banana is most susceptible to this disease; it succumbs to the disease just few months after planting.

Figure 9 graphically represents the last 10 years of data for the size of area harvested in hectares and the total volume of Cavendish production in metric tons. The land area being planted to Cavendish was increasing over time since 2010. The significant drop in Cavendish production in 2013 can be attributed to "Typhoon Pablo" in December 2012 as well as the increasing incidence of Fusarium wilt in the commercial banana plantations in Mindanao. Despite the consistent increase in production area in 2013, there was a

very significant dip in production and gradually increased in production over a period of 4-5 years. The slow and steady increase in production of Cavendish may be attributed to commercial plantations expanding to other disease-free areas and abandoning the Foc TR4 infected soils and also due to the introduction of Foc TR4 resistant lines from Taiwan Banana Research Institute (TBRI) called as the GCTCVs. These varieties were selected at TBRI and were field tested in the Cavendish plantations and were found moderately resistant to Foc TR4 under the Philippine conditions. The GCTCVs were initial replacements to the usual Gran naine cultivar in heavily infested Foc TR4 areas because of its resistance to the disease. Although there were differences with the usual Gran naine fruit, the resistant variety was used as a 'stop gap' variety with the application of microbial agents Vesicular-Arbuscular Mycorrhizae (VAM) and Trichoderma harzianum which significantly reduced disease incidence and was helpful to sustain Cavendish banana production (Herradura et al., 2018).

FIGURE 9. TOTAL VOLUME OF PRODUCTION AND AREA HARVESTED FOR CAVENDISH VARIETY PHILIPPINES OVER THE LAST 10 YEARS (PSA, 2021)



Source: Philippine Statistics Authority (2020)

PER CAPITA CONSUMPTION

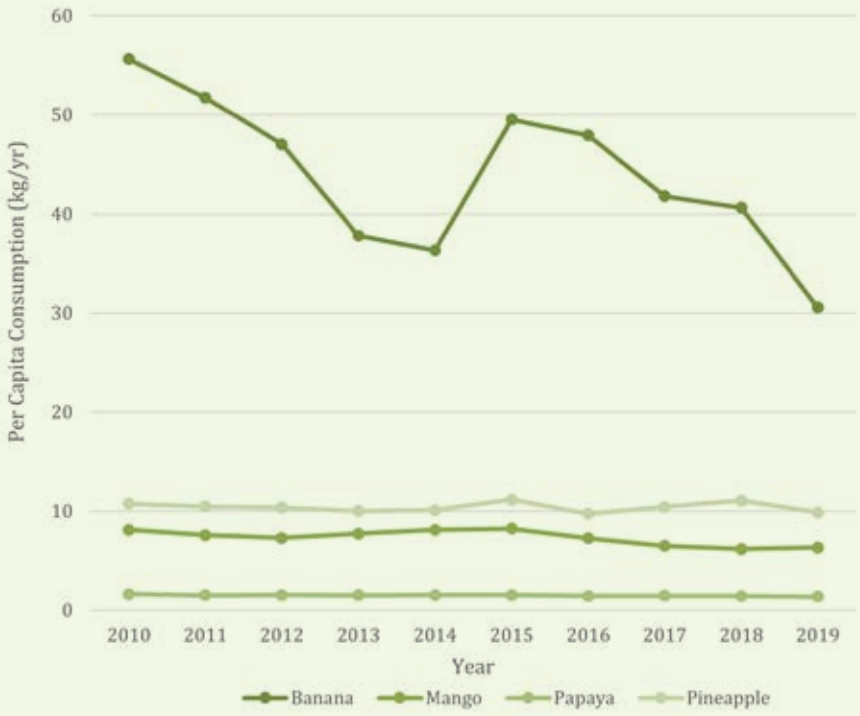
Bananas play a major role in food security in the country. Based on the Philippine Nutritional Value, dessert bananas have 112 u/mg calories, 11 g/mg of proteins and 7g/mg of fats, while cooking bananas have 75 u/mg calories, 8g/mg proteins and 3g/mg of fats (PSA, 2018). According to reports & data in 2011, Filipinos have one of the highest per capita consumption of approximately 55kg/year for both the cooking type and dessert type bananas FAO, 2021). However, in the recent years (Figure 10), banana per capita consumption in the Philippines was reduced to 31kg/year in 2019, 38% less than the per capita banana consumption n in 2015 of 50kg/year (PSA, 2021).

For the year 2020 (Figure 11), average per capita consumption of bananas in the Philippines went down to as low as 19kg/year, that is 48% less than the consumption in 2019. Based on a survey conducted by Chase and Roux (2020), global banana situation has possibly been affected by the recent COVID 19 pandemic in terms of transportation and consumption – consumption of fresh bananas was reduced due to shortages in supply and high prices in the market. Increase in prices was possibly due to several lockdown restrictions that prevented slow movement of fresh bananas to markets, with effects felt along the market chain.

Top 5 consumption of banana was observed in mostly the Mindanao Provinces (except the CARAGA Region) and the MIMAROPA Region. Lowest per capita consumption, even lower than the average for the Philippines, was observed in the provinces of Luzon, specifically the Ilocos Region, Central Luzon and the National Capital Region. Based on the latest per capita consumption data, banana volume of production is somewhat directly proportional to the per capita consumption. It is important to note that highest banana production for Cavendish, Saba and Lakatan was in the Davao Region which is also the region with the highest banana consumption. Lowest volume of production for the bananas was observed in the Ilocos Region, Cordillera Region and Central Luzon Region, consequently, lowest per capita consumption was also observed in these regions of the country.

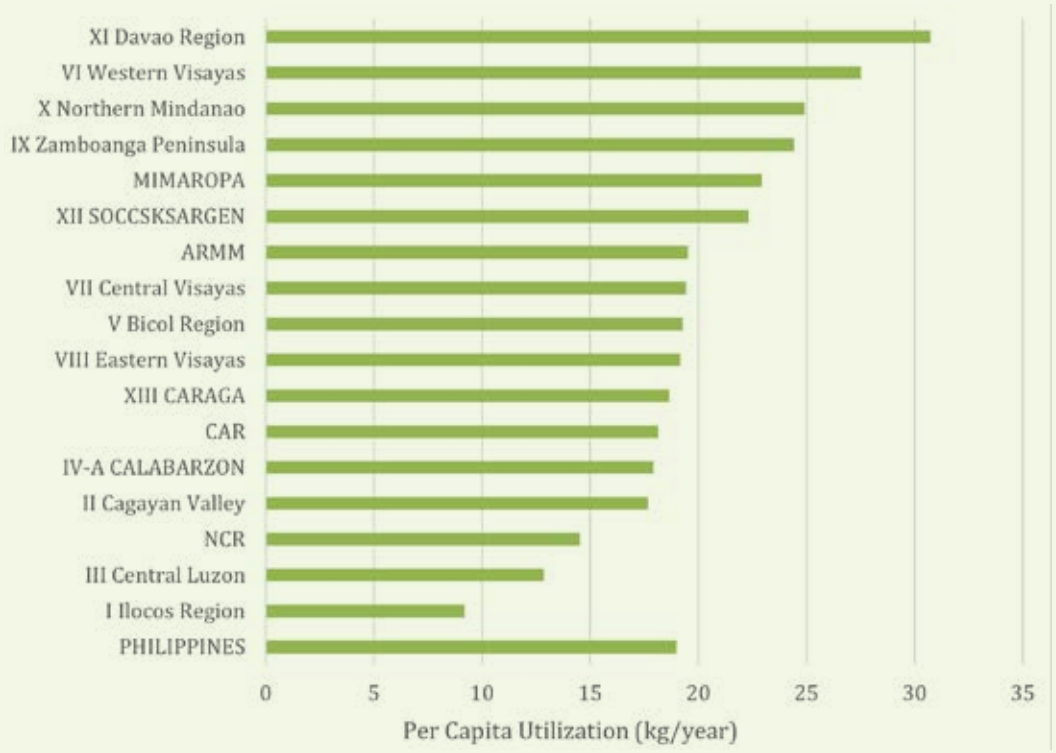
The decreasing consumption of bananas in the Philippines may be due to more unaffordable prices of the bananas for the whole population (FAO,2021). Prices of bananas per kilo is increasing over the past years especially in the urban market setting. Also, with low volume of production in some provinces in Luzon, it results to low supply of bananas, given the high demand, would result to high prices in the market. Over the years, it has become even more unaffordable to maintain a healthy diet of fruits and vegetables compared to just buying cheap canned meat, fish and instant meals. Another possible reason for the decline of annual per capita consumption is, there are increasing number of cheap fruit choices in the market for the people to choose from. Since budget is always a limitation, Filipinos may choose to buy just one kind of fruit that is sold at a lesser price than a kilo of banana.

FIGURE 10. PER CAPITA CONSUMPTION OF BANANAS IN COMPARISON WITH OTHER COMMON FRUIT COMMODITY IN THE PHILIPPINES (2010 – 2019)



Source: Philippine Statistics Authority (2020)

FIGURE 11. PER CAPITA CONSUMPTION OF BANANAS IN THE DIFFERENT REGIONS OF THE PHILIPPINES FOR THE YEAR 2020



Source: Philippine Statistics Authority (2020)

OVERVIEW OF THE BANANA EXPORT INDUSTRY

World export value for banana amounted to US$13.7 billion in 2020. Philippine banana export in the same year was valued at US$1.6 billion, 12% of the world total export value. Ecuador, the top banana exporter accounted for 27% of the world export value.

Table 3 shows the list of the top banana exporting county based on the value of banana exports and the volume of banana exports. The Philippines ranked 2nd in the world and has an annual growth rate computed from 2016 to 2020 at 34% despite the 14% decline in volume of export in the recent year. There was a dramatic increase of export value from 2016 to 2020 due to the increase in the export value and expansion in the export market. Overall, the banana export industry has a positive growth rate over the last 5 years.

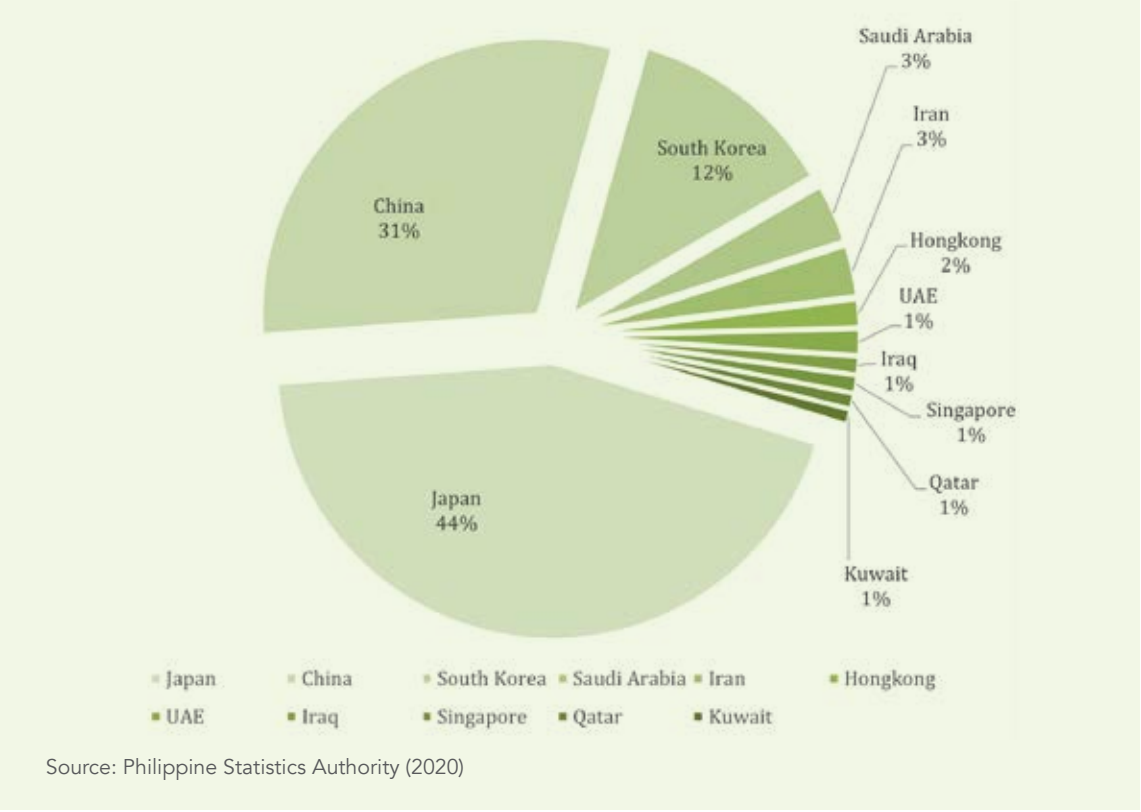
TABLE 3. VALUE OF BANANA EXPORTS FROM THE TOP BANANA EXPORTING COUNTRIES (IN '000 USD)

	2016	2017	2018	2019	2020	Annual growth rate (%) 2016 – 2020
Ecuador	2,657,015	2,959,428	3,115,836	3,185,474	3,682,436	7
Philippines	618,830	1,048,738	1,504,260	1,953,252	1,608,278	34
Costa Rica	994,638	1,111,280	1,028,975	998,345	1,082,970	1
Colombia	857,165	857,286	809,776	870,675	990,338	2
Guatemala	769,660	793,633	809,136	845,299	955,619	5
Netherlands	420,302	550,846	648,158	742,029	708,269	16
USA	416,137	428,095	427,207	431,279	448,623	1
Myanmar	48,043	69,640	167,534	396,519	367,375	79
Mexico	188,505	234,750	250,099	279,759	256,159	7
Panama	88,843	100,665	105,918	277,504	410,068	22
Honduras	258,569	249,583	250,590	236,698	285,720	- 2
Côte d'Ivoire	139,379	154,175	173,555	166,902	325,913	6

Sources: FAOSTAT, ITC calculations based on UN COMTRADE and ITC statistics

Top three banana importers were from Asia, namely: Japan, China and South Korea. These three import markets contribute to the total export value of the Philippine bananas in the recent year, Japan accounts for 44% share of Philippine bananas exports while China shared market percentage of 31% and South Korea with 12% share (Figure 12). The rest of the countries to which Philippine bananas are exported are the Middle East Countries (Saudi Arabia, Iran, Iraq, Kuwait and Qatar) and to other nearby Asian countries like Hongkong and Singapore. These values are important to consider for the export industry of the country as these importing markets are very close to the Philippines, thus incurring less logistics costs. Potential threat to consider will be the possible modification of importing rules which may result to much stricter import policies and trade regulations.

FIGURE 12. PERCENT SHARE OF THE TOP IMPORTING MARKETS OF THE PHILIPPINES BANANAS BASED ON THE EXPORT VALUE (IN USD)



Source: Philippine Statistics Authority (2020)

Figure 13 illustrates the distance of the Philippines to its markets in the world. The Philippines is approximately only 3,000 km away from the destination markets which is relatively close compared to Ecuador that is approximately 10,000 km away from its importing markets. The Philippines is basically strategic in its position with reference to its distance to the main importing markets such as the Middle East and other nearby Asian countries. Cost efficiency in exporting bananas is a very important factor to consider for the banana export industry.

FIGURE 13. CONCENTRATION OF EXPORTING COUNTRIES AND AVERAGE DISTANCE FROM THE IMPORT MARKETS OF CAVENDISH BANANAS

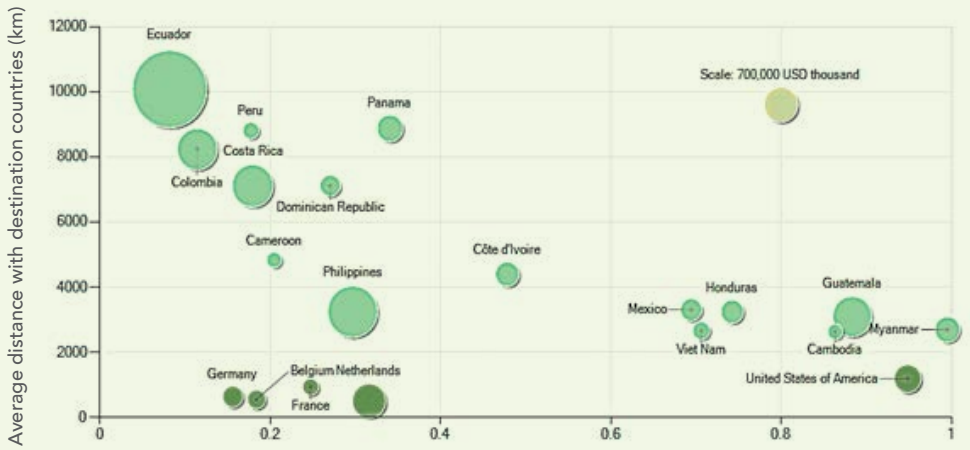
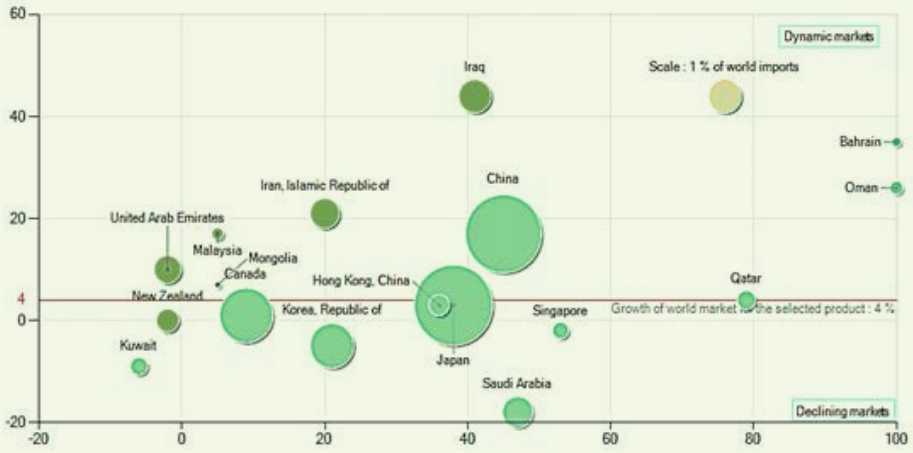


Figure 14 indicates potential for expansion of Philippine banana exports. Some importing countries have higher demand for banana products which the country has inadequately supplied. Iraq has shown an annual banana demand growth of 44% to which only about 1% was supplied by the Philippines. Malaysia had an annual growth of banana imports from the country by 17%, only 5% of the total annual requirement was exported.

FIGURE 14. GROWTH IN DEMAND FOR THE PHILIPPINE BANANAS BASED ON THE ANNUAL EXPORT GROWTH AND ANNUAL IMPORT GROWTH



Annual Export Growth for the Philippine Bananas

With the pressing conditions of the Cavendish plantations in Mindanao due to the disease caused by Foc TR4, growers have started to shift to other banana varieties such as Saba/Cardava that has moderate resistance to Foc TR4 and has potential for exports.. Other banana varieties with high potential for export are Inabaniko (Saba type variety), Señorita (dessert type banana), Morado (with red attractive color, dessert type banana) and Bungulan (green ripe Cavendish that can be planted with minimum chemical inputs) – an important variety that can be considered for the organic banana markets.

INDUSTRY PLAYERS

In order to understand the totality of the current scenario of the Banana Industry, there are several stakeholders and their corresponding roles. It is important to note that some of which may have overlapping functions and mandates which need to be addressed to effectively utilize resources and focus through their respective niches to collectively improve the industry.

Banana Growers

Accordingly, banana growers are classified based on the area covered for production. They can be backyard, small scale, medium scale and large-scale growers.

a. **Backyard Growers.** Farmers who plant their bananas within their residential vicinity and primarily used for subsistence while excess harvests are sold but on minimal scales. It is important to mention that many growers in Luzon have less than a hectare of banana.

b. **Small Scale.** Farmers grow bananas in an area of 5-10 hectares which can be monocropping or intercropping with other crops. Practiced as a pure source of income or as alternative crops while waiting for the maturity of other crops.

c. **Medium Scale.** A banana farm covering 11-100 hectares of land which is focused on producing standard bananas and commonly engaged in export of products through multinational companies or membership in cooperatives.

d. **Large Scale.** A plantation with an area from 101 hectares which is usually managed by multinational companies with complete production inputs and certification from certifying bodies. Plantations are also equipped with their own research centers and support services for crop improvement and competitiveness development

Government Agencies

Government intervention is through government agencies who provide support and services for the different stakeholders in the Banana Industry.

a. **Department of Agriculture (DA)** - mandated to support individuals, groups or business entities engaging in the agricultural industry. Specific bureaus, attached agencies and corporations under DA related to the banana industry are as follows:

    i. Department of Agriculture - High Value Crops and Products Division - mandated to focus on crops with high market price and requiring careful handling compared to other commodities

    ii. Bureau of Plant Industry – mandated to support the Philippine plant industry stakeholders ensuring the availability of high quality seeds, advanced farming technologies, maintain the safety and integrity of plant food and support the export industry through proactive biosecurity

    iii. Agricultural Training Institute - the arm focusing on the transfer of technology and development of learning sites for farmers

    iv. Bureau of Agricultural Research - mandated on coordinating relevant research to support the different aspects of crop production

    v. Bureau of Soils and Water Management - focused on the monitoring the soil and water resources as well as conduct research related to agricultural utilization

    vi. Agricultural Credit Policy Council - mandated to provide financial support through equitable loans to farmers

    vii. Fertilizer and Pesticide Authority - focused on regulating the utilization, development and certifications related to fertilizers and pesticides

    viii. Philippine Center for Postharvest Development and Mechanization - focused on postharvest management and development of equipment to improve shelf life of the commodity

    ix. Philippine Crop Insurance Corporation - responsible in providing insurances to commodities

b. **Department of Trade and Industry (DTI)** - the government agency responsible for the regulation of trade and development of various industries resources inclusive of international relations which are important in the banana industry

c. **National Economic Development Authority (NEDA)** - functions as the premier socio-economic planning body of the government and authority in macroeconomic forecasting, and policy analysis and researches

d. **Department of Science and Technology (DOST) -** mandated to serve as the main researching arm for the country geared towards progress using science and technology. The Banana Industry has benefited from multifaceted support through research, development of equipment and various technologies

e. **Bureau of Food and Drug (BFAD) -** ensure safety of banana by-products which are entering the market

f. **Food and Drug Administration (FDA)** - assess and certify banana by-products fit for consumption

g. **Department of Agrarian Reform (DAR)** - responsible in facilitating land tenure, farmers' assistance and various support systems for agrarian reform beneficiaries

h. **Department of Interior and Local Government (DILG)** - through the Local Government Units (LGU), facilitates the agreements and local support to the different stakeholders engaging in the production and trading of the commodity

i. **Department of Environment and Natural Resources (DENR) -** assist in crafting policies for the banana industry to promote a sustainable environment

j. **Department of Public Works and Highways (DPWH) -** assist in road planning and route optimization of farm to market roads for the commodity

k. **Commission on Higher Education** - promote or endorse programs assisting in the engagement of higher education institutions in the banana industry

l. **State Colleges and Universities** – conducts collaborative research and development with relevant government institutions and agencies for banana production and farming systems, pest management, post-harvest, extension and agriculturdsdscal economics studies

Banana Research Institutions

As of the moment, there is no existing research center in the Philippines focusing on Banana Research. Private companies establish their own research centers and their results are considered as company trade secrets. In the public sector, government research institutions and SUCs collaborate and engage in studies in support for the needs of the Banana Industry.

Traders

Various level of traders is found in the industry contributing to the movement of the product through the chain:

a. **Farmer-Trader** – in-charge of producing and trading the bananas from farm gate to plate

b. **Middlemen** - responsible for trading of goods from different points in the value chain which can lead to the assembler if the goods are not in bulk

c. **Assembler/Consolidator** - focuses on collecting the necessary volume needed by a specific market usually involving transport to the area of demand

d. **Cooperatives/Small Companies** - composed of small farms which created an organization to consolidate and engage in business with multinational companies for export or extended to engage in international markets (i.e. Mindanao-direct Exporters and Growers Association, Inc. (MEGA) and Mindanao Banana Farmers and Exporters Association (MBFEA)

e. **Large Multinational & Filipino Owned Companies** - large business entities which usually engage in the international market and control the bulk of the supply in terms of production and marketing of the Banana Industry.
   - Unifrutti Tropical Philippines, Inc.
   - Dole STANFILCO
   - umifru Philippines Corp.
   - Lapanday Foods Corporation
   - Tagum Agricultural Development Company, Inc. (TADECO)
   - Del Monte Fresh Produce

f. **Processors** – engages in the production of value-added products such as banana chips, individually quick freeze (IQF) bananas and first fry chips for local and international market.

Regulatory Organizations on trade and prices

International trading of bananas involves discussion on tariff concerns through foreign relations. Such concerns are addressed by the National Economic Development Authority - Tariff Commission, Department of Agriculture and Department of Trade and Industry - Export Monitoring Bureau. The agencies function synergistically to provide the best market avenues and negotiate tariff agreements with the importing countries.

Pilipino Banana Growers and Exporters Association, Inc. (PBGEA) serves as the coordinating agency among the different companies producing bananas in the country. In the absence of a government regulatory board, the different players in the banana industry created the group which functioned to ensure compliance to international quality standards, continued competitiveness in the global market, to undertake and promote research for technological innovations, and to look after the welfare of all those involved in the industry. PBGEA's membership covered the welfare of the fifteen (15) provinces in Southern Mindanao (https://pbgeabeif.com, 2021). Smaller groups which were not included or contracted by members of PBGEA organized themselves in MEGA and MBFEA which functions similarly.

In terms of Cavendish trading, prices are set by the buyers in line with their expected quality of the products they will receive. Markets all over the world have varying standards which are then targeted by respective banana growers in order to command better prices. International certifications such as from Rainforest Alliance, Farm Trade, and Global Gap can also increase the buying price and product image which in return, increases the demand.

Prices on Saba and Lakatan are usually dictated by the supply available and the demand in the market. Price monitoring is usually done by DA and DTI yet due to production fluctuations, regulation on the prices is not set into policies.

PRODUCT FORMS

a. **Fresh Bananas** - the primary product form wherein the different varieties are being marketed. It is obtained via harvesting while some undergo post-harvest processes to improve shelf life in order to reach the target markets with reduced losses

b. **Banana Snacks** - are locally cooked bananas, usually sweetened and consumed as snacks. Cardava and Saba varieties are usually utilized. Examples are turon, pinaypay, banana cue, boiled banana, minatamis and banana fries. Recently, ready to fry banana snacks in the form of turon was also exported to countries with Filipino communities

c. **Banana Chips** - produced using Saba varieties by slicing them thinly and according to specifications. Some are sold locally while others are processed for international market demands.

d. **Banana for Animal Feed** - in some areas, Cavendish bananas which did not pass the quality for export are processed for animal feed. In some parts of the world, most parts of plantain or Saba varieties are fed to animals due to zero to low residues from chemicals.

e. **Banana Flour** - can be considered as a substitute to wheat flour and considered as one of the byproducts since it utilizes mature green bananas. All varieties can be considered for processing and has a growing market worldwide.

f. **Banana Ketchup** - a substitute for tomato ketchup, the condiment is very popular in the Philippines as one of the byproducts and recent reports presented the export potential of the product

g. **Banana Blossoms** - refers to flowers of the bananas, usually from Saba varieties, are gaining popularity as an ingredient for several Asian cuisines. In 2019, records have shown exporting of banana blossoms to other countries.

h. **Banana-derived Organic Fertilizers** - considered to complete the nutrient cycling, plant residues will be processed into organic fertilizers which can be utilized in the farm or to be sold to other farmers

COMMODITY INDUSTRY ANALYSIS: CAVENDISH INDUSTRY

Industry Summary

The Cavendish Industry is the largest and one of the most profitable industries in the Philippines. As the leading exported product of the country, there are numerous key players in the industry, the success of Cavendish production is facing different challenges. The following were observed:

1. Highest Cavendish Banana production is in the Davao Region, Northern Mindanao and SOCCKSARGEN, primarily produced for export as fresh bananas in Japan, Korea and the Middle East by large commercial plantations.
2. Production Rate is highest at 75 metric tons per hectare in Northern Mindanao and lowest is at 2.8 metric tons per hectare in MIMAROPA.
3. Observed high production rate efficiency of Cavendish in Mindanao can be attributed to the application of high production inputs and good agricultural practices in large banana plantations.
4. PhilGAP adoption is prominent in large farms and multinational companies compared to small-scale producers as it is aligned with the GlobalGAP. Increasing the adoption of PhilGAP can be done through reexamining the process and provide possible leniency and incentives to adopters.
5. Philippine Cavendish bananas are sold to Middle East and East Asian countries at varying quality and packaging which needs to be formalized in a form of quality standards in order for small scale producers to penetrate the market.
6. Classification of Cavendish bananas results into product variation which needs to be address by looking for markets which accepts other classes of bananas.

7. Issues on disease control resulting to market losses have resulted to unsold supply of Cavendish bananas yet the situation can be mitigated by promoting local consumption in the Philippines.
8. The increasing costs of production, specifically on labor costs, did not translate to increase in productivity which needs technological interventions to cope with the demand on efficiency

Area Harvested and Production for Cavendish

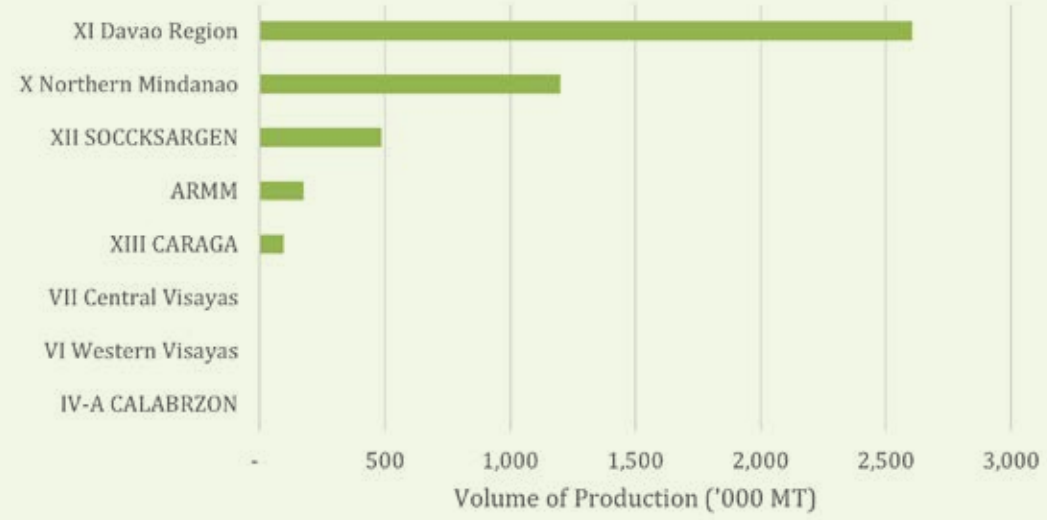
It is significant to note that only 19% (86,000 hectares) of the total banana plantation area in the Philippines is planted with Cavendish, despite the fact that the variety has the highest production volume of 4.7 million metric tons in the recent year having the best yield efficiency per unit area. This only proves that the current Cavendish production system and agricultural practices in place is efficient and advanced that the highest yield potential for Cavendish variety is achieved in the country.

Highest volume of production was observed from the Davao Region with an annual volume of production of 2.6 million metric tons, almost 50% of the total Cavendish production of the country (Figure 15). Second on the top list of Cavendish producers is the Northern Mindanao. Cavendish production in other regions of the country- Luzon and Visayas is close to none. Majority of Cavendish plantations of the country were focused in Mindanao alone basically for some obvious reasons. The location of Davao Region is not usually affected by adverse weather conditions such as the typhoon with strong winds. The climate in this region supports the ideal growing conditions for the banana plants.

Table 4 shows the comparison of yields per hectare for Cavendish in the regions of the Philippines in the recent year. Highest yield efficiency per unit area is observed in Mindanao region for Cavendish variety, an overall average of 43.99 metric tons per hectare was achieved for the recent year in Mindanao. While in the rest of the country an average of 11 and 13 metric tons per hectare only was realized from Luzon and Visayas, respectively.

In CALABARZON alone, 28 metric tons per hectare was the average yield efficiency – this is relatively higher than the average results generated from the Saba and Lakatan plantations. The same was observed from Cagayan Valley. This may mean that it is very possible to increase per unit hectare yield of the bananas in Luzon given the right variety and given the application of good agricultural practices. Thus, it is important to consider that the current banana plantations in Luzon and Visayas with very low yields per hectare may still be improved and rehabilitated. Low yields per hectare of Cavendish in Luzon and Visayas may be improved with the application of good agriculture practices and by investing on fertilizer inputs and disease management inputs to increase yield.

FIGURE 15. TOTAL VOLUME OF PRODUCTION (METRIC TONS) FOR CAVENDISH VARIETY IN DIFFERENT REGIONS OF THE PHILIPPINES



Source: Philippine Statistics Authority (2020)

TABLE 4. COMPARISON OF YIELDS PER HECTARE FOR CAVENDISH VARIETY AMONG THE REGIONS IN THE PHILIPPINES

	Volume of Production (MT)	Area Harvested (has)	Yield per Hectare (MT/ha)
CAR	-	-	
I Ilocos Region	-	-	
II Cagayan Valley	335	21	15.9
III Central Luzon	-	-	
IV-A CALABRZON	1,037	37	28.0
IV-B MIMAROPA	231	83	2.8
V Bicol Region	-	-	
Regional Values			
Total	**1,603**	**141**	
Average			**11.37**
VI Western Visayas	5,081	317	16.1
VII Central Visayas	662	81	8.2
VIII Eastern Visayas	85	25	3.4
Regional Values			
Total	**5,828**	**423**	
Average			**13.78**
IX Zamboanga Peninsula	169	17	10.2
X Northern Mindanao	1,337,798	17,735	75.4
XI Davao Region	2,505,525	47,082	53.2
XII SOCCKSARGEN	571,724	12,792	44.7
XIII CARAGA	121,532	2,985	40.7
ARMM	198,896	5,018	39.6
Regional Values			
Total	**4,735,643**	**85,628**	
Average			**55.30**
National Values			
Total	**4,743,074**	**86,192**	
Average			**55.03**

Source: Philippine Statistics Authority (2020)

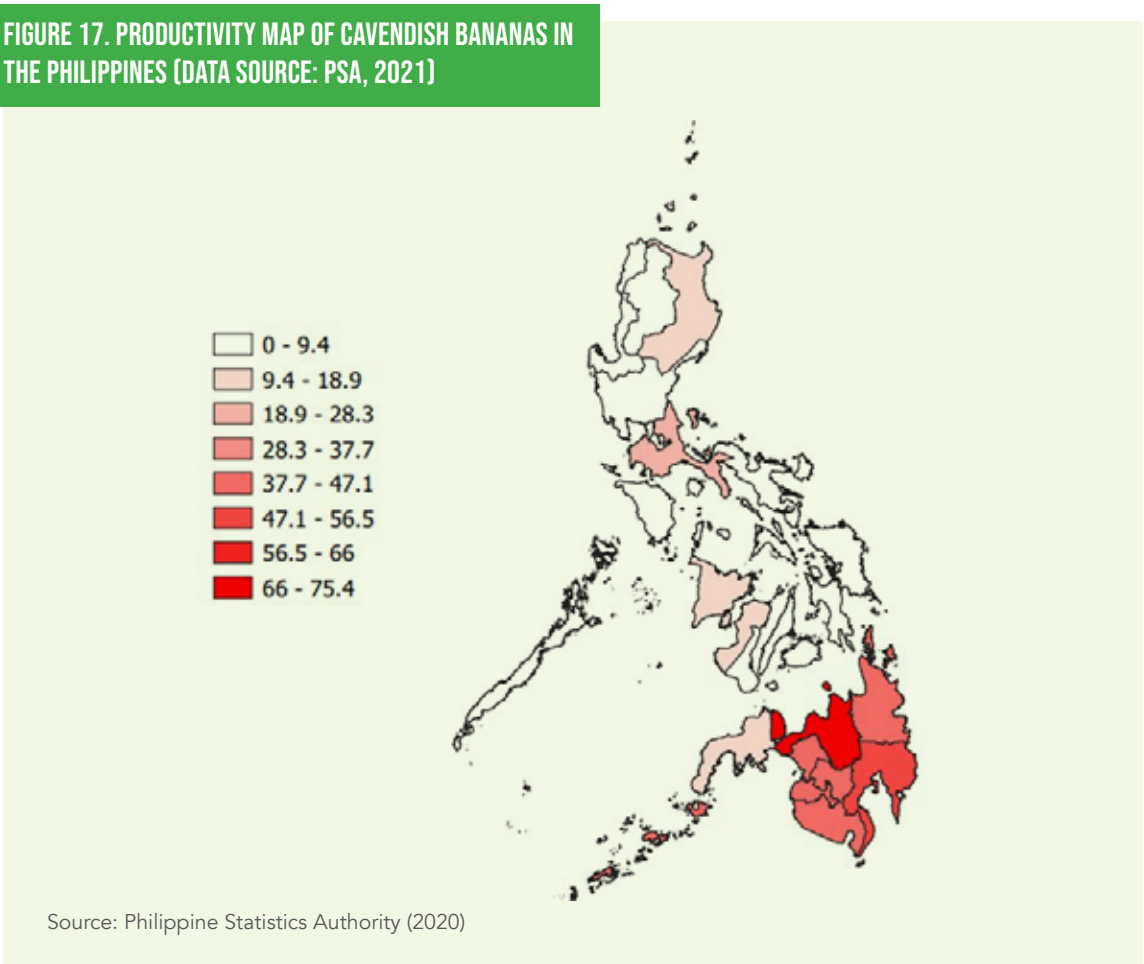
Key Distribution Areas

The Philippine Cavendish Banana Industry is one of the leading producers of quality and meet the production volume. Different importing countries have grown their preference for Cavendish bananas from the Philippines. Cavendish production is being led by different exporting companies which are also growing portions of their products in other countries (Figure 16).

FIGURE 16. DISTRIBUTION OF CAVENDISH PLANTATIONS OF EXPORTING COMPANIES IN MINDANAO (ADOPTED FROM BUGUIS (2015))

Source: Philippine Statistics Authority (2020)

FIGURE 17. PRODUCTIVITY MAP OF CAVENDISH BANANAS IN THE PHILIPPINES (DATA SOURCE: PSA, 2021)



Source: Philippine Statistics Authority (2020)

As shown in Figure 17, productivity is high in Mindanao compared to other island groups in the Philippines. Importing countries of bananas were from the Middle East and Far East regions of Asia. Far East countries such as China, Japan and Republic of South Korea have the biggest share of the country's produce while the latter two countries command the highest prices among importing countries (ITC, 2021).

Supply and Product Flow of Cavendish Banana

The production of Cavendish banana is established in terms of production technology yet continues to progress due to the dedication of private companies in improving yields, quality, nutrient management and more importantly on the resistance and reduced damage of pests and diseases. Being grown in wide monocropping system, Cavendish banana's pest and diseases can develop resistance to chemical controls over time.

FIGURE 18. SUPPLY AND PRODUCT FLOW OF CAVENDISH BANANA INDUSTRY (ADOPTED FROM BUGUIS (2015))

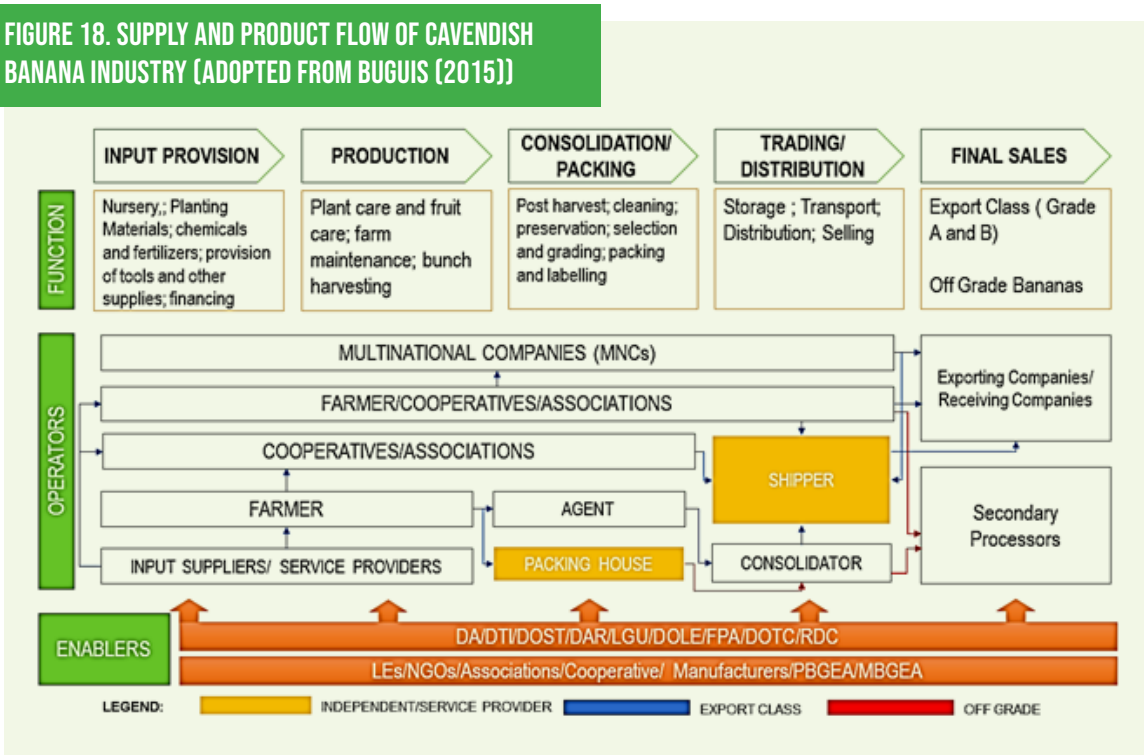


Figure 18 shows the movement of the products from the farms to the point of final sales. It shows that multinational companies in the Philippines are only producers for the exporting companies. Moreover, there are also independent operators in the product flow which acts as service providers only such as the packing house and the shipper of the bananas. Exported bananas can be produced by all producers be it contracted or independent as long as the standards are met.

Producers engaged in the Cavendish banana industry can be contracted or independent. Farmers and growers can either be contracted or independent from the MNCs. Before, plantations were established through leasing of lands yet due to some concerns on expansion, farmers and growers were encouraged to establish their own Cavendish farms. Aside from MNCs, associations and cooperatives have emerged to organize farmers and growers in far flung areas to consolidate the products of the Agrarian Reform Beneficiaries (ARBs) (Bulguis, 2015). Establishment of packing houses and even procurement of equipment needed for farm maintenance can be efficiently used when utilized in vast areas. In terms of inputs for farm establishment, MNCs support the sourcing of inputs needed for establishment

Considering the area covered by Cavendish production, numerous individuals have been employed. At estimate, there are 240,000.00 individuals employed in the industry which benefitted from the outsourcing activities (DOLE Region 11, 2010). Depending on the farm size, a hectare is needs a single man power (1:1.5 ratio) for the plant care and maintenance and farm maintenance.

Due to the different activities, several manpower arrangements have evolved over the years wherein workers can be found. Due to the expansion of planting areas, farmers became farm workers who engage as service providers to farms. According to the Center of Trade Union and Human Rights (2013), the following are the different classification of labor groups engaged in the Cavendish industry:

TABLE 5. CLASSIFICATION OF MANPOWER SERVICES INVOLVED IN THE CAVENDISH BANANA INDUSTRY.

Classification	Tasks
Regular workers	Also known as rank and file. These are workers directly employed by the company to perform work in various stages of banana production
Manning or Labor pool	These are workers under a labor cooperative that work in managed farms or in production plants. They are usually employed on a contractual basis and have lesser benefits than regular workers
Contracted workers	These are workers handled/employed by middlemen that are deployed to different growers depending on the latter's human resources needs.
Workers of Growers	These are workers directly employed by private growers and are not handled by a middle person or a third party (i.e. a manpower agency or cooperative)
Help-out	These are workers who work on a very seasonal or on-call basis. They substitute or fill-in the labor force of small growers when the "original" workers are absent or they need an extra hand in order to meet their quota.

Some Cavendish areas have adopted to the Philippine Good Agricultural Practices (PhilGAP). In Davao Region, there are 7 Cavendish producing firms which were awarded with PhilGAP certificate. The certificate became instrumental in improving the labor situation of farm. Entities producing Cavendish were encouraged to have PhilGAP cerificates since it is also needed in acquiring GlobalGAP which can be a value adding process wherein the price of the banana can be increased as well. Aside from the value-adding in bananas, adhering to PhilGAP can readily improve phytosanitary practices and

reduce disease incidents. In addition, DA provided training for farmers engaged in the industry for GAP certification which will allow them to engage in the world market as well as it is aligned with the GlobalGAP (Department of Agriculture, 2020).

Figure 19 shows the criteria in classifying the harvested banana and the corresponding tolerances. The criteria play a major role in passing the quality standards of the receiving market and a guide as well for farmers. Each market has a corresponding quality demanded which is received by the exporting company. The specifications are then given to the MNCs or by the agent or consolidator.

FIGURE 19. CLASSIFICATION OF CAVENDISH GRADING AND TOLERANCES (ADOPTED FROM: UCAT & DELA CRUZ, 2019)

CLASSIFICATION OF CAVENDISH BANANA GRADING AND TOLERANCES

BASIS FOR GRADING		SELECTION CLASSIFICATIONS											
BANANA CHARACTERISTICS		CLASS A		CLASS B						CLUSTER			
		BIG HANDS	SMALL HANDS	BIG HANDS			SMALL HANDS						
NO. OF DEFECTS	0-2	√	√	√			√			√	√		
	MORE THAN 2 BUT NOT 10% OF THE TOTAL SURFACE AREA				√	√		√	√			√	√
DIAMETER	39mm to 47mm	√	√		√			√		√		√	
	36 mm to 38mm			√		√	√		√		√		√
LENGTH	7.5 inch minimum	√		√	√	√				√	√	√	√
	6.5 inch minimum to 7.4 inch		√				√	√	√				
NO. OF FINGERS	Full Hand (12 fingers and above)	√	√	√	√	√	√	√	√				
	5-11 fingers									√	√	√	√

In the contracted growing by MNCs, the producers do not need to search for markets and are paid according to their produced boxes as stated in the contracts. In contrary, independent growers can suffer the problems in market price fluctuations which can cause drastic losses. The selling of their products is dependent to agents and product consolidators who independently transact to other countries (Fairtrade Network of Asia & Pacific Producers, 2018).

During the year, there are months that the demand is very high compared which results to price peaks. In times of price peaks, pole vaulting disrupted the volume quota of the MNCs and their corresponding exporting companies which also have markets waiting for the products. After price peaks, the pole vaulters will then disappear in the market and return again when the prices will be high again. Aside from purchasing contracted bananas, the influx of products also leads to price drops (Fairtrade Network of Asia & Pacific Producers, 2018).

In terms of off-grade bananas, some packing plants have consolidators who buys it at around P10.00 per kilogram which is then sold to banana chips processor for animal feed material (Bulguis, 2015).

The engagement of the contracted producer ends in the packing of the products for the market. The MNCs will be in-charge with the selling of the products. MNCs are contracted as well with buyers in the market for specific volumes and benefits on the present prices. However, the risk is also high for them whenever there are price drops in the market. To address such, some MNCs also include fixed prices for to their exporting companies. To reduce the risks of price failures, MNCs also signed contracts on fixed prices with exporting companies which are good for long periods of time such as 10 years or 25 years. Independent producers, cooperatives and associations have engaged in such scheme as well but others remain on selling their products with the current prices.

Strengths, Weaknesses, Opportunities and Threats Analysis

TABLE 6. SWOT TABLE FOR CAVENDISH VARIETY

Value Chain Segment	Target Industry Player	Strength	Weaknesses	Opportunities	Threats
Input Provision	Contract Growing Providers	Efficient provision of materials and equipment's Availability of technology to produce quality planting materials	Inadequate information on demand forecast (Shortage on planting materials)	Effective seedling systems	Lack of access to quality planting materials and lack of financial capacity
	Independent Farmers	Adequate knowledge and capability	Continuous price increase of inputs Challenges on capital availability to purchase required inputs	Institutional input support interventions	Continuous price increase of inputs
Production	Cavendish workforce	Trained and experienced workforce	Insufficient updating of knowledge and skills	Holistic approach for pest and disease (Foc TR4) control	Inexistent solution for current disease problems
	Production Areas/ Producers	Strategic marketing location Substantial volume of production	Reduced productivity Uneven quality of produce from small holder farms	Effective market tagging Improvement of collaborative extension services	Possible bankruptcy Noncompliance to market requirements

Value Chain Segment	Target Industry Player	Strength	Weaknesses	Opportunities	Threats
	Government Intervention	Established Philippine Good Agricultural Practices (PhilGAP) for Banana	Low adoption rate	Effective and collaborative promotion	Lack of production and market impact
Consolidation /Packing	Packing Stakeholders	Included in investment plans	Non-uniform compliance on standard operating procedures	Collaborative enforcement of legal frameworks and controls	Possible market shrinkage and losses
	Fly by Night Consolidators	High buying prices	Illegal sourcing of products		
Trading/ Distribution	Largest Buying Independent Market: China	High volume procurement	Outsourcing and plantation investment in other countries	Price limits establishments Timely market exploration	Possible negative economic effects
Final Sale	Contracted Producers	Consistency of income and support system	Flat rate income	Considerable incentive schemes	Vulnerability to competitive marketing

Cost and Return Analysis

The cost of production for Cavendish is based on the condition of a small farmer and a hectare of land alone for the cropping period. Accordingly, small scale farmers sell their products to consolidators. Farmers earn per box that they produce for the consolidator. The income per box is based on average amount for contracted lowland bananas as they dominate Philippine production. Costs were merged per phase of farm development from informants.

TABLE 7. APPROXIMATE COST AND RETURN OF A HECTARE OF CAVENDISH BANANA PRODUCTION*

	Inputs	Cost
A.	Development Cost	P100,000.00
B.	Pre-productive Stage	P150,000.00
C.	Productive Stage	P280,000.00
	Subtotal	
	TOTAL	**P530,000.00**
	Approximately 10% Mortality = 1800 mats	
	1800*21 kg (excluding stalk)	
	approx 37800 kg	
	Number of boxes @ 13.5 kg/box	
	approx 2800 boxes	
	Total earnings @235PHP/box	**P658,000.00**
	Net Income	**P128,000.00**
	Return of Investment (%)	**24.15%**

Source: PBGEA

Unlike other varieties, the itemized cost in Cavendish banana production is not given which also made it difficult to compute for depreciation rates. However, as observed, the bulk of the expenses was incurred during the productive stage of the enterprise which comprises 53% of the total budget. It is inclusive of the harvesting operations and the packaging wherein the selling of the bananas is in terms of boxes produced after postharvest procedure. Management cost is excluded since all operations are compensated with the existing minimum wage. However, the conservative budget may not have any buffer for other outbreaks of disease or even. Moreover, the farmer is also expected to have intensive management system to ensure that the production system is well-managed.

Another financial outlay for the production system based on a submitted business plan to The Landbank of the Philippines is presented in Table 8 wherein the budget reached at 1.3 million pesos. The costs were itemized and there are investments on farm infrastructures and mobilization. As shown, plant care has the bulk of the expenses followed by the establishment of overhead cable. Overhead cables are necessary for bunch support and transport t to the packing house. Accordingly, in the succeeding cropping for the follower, the expenses will only include the plant care, harvesting, packing costs and possible fees on irrigation maintenance. Return of investment is expected after the selling of the yield of the follower considering that most of initial costs were part of the farm establishment.

TABLE 8. APPROXIMATE COST AND RETURN OF A HECTARE OF CAVENDISH BANANA PRODUCTION BASED FROM A FINANCIAL INSTITUTION

Item	Activity	Cost
A.	Land Preparation	P51,250.00
B.	Planting	P217,180.00
C.	Plant Care	P302,200.00
D.	Harvesting	P45,000.00
E.	Overhead Cable	P295,690.00
F.	Packing House and Washery	P100,000.00
G.	Quarantine	P20,000.00
H.	Electrical Installation	P209,000.00
I.	Perimeter Road	P0,000.00
J.	Irrigation	P70,000.00
	TOTAL	**P1,330,320.00**
	Approximately 2250	
	2250*23 kg (exclusive of stalk)	
	51750 kg (first cropping)	
	Number of boxes @ 13.5 kg	
	3833 boxes	
	Total Income @235/box	**P900,755.00**

Sourced from LBP Lending Center

Cavendish Banana Plantation Development and Production Project (300 hectares)

In developing a plantation, MNCs commonly avail of large loans from banks due to their capacity to pay compared to small scale farmers. Financiers involved in large loans are the Landbank of the Philippines and other commercial banks. One of the assumptions of the plantation is out of the 300 hectares, only 250 hectare is productive and it is fully irrigated farm with a water treatment system. Investments for establishment of another plantation may be detrimental to the company due to the cost needed to increase the production thus financial assistance through loans is one of the best measures. In the present case, it is assumed that it is a 15-year loan at 6% per annum with a 3-year grace period. Table 9a shows that compared to the previous financial outlay, the development cost, working capital, equities and capitalized interest were already presented.

TABLE 9A. PROJECT FINANCIAL SUMMARY FOR 300-HECTARE CAVENDISH BANANA PLANTATION DEVELOPMENT AND PRODUCTION PROJECT. (IN US DOLLAR (FOREX RATE @PHP52.00)

	PER HECTARE	TOTAL COST	%
Development cost before working capital	**$ 35,917**	**$ 10,774,955**	**95**
Working capital	**1,930**	**579,012**	**5**
Project development cost	$ 37,847	11,353,967	100
Financing	$ 30,277	9,083,174	80
Equity	**$ 7,569**	**2,270,793**	**20**
Capitalized interest	**3,397**	**1,019,135**	
Total equity	10,966	$ 3,289,929	

Total developed area (300 hectares)

TABLE 9B. PROJECT FINANCIAL SUMMARY FOR 300-HECTARE CAVENDISH BANANA PLANTATION DEVELOPMENT AND PRODUCTION PROJECT. (IN PHILIPPINE PESO (FOREX RATE @PHP52.00)

	PER HECTARE	TOTAL COST	%
Development cost before working capital	P1,867,684.00	P560,297,660.00	95
Working capital	P100,360.00	P30,108,624.00	5
Project development cost	P1,968,044.00	P590,406,284.00	100
Financing	P1,574,404.00	P472,325,048.00	80
Equity	P393,588.00	P118,081,236.00	20
Capitalized interest	P176,644.00	P52,995,020.00	
Total equity	P570,232.00	P171,076,308.00	

Table 10a and 10b shows the financing terms and the amount to be paid to the financial institution. Despite the large earnings per se, the amount to be paid for the annual amortization of the principal is 99.33% of the income from the boxes provided in in the annual production. Excluding the interest rate, the MNCs should find means in paying the remaining amount in order to have net positive returns.

TABLE 10A. FINANCING TERMS IN US DOLLARS

Principal Amount Of Loan	$9,083,174	Total Loan Term [In Years]	15
Annual Amortization Of Principal	756,931	Grace Period – Principal [In Years]	3
Annual Production – At 13.5 Kg Boxes	1,137,418	Payment Term [In Years]	12
Per Box	$ 0.67	Interest Rate [Fixed]	6%

Loan Principal Is Paid In Equal Installments Over Remaining Term (Term Less Grace Period Of 3 Years) Of The Loan

TABLE 10B. FINANCING TERMS IN PHILIPPINE PESO

Principal Amount Of Loan	P472,325,048.00	Total Loan Term [In Years]	15
Annual Amortization Of Principal	P39,360,412.00	Grace Period – Principal [In Years]	3
Annual Production – At 13.5 Kg Boxes	1,137,418	Payment Term [In Years]	12
Per Box	P34.84	Interest Rate [Fixed]	6%

Loan Principal Is Paid In Equal Installments Over Remaining Term (Term Less Grace Period Of 3 Years) Of The Loan

Benchmark Analysis

Cavendish plays a major role in contributing to the economy as an exported fresh fruit. In terms of government interventions, the banana industry is a part of the regular program which mainly promotes better production technology and practices as well as financial assistance in terms of production capitalization and even crop insurance (Department of Agriculture, 2020; Deluna et al, 2016)

TABLE 11. PHILIPPINE GOOD AGRICULTURAL PRACTICES FOR BANANA PRODUCTION VS THE SMALL-SCALE BANANA PRODUCTION PRACTICES*

Cultural Management	Philippine GAP	Small Scale Growers Practice
1. Planting Materials	Tissue cultured materials from accredited TC laboratory	Use of plant suckers only sourced from any healthy-looking banana plant in the farm
2. Drainage and Irrigation	• Drainage canals (primary, secondary and tertiary) must be constructed to prevent water logging • In areas with pronounced dry periods, irrigation system is recommended – drip irrigation or under tree system	• Drainage canals are optional depending on the topography of the area • Farms usually rainfed, no irrigation system is put in place
3. Planting lay out (depends on the banana variety being planted)	• Planting density: 2,000 – 2,700/ ha • Planting Distance: 2.0 m x 2.5 m 1.8 m x 2.0 m	Depends on the most convenient and efficient system established by the grower
4. Fertilization	Fertilizers should be applied based on the quantitative information on soil nutrient obtained through soil analysis	Fertilizers are occasionally applied

Cultural Management	Philippine GAP	Small Scale Growers Practice
5. Crop Protection	• To control the entry of diseases such as Moko, Bunchy Top, Bract Mosaic, Fusarium Wilt disease, the farm should regularly conduct survey for the presence of disease and implement eradication and treatment area interventions. • Visual inspection for the symptoms of diseases should be conducted regularly.	Visual inspection of the banana farm is not regular Disease management for banana farm is not usually applied
6. Mat Sanitation	• Removal of dried bracts from the pseudostem should be carried periodically to minimize insect infestation (scale insect, mealy bugs and aphids) • FPA-registered pesticides or oil should be sprayed in order to control the insect infestation and spread of diseases • During the operation, tools should be regularly disinfected using quaternary products to prevent spread of disease	Occasionally applied for farm sanitation, depending on the available labor for field operations
7. Fruit Care and Harvesting	• Bud injection - control of thrips by chemical/ non-chemical approach • Bunch spraying with fungicide a week after bud injection • Deflowering, defingering, hand pruning and debelling carried out either prior to bagging • Bagging should be done when all the hands have emerged, after the buds and false hands have been removed and after the bunch has been sprayed – to prevent scaring beetle damage	No fruit care practices are applied before harvesting

*Philippines National Standards PNS/BAFPS 129:2013

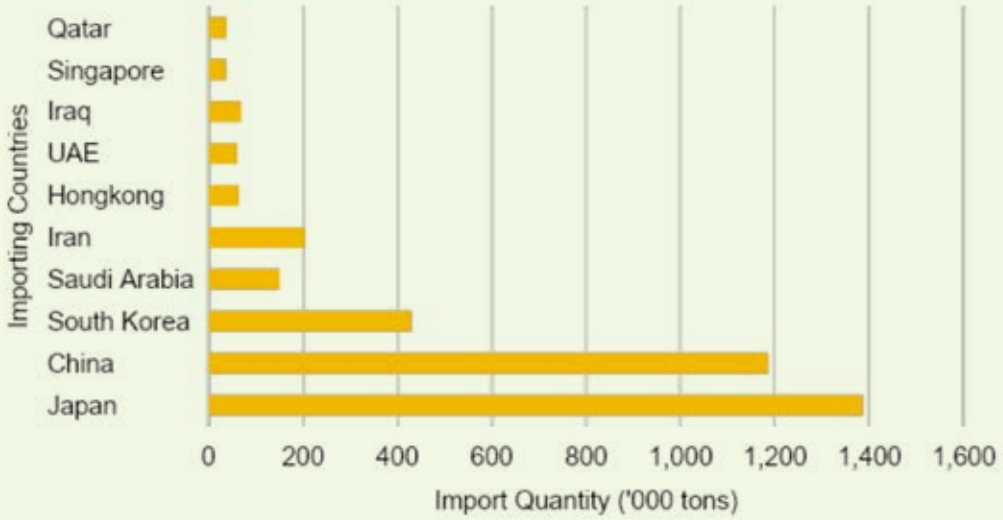
The Philippine production practices for Cavendish banana is generally standardized, following the Philippine Good Agricultural Practices (PhilGAP) for Banana Production developed by the Bureau of Agriculture Fisheries and Product Standards (BAFPS). Production for most Cavendish plantations in Mindanao, specifically, is Philippine GAP adapted primarily because most of the banana growers in this area are corporate farms producing Cavendish for the export market (Banzon, 2013). Application of the Philippine GAP in the Mindanao provinces yielded high production rates for every unit area to as much as 86% more than the Cavendish production rates in Luzon and the Visayas.

Figure 20 illustrates the trade map of the Philippine bananas in the world. The Philippines exports its Cavendish banana to sixteen (16) countries worldwide (Figure 21). The majority of the Cavendish bananas produced in the country are imported by Japan (43%), China (30%) and Republic of Korea (12%). Smaller quantities in terms of volume are being sold to the Middle Eastern countries.

FIGURE 20. TRADE MAP OF THE PHILIPPINE BANANAS IN THE WORLD

(Source: ITC, 2021)

FIGURE 21. TOP 10 BANANA IMPORTING COUNTRIES FROM THE PHILIPPINES BASED ON THE 2020 IMPORT QUANTITY

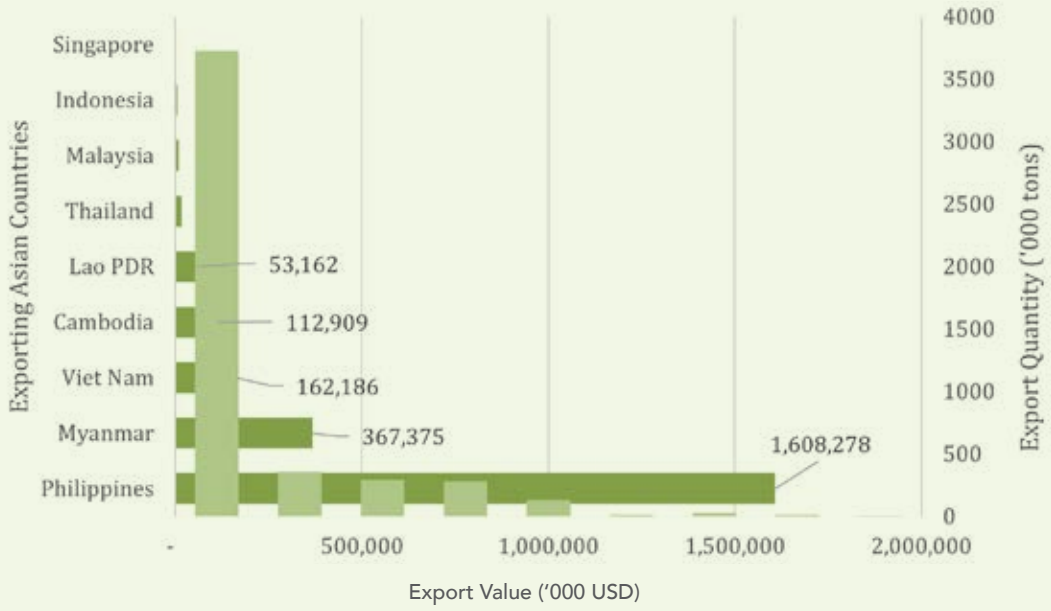


Source: ITC calculations based on National Statistics Office, Republic of the Philippines statistics

The Philippines being second in the world as a banana exporter, next to Ecuador is the only Asian country among the top banana exporters in the world. In comparison with other top banana exporting countries in Asia namely: Myanmar, Vietnam and Cambodia and Lao PDR, the Philippine Cavendish exports is 90% more than the banana exports of these countries (Figure 22).

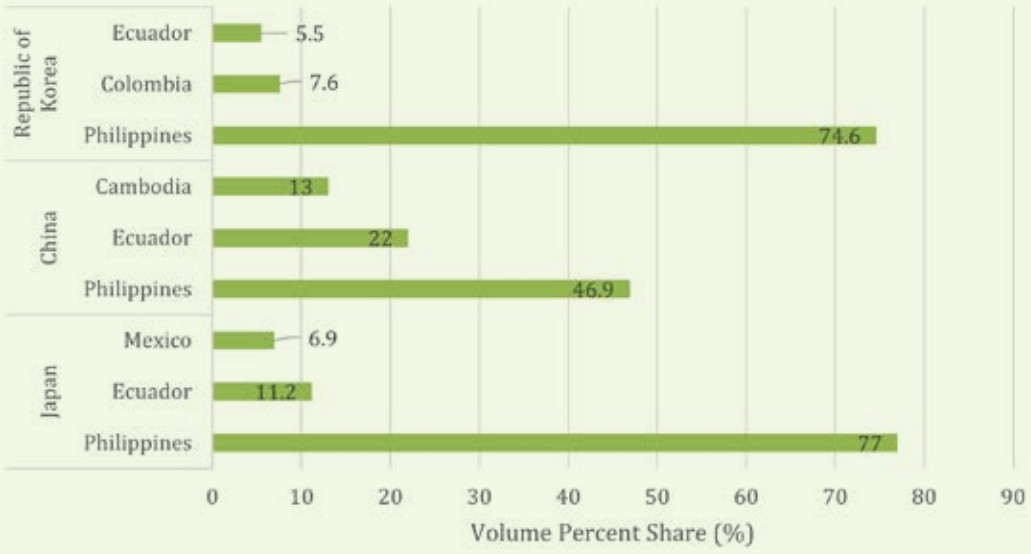
Comparing the Cavendish imports from our Top 3 banana importers, the largest volume of banana imports is from the Philippines having 40% to 70% share of the import volume (Figure 23). A big difference in imports from other export competing countries such as Ecuador, Colombia, Mexico and Cambodia can be observed. Competing with the other countries as of the moment might not be very necessary, but quality management should be given importance specially with the heightening concern on the MRLs (the maximum concentration of a pesticide residue permitted in or on agricultural commodity).

FIGURE 22. BANANA EXPORTERS IN ASIA BASED ON THE EXPORT VALUE AND QUANTITY



Source:: ITC calculations based on National Statistics Office, Republic of the Philippines statistics.

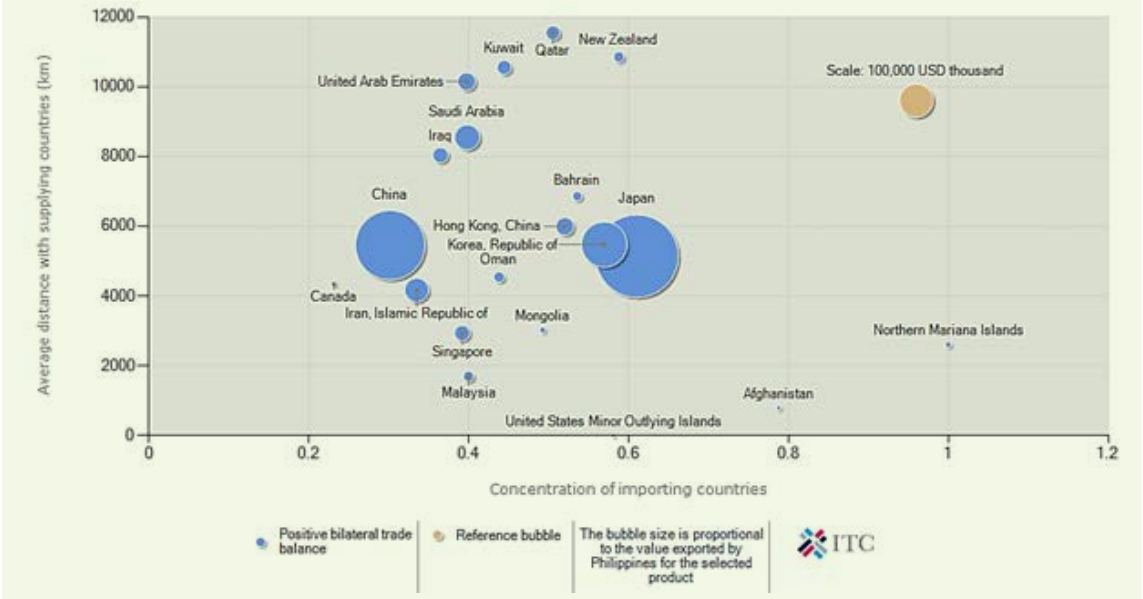
FIGURE 23. VOLUME PERCENT SHARE (%) OF TOP 3 COUNTRIES SUPPLYING CAVENDISH BANANAS TO JAPAN, CHINA AND SOUTH KOREA



Source:: ITC calculations based on National Statistics Office, Republic of the Philippines statistics.

In terms of value, the top ten (10) importing countries have competitive prices while the top (3) importing countries in terms of volume offer the highest prices as well. Despite the high value of Cavendish bananas in Singapore, their limit in importation is primarily due to their small population compared to Japan, Republic of Korea and China. Accordingly, the said countries have stricter compliance in terms of the maximum residue limits for pesticides (MRL) and countries from the Middle East have higher limits compared to those countries. However, as shown in Figure 24, the countries from the Middle East are farther from the Philippines and the volume imported is much lower compared to the top three (3) importers. Logistics in terms of transportation and maintenance of product quality can imply higher costs as well.

FIGURE 24. CONCENTRATION AND AVERAGE DISTANCE WITH SUPPLYING COUNTRIES OF NATIONS IMPORTING BANANAS FROM THE PHILIPPINES



Source:: ITC calculations based on National Statistics Office, Republic of the Philippines statistics.

Despite the advantage of the Philippines in such markets, the threats of Foc TR4 in Cavendish banana is also faced by its contemporaries. As preventive measure, the Philippine government established standards to promote phytosanitary practices for bananas known as PNS/BAFPS 129:2013 or Code of Good Agricultural Practices (GAP) for bananas (Department of Trade and Industry - Bureau of Product Standards, 2013).

Moreover, a quality management system for the implementation of various GAPs in the country called PhilGAP was established to assess, certify and audit farms. PhilGAP is aligned with GlobalGAP to satisfy various concerns of the international market and to have at par or better positioning of products (Agricultural Training Institute - Cordillera Administrative Region, 2021). Despite the efforts of government agencies concerned, adoption rate and certificate were quite low compared to the competitors (Secretario, 2017). Adoption of GlobalGAP can be advantageous in the global market as exhibited by Ecuador. Ecuador, the top exporter of Cavendish banana, has 71,800 hectares certified by GlobalGAP in 2016 which is around 39.81% (FAOSTAT, 2021) of its country's area of production and 26.40% of the total area certified by GlobalGAP (Food and Agriculture Organization, 2016). In terms of market, Ecuador caters the demand of the United States of America (USA), Russia, the European Union, Australia and Canada which do not impose or have minimal tariffs. The USA has the highest importation of Cavendish bananas in 2019,19.7% was supplied by Ecuador without tariff despite the existence of Most Favored Nation (MNF) Agreement which uniformly imposes a 0.35% tariff. The locations are also strategic for logistics for Ecuador compared to the Philippines.

Ecuador is similar to the Philippines; it is a developing country wherein multinational companies (MNCs) contracted lands to grow bananas for trade. Though it is mainly a lowland area, the soil and other environmental factors enable the country to produce quality bananas. With the potential, the government of Ecuador provided agricultural credit support, port construction, highways, price regulation and disease control assistance as early as 1948 (Human Rights Watch, 2002). In the Philippines, support programs were extended to the Cavendish banana industry especially in resolving the issues of Foc TR4. From the budget of Republic Act 11494 also known as Bayanihan 2, the Fusarium Wilt Rehabilitation Program with a budget of PHP 100,000,000 was included in order to assist the industry in recovery from the disease and to sustain the production effectively (Department of Agriculture, 2020).

In terms of issues on pole vaulting and fly by night buyers, 80-90% of Ecuador's produced bananas are bound in contracts which prevented such activities. Compared to the present situation in the Philippines, the number of banana growers who engage in direct trading due to spot pricing are increasing. Several lawsuits were filed due to contract violations

which also placed the industry under the negative light. However, due to the nature of trading in the Philippines, the freedom resulted in more cases of spot trading instead of engaging in contract growing (Aquino, 2014).

National Research Centers for Banana

Currently in the Philippines, usual research for Cavendish bananas - production, disease management and post-harvest studies happens in private sector laboratories. Occasionally there are research collaborations between government research institutions, SUCs and the private sector. This is especially true for the recent Fusarium Wilt disease outbreak in Mindanao. However, despite the joint efforts of the private sector and the government to educate small scale banana growers of the latest production technology updates, some production practices cannot be rightfully implemented by the small-scale growers because some practices are not suitable for small scale production. Also, there are cases when there are some advanced technologies or new varieties that are not disclosed to small growers that result to competitions which left the small-scale growers behind.

In contrast, the international contemporaries which are leading the world banana production and export of Cavendish have research centers dedicated to banana research. These research institutions are usually supported by their respective governments and/ or supported by the levy from every box of banana exported to other countries. Latin American Cavendish exporters have Banana Grower Associations and these groups established their own Banana Research Arm. Examples of which are the following:

1. Costa Rica – Corporacion Bananero Nacional (CORBANA)
2. Colombia – Association de Bananeros de Colombia – Centro de Investigaciones del Banano (Augura - CENIBANANO)
3. Taiwan – Taiwan Banana Research Institute (TBRI)

It is however important to note that Ecuador, despite its leading banana production and export in the world has no established banana research institution. Association of Banana Exporters of Ecuador (AEBE) is the only existing organization for banana exporters in the country.

Government supported research institutions particularly for banana are the following:

1. India – National Research Center for Banana (NRCB)
2. China – Institute for Fruit Tree Research – Guangdong Academy of Agricultural Sciences (IFTR-GDAAS)

In the Philippines for banana research, some efforts have been made in collaboration with an international banana research institution - Bioversity International (formerly INIBAP) by establishing a National Banana Repository Center at the Bureau of Plant Industry - Davao National Crops Research Development Center (BPI-DNCRDC) as the Field Genebank and at the National Plant Genetic Resources Laboratory (NPGRL) of the Institute of Plant Breeding, UP Los Baños as the in vitro repository. Also, some budget has been allocated by the Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development (PCAARRD) for the development of the Package of Technologies for Bananas (POT for Banana) and for several small-scale banana production-related research. The Department of Agriculture – Bureau of Agriculture Research (DA-BAR) and through the BPI-DNCRDC also funded research, extension and rehabilitation activities for the mitigation and management of the recent Fusarium Wilt TR4 pandemic in Mindanao.

Despite the funding of several projects for banana research, most are coursed through existing government research institutions and university research departments. Most researches funded are usually basic research, laboratory studies, yet lacking in field verification and application to address the needs of banana growers.

To address the above-mentioned concern, the National Banana Congress held in 2016 crafted a resolution for the establishment of the research center which requires at least PHP 500,000,000.00 as initial funding. However, in 2021, it is not yet established and research activities related to banana for public utilization are dependent on the studies conducted by State Universities and Colleges (SUCs). Though government funding was provided, the maturity of the technology for public utilization is not realized due to the limitations of the research.

Government funded banana research centers in other countries provided technical support, economic literacy and strategic guidance to small scale growers and contributed well in the pest management for the commodity. Public-private partnerships became the avenue for sharing best practices through collaborations.

Competitive Analysis

The quality of Cavendish banana from the Philippines is one of the best in the world market which makes it very sellable. Lowland and Highland variants are also available which is also responsible for commanding competitive price margins. Strategic product positioning must be considered through targeting the markets with high buying prices and applying corresponding production practices to achieve the standards of the target markets.

In the international arena, the growing banana plantations in the neighboring ASEAN countries come as close competition for the Asian markets. Accordingly, China sourced out from Cambodia and Vietnam which reduced the demanded volume from the Philippines. The reason for such a decision is the number of cases of Covid-19 patients which places the bananas from the Philippines at high risk compared to bananas from the competitors. Alongside with the problems on Foc TR4, the control of the Covid-19 pandemic affected the banana industry negatively which is beyond the control of the industry (Produce Report, 2020).

During the pandemic, the international market encountered a net surplus which resulted in an overall lower buying price compared to the expected. Latin America is also closer with better logistics and trade agreements in the Western Market, thus targeting the desired markets must be supported with trade agreements in order to manage competitions.

Market Trends And Prospects

Although Philippine Cavendish bananas are lauded for their quality in the international market, local consumption did not increase due to preferences as well as lack of a government and private sector marketing plan to sell cavendish to the local market. However, increased consumption and awareness can promote the intake of Filipinos for the product

In Davao del Norte, Cavendish banana producers supply bananas in offices in order to promote its consumption for health benefits. Some developed ripening rooms to prepare

the products. Producers also sponsor Cavendish bananas to several events to give the opportunity for people to taste their product. In stores, several supermarkets display Cavendish bananas especially those who cater foreign shoppers who are used to the said variety. On 7-Eleven, a convenience store started selling Cavendish bananas at ₱ 29.00 for two pieces (7-Eleven Philippines, 2018).

In the international context, there are countries which produce enough Cavendish bananas for their consumption. India, the top producer of Cavendish banana, exported on a volume valued at 57.57 USD million. It is minimal compared to the potential due to high consumption of bananas by its people. They promoted bananas as a part of their meal, similar to China. China, being one of the biggest importers of bananas due to its population, considered it as a part of their daily meals which paved the way for increased consumption.

As the bulk of the Cavendish production is marketed internationally, the dynamics of each country's socio-economic status can affect their importation rates. During the pandemic, importing countries have a decline in the volume demanded due to economic decline. A bigger threat is the rise of new Cavendish producing countries in Asia, such as Cambodia and Vietnam, supplies 50% of the China's demand. Thus, there is a need for our independent growers to sell their fruits not only to the China market but to the Japan and Korean market as well. There is also a need to be more aggressive in marketing our fruits in China. Very few exporters are directly shipping to China. Most go through Chinese buyers even most of the multinational companies. Also, it is also important to invest in processing of the fresh products into other forms with longer shelf-life and marketability.

Off-grade bananas disposed from the packing houses are utilized for different products such as animal feed, ketchup, and flour. In communities near plantations, off-grade bananas are gathered and chopped by family members of workers. Chopped bananas are then dried and sold per kilogram for feed processors which serve as an alternative income. It is commonly bought at PHP 4.00/kg by buyers who consolidate the products and sell the volume to feed mills.

Banana ketchup is also one of the by-products of banana which is also derived from the Cavendish variety and invented by Maria Y. Orosa. As the country was colonized by

Americans, tomato ketchup became popular yet the country is not producing the variety for ketchup production. The abundance of bananas gave an idea for the innovator. The smoothness and slight sweet taste of Cavendish made it ideal for addition of vinegar and spices. Primarily patronized by Filipinos, banana ketchup is now being exported as well to other countries primarily consumed by Overseas Filipino Workers (OFW) who miss home. In 2019, 4,189.89 metric tons (MT) of banana ketchup was exported earning P212.61 million. Major importing countries are USA (35.5%), Canada (21.9%), and United Arab Emirates (UAE) at (18.1%) (Philippine Statistics Authority, 2019).

Flour derived from bananas is also a trend due to health preferences for gluten-free baking material. Gluten is considered as an allergen which is absent in banana starch. Ratio of polysaccharides for food preparation is ideal in the Cavendish variety, organically produced Cavendish are commonly sourced out yet some buyers settle with the safety measures alongside with price reduction. However, shipments of the Philippines are intended for feed use which, in 2019 was valued at PHP 28.16 million with a corresponding volume of 1,566.52 MT. Most of the product was imported by the Republic of Korea (74.3%), Japan (22.1%), and Germany (3.6%) (Philippine Statistics Authority, 2019).

However, among these, processed products require large capitalization in terms of training, equipment and product marketing. Supporting individuals and organizations to engage in international trade can also be challenging to the government as to prevent internal surplus of products.

Key Demand Drivers

The demand for Cavendish bananas is continually growing yet the management of different pests and diseases is one of the challenges. In order to meet the visual quality standards, utilization of chemical controls is often done in most plantations. One of the negative effects of continuous use of chemicals is passing the tests for maximum residue limits (MRLs). MRLs differ in each importing country which often lead to non-acceptance of the products.

Currently threatened by Asian Countries such as Vietnam and Cambodia, the countries mentioned has 50% of the import market for Cavendish bananas in China. The situation

threatens the main market for our independent growers (Table 12) and needs to be addressed by increasing product quality to engage in the "Up Markets". With the recent trade agreement on zero-tariff engagement with South Korea for fresh bananas, it also signals increased demand from the said country.

TABLE 12. EXPORT QUANTITY OF ASEAN CAVENDISH EXPORTERS, 2016 - 2020

ASEAN Countries	Export Quantity ('000 Tons)					Annual Growth in Quantity (%) 2016-2020
	2016	2017	2018	2019	2020	
Philippines	1,397	1,663	3,388	4,351	3,725	34
Myanmar	109	233	190	410	358	34
Viet Nam	91	90	128	255	293	40
Cambodia	0.001	12	27	112	278	1,430
LAO PDR	275	212	129	642	131	59
Malaysia	25	27	24	23	28	-11
Thailand	24	29	38	23	15	1
Indonesia	19	18	30	22	12	- 6
Singapore	0.19	0.15	0.016	0.25	0.03	- 28

Source: ITC calculations based on National Statistics Office, Republic of the Philippines statistics

As Japan has agreed to zero tariff on small table bananas, the shift of demand to smaller varieties can reduce the demand of Cavendish in the said country. Being banked on the possible organic production, it can lead to change in preferences. However, this is still a very small market for other variety of bananas. High tariff concerns on Cavendish bananas are also a concern which was raised by several groups. Accordingly what can happen to China can happen to Korea. We stand to lose up to 50% or more of our market in the near future. (two to five years) In terms of processed products from Cavendish, the shift of demand was observed to take on the positive movement as the population grows. As most products become stable after processing, storage can be done when the prices are low and can be released. Banana ketchup's demand will increase when tomato ketchup and similar products are expensive and the global acceptance have increased due to the Filipino diaspora all over the world (Kabir, 2021)

Market Prospects

The results of the rehabilitation of Cavendish farms from Foc TR4 will directly affect the market prospects. Until now there were no significant results from the intervention to stop the TR4 although some companies and individual growers have been able to contain the disease. Due to this, a considerable decrease in the area of production already affected the recent volume produced (Business Mirror, 2020). With the constant threats on the supply, the companies and even small farms cannot fully commit to contracts. As a result, our traditional markets, like Japan, imports from other countries and reducing our share to 77% and is expected to go down further. In the current scenario and despite the forecast of increased demand, the MNCs could fail to meet market demands and the products will stale in the country.

In order to cope with the reduced supply and probable non-importation of Cavendish, the public may consider its consumption. Alongside with the possible lower prices compared to Lakatan, individuals might consider it to be added for other products such as smoothies and shakes (Eusebio et al, 2002). Moreover, Filipinos who went abroad could have adopted to the taste and preferences of Cavendish can be instrumental in the primary marketing of the product. Cavendish is also used in a variety of recipes compared to other varieties which can be explored to continually market the variety and reduce the losses for Cavendish producers (Dotto et al, 2018).

Areas for Consideration:

With the pressing concerns in the Cavendish Industry, the following can be considered as additional conditions to be address:

1. The increase in labor costs without being translated to additional productivity can be avenues for optimization through the development of artificial intelligence as substitute to human labor. Other technological advances in terms of mechanization to further reduce production cost in the long term
2. One of the strategies to ensure the standardized production protocol and improvement of product quality to expand our market is the promotion of public-private partnership.

Target Setting for the Cavendish Industry

Vision/Mission:

Philippine Bananas and Banana-related products to consistently meet world quality standards with good productivity, sustainable production practices, thus ensuring economic viability for its stakeholders.

Goals and Targets:

1. Farmer productivity is maintained at 55,000 tons/ha per year for Cavendish
2. Increase production area by at least 1% per year
3. Increase Market share by 1% in both Fresh Fruit bananas
4. Attain 100% world standard product quality
5. Support Stakeholders in moving up in the Value Chain
6. Identify Resources and Financing windows for the Banana Value Chain players
7. Improve productivity related infrastructures and post-harvest facilities in the Banana value chain
8. Establish Banana Research and Development structures and systems
9. Strengthen the Banana Industry Governance through the establishment of the Banana Industry Council as the lead group for the Philippine banana directives

Short Term Targets for 2022 - 2025

Table 16 shows the annual target for banana productivity from the year 2022 to year 2025, provided that all factors affecting banana production all over the country hold stable for the next 5 years. Increasing productivity per hectare is the primary target for the next years, harvesting more fruits each year for every hectare of banana farm.

From recent discussions during the National Food Security Summit (NFSS), several factors were identified affecting banana productivity. The following production factors, if not properly addressed in the following years, may largely affect the short-term targeted productivity for 2022-2025.

a. Availability of Improved Foc Tr4 Resistant Cavendish Variant Selections. Since several commercial plantations have their own selections of Foc TR4 resistant varieties, the small Cavendish growers are left behind not having the true to type Resistant Selections, and thus are left without any option but to shift crop to Saba, corn or rice. Available resistant somaclone selections from GCTCV 218/219 should be made available for small growers through accredited Tissue Culture Laboratories in the Cavendish growing regions.

b. Development of Foc TR4 resistant variety. Research proposals have been forwarded to National Research Institutions (DA-BAR, DOST-PCAARRD and SUCs) for the development of Foc TR4 resistant Cavendish banana for the improvement of our productivity per unit area. Existing Foc TR4 resistant somaclone variant selections are useful and market acceptable to commercial multinational Cavendish growers at the moment. However, for small growers with no market contracts, Chinese consolidators prefer not to buy the fruits of the Foc resistant Cavendish selection. Thus, developing our own resistant Cavendish banana - making use of both conventional and non-conventional methods of crop improvement is necessary.

c. Accredited Tissue Culture Laboratories. It is notable that there are existing commercial tissue culture laboratories catering to the needs of the local growers primarily for Grand Naine and Fusarium Wilt TR4 Resistant varieties. The local tissue culture laboratories should to be required to apply for accreditation for assured mass production of true-to-type resistant selections, and these in turn will be planted to rehabilitate Foc TR4 infested Cavendish plantations.

d. Incentive program for companies and individuals who have successfully controlled TR4 and once proven to be indeed effective to disseminate it to all the stake holders. There are some companies and individuals who have been able to control the TR4 and the government needs to know about these initiatives. It is suggested that the government gives an award to the top three or top five initiatives that prove to be effective in controlling TR4. In this way we get these companies and individuals to come out and offer what they have done which shall then be validated and tested by giving these companies and individuals areas to show case their initiatives and prove their effectiveness.

e. Establish market share of stakeholders (Certain percentile for smallholders to guide

them in penetrating up markets) The shifting market direction of the Philippine Cavendish Bananas to the upper priced markets should be inclusive for all producers. Being affected by the changes in market perspective of China, the smallholders need interventions to sustain their enterprises. Smallholders should be encouraged and engaged in levelling their products with the large producers through provision of a certain market share. Guidance from established and certified farms will be instrumental not only for product improvement but also in synchronized phytosanitary measures

f. Annual Banana Congress. An avenue for banana scientists, researchers and banana stakeholders to present up to date research findings on technologies that will improve banana production, pest and disease management, advances in production systems, latest market prospects and value adding technologies for processed banana.

g. Increase private-public promotion for local consumption of Cavendish. Although being considered one of the leading Banana producers in the world, the Philippines does not extensively celebrate Philippine Banana Day which was said to be on the 15th day of April (Antonio, 2021) while the World Banana Day is said to be on the 18th day of April (Kabithra, 2021). It could serve as a celebration, awareness and product promotion. Promoting Class B Cavendish bananas can be done by selling in the markets, canteens, food hubs and office pantries at competitive prices with Lakatan

TABLE 13. TARGET FOR CAVENDISH BANANA PRODUCTIVITY

Parameter	2021	2022	2023	2024	2025
Productivity (tons/hectare)	55.03	55.03	55.03	55.03	55.03
Area Planted (hectares) 1%	86,191	87,052	87,923	88,802	89,690
Production (metric tons) 1%	4,743,090	4,790,521	4,838,426	4,886,811	4,935,679

Medium Term Target (2026 - 2030)

Establishment of additional post-harvest and processing facilities in strategic areas of the country:

- Maximum Residue Limit (MRL) Analysis Laboratories near production areas in order to regularly check the compliance of small-scale growers to the respective market standards. It can also be utilized by other varieties and commodities for safe standards and certifications
- Banana By-Products Processing Facilities to maximize the utilization of off-grades and possible surplus bananas from the farms. The excess bananas will be turned into items with longer shelf life and higher prices.

    Banana Flour Production Facilities for animal-grade and human-grade consumption are highly in demand which can then be clustered in order to produce the volume for the different markets.

    Banana Chips Processing Facilities can be considered since there are also markets for Cavendish chips from Dwarf Cavendish Bananas which are currently supplied by neighboring countries and India.

Long Term Target (2031 - 2040)

Alongside the government's thrust by 2040, every Filipino enjoy a strongly rooted, comfortable, and secure life. It is envisioned that we will all enjoy a stable and comfortable lifestyle, secure in the knowledge that we have enough for our daily needs and unexpected expenses, that we can plan and prepare for our own and our children's future. Our family lives together in a place of our own, and we have the freedom to go where we desire, protected and enabled by a clean, efficient, and fair government (Ambisyon Natin 2040)

- Local farmers of Cavendish will realize a comfortable life (maginhawa) by increasing income of farmers thru long term sustainable production practices that will encourage higher production volumes and good quality produce
- Cavendish farmers will have a secured future (panatag) through stable and wider

scope of international Cavendish markets and dependable crop insurance policies

- With sustainable markets for Cavendish due to increasing local and world market demands for the bananas - established Filipino Owned and Multinational Company Owned Cavendish farms will be a stable source of employment for many Filipinos, thereby securing their source of income for the future.
- Institutional mechanism – The Banana Industry Development Council that will be established will serve as the oversight of the Banana related Programs, Activities and Projects implemented by the National Government Agencies and the Private Stakeholders

Strategic Actions for Cavendish Industry

Development Directions and Upscaling Strategies

1. Improvement of Productivity per unit area. Many of small-scale Cavendish farms need rehabilitation into an intensified mono-cropping system to increase productivity for every hectare land area. There must be an effective dissemination program of applications of proven technologies such as application of fertilizers, banana sucker population management, application of appropriate irrigation system - to increase productivity should be applied in small banana growers' fields to demonstrate the profitability of PhilGap approved production system.
2. Increasing Quality and Sustainability Level. Effective dissemination of package of technologies for good harvesting and post-harvest practices should be applied in all banana plantations to ensure the quality and acceptability of the bananas we sell in the domestic market and in the export market. Preparation of information and extension materials should be improved and trainings should be implemented for banana growers and processors to ensure satisfaction of the export quality product standards.
3. Expansion of Production Areas.Strategic planning should be made for expansion of production areas for Cavendish and other export potential banana varieties. Establishment of a national program for Banana Crop mapping (includes location of Cavendish, Saba, Lakatan plantations, cropping schedule and crop clustering) may also be considered to efficiently identify the best locations for plantation expansion and infrastructure establishments to enhance crop productivity and ensure proper

post-harvest handling.

4. Efforts must be made to cut cost for pest management, specifically Black SigatokaStudies and experiments must be directed towards cost cutting for pest and disease management. Drones may be considered for Black Sigatoka spraying and other adjustments to minimize the number of cycles for spraying.
5. Efforts to get better prices through the coordination of the DTI, DA, PBGEA, MBFEA, MEGA and other banana groups together with the local banana council (PHILBana Council). A floor price and a ceiling price is suggested.
6. Aggressive efforts by the Government to get buyers in the various international markets to offer WHAT? to existing exporters as well as farmers who would want to move up the value chain(?)
7. Focused and timely intervention for the provision of credit access to independent growers.
8. Infrastructure support and post-harvest facilities with acceptable standards such as packing houses/trading centers, ripening rooms, etc.
9. Research and Development
    - Fusarium Wilt TR4 Disease Management

      The following are recommendations for Fusarium wilt management in Cavendish plantations in Mindanao:

      a. The use of true to type Cavendish resistant varieties derived from accredited tissue culture laboratories. Several large banana companies have their own selection of the TBRI resistant clones – which are not accessible to small banana growers, use of these clonal selections will ensure productivity of the Cavendish bananas even in Foc TR4 infested areas

      b. Training of small banana growers on the proper management of the resistant varieties. Recommended inputs must be applied on resistant varieties to maintain its resistance to the disease.

      c. Philippine research institutions may conduct research on further clonal selections for adaptable Foc Tr4 resistant Cavendish varieties in the country

      d. Regional field units in Cavendish growing areas must regularly visit and inspect banana plantations for further spread of Foc TR4 in Cavendish or Lakatan plantations in the area

e. Crop shift may also be encouraged for Cavendish plantations that were heavily affected by Foc TR4 – from Cavendish, the grower may start growing Saba for the export market, for processing into banana chips and other by-products owing to their high market demand.

- Accreditation of Tissue Culture Laboratories in the Davao Region for assured quality tissue cultured planting materials for small growers
- Creation of the Philippine Banana Research Institute (PBRI) and the Banana Industry Development Council (BIDC)

  Creation of a team of researchers and scientists to conduct continuous research for production systems, disease management, breeding and selection for resistant banana varieties (against Black Sigatoka, Foc Tr4, BBTV) to ensure long term sustainable banana production in the country.

Recommendations for Policies, Strategies & Programs

Banana Industry Action Plan

These plans and programs were developed by the stakeholders, to be implemented and monitored by the appropriate Government agencies and in tandem with the BIDC and other stakeholders.

- **Creation of the Philippine Banana Research Institution (PBRI)**

  The PBRI shall be under the supervision of the Department of Agriculture (DA). The research institute shall:

  a. Undertake training and capacity building programs for banana producers, processors and cooperatives and provide basic strategic research for developing technologies to increase production and utilization of quality banana produce and raise level of income especially marginalized stakeholders.

  b. Enable banana producers, processors and stakeholders to have access to quality banana seedlings, modern production and processing techniques and other support services from production to marketing.

c. Aid in the establishment of village level-based banana social enterprise to generate livelihood opportunities and improve general well-being of the large percentage of the workforce in agricultural communities.

d. Promote cooperative development among stakeholders and provide with access to resources, technological know-how, as well as decision-making process for the enhancement of their banana social enterprise and protection of welfare.

e. Initiate banana research and development projects in order to address technology and policy gaps in promoting a robust banana industry

f. Enter into memoranda of agreement and receive grants from local and foreign funding agencies through the DA upon the recommendation of the PBRI Advisory Board; or through the respective academic boards of satellite units housed in concerned state universities and colleges upon the recommendation of the PBTI Advisory Board.

- **Creation of the Banana Industry Development Council (BDIC)**

The Banana Industry Development Council (BIDC) will be the policy making and coordinating body of the banana industry. It shall take the responsibility of promoting a sustainable and competitive industry towards attaining inclusive growth among stakeholders. It shall maintain close coordination with the local government units (LGUs), research institutions, academe, partners groups and other government agencies for relevant intervention and program support.

As such, the BIDC shall undertake, among others, the following:

a. Initiate the formulation of industry development framework that defines priority strategies, programs and projects to address the various industry challenges and concerns;

b. Advocate for supportive policies and resources such as development funds, long-term financial assistance, investment incentives and trade regulation measures to sustain industry competitiveness;

c. Recommend measures to address various concerns such as pest and diseases, climate change adaptation, quality standards compliance, productivity improvement and others;

d. Harmonize marketing/trading and pricing mechanism on commercial transactions maintaining transparency and industry professionalism;

e. Monitor and evaluate projects, activity outcomes expected to benefit industry players and stakeholders and

f. Represent the country in international banana conferences/events.

The BIDC shall be composed of the following:

Chairperson - Secretary of Agriculture or alternate (Undersecretary)

Co-Chairperson - Industry Champion

Members: Secretary of DENR

Secretary of DTI

Secretary of DOST

Private Sector Representatives:

PBGEA (for MNCs/large companies)

MBFEA (for small growers/exporters)

MEGA (for independent growers/exporters)

OBEX (for banana processors)

Cooperative Groups

Representatives from each of the regions (major banana producing area/s.)

Fifteen (15) representatives from legitimate banana plantation/farmers' cooperative who shall own or till not more than five (5) hectares of banana plantation. Each island group must be at least be represented by three. They shall be nominated by the farmers group in their respective island group and who shall be chosen by the chairperson from the list of five (5) nominees.

Three (3) representatives from the business/industry sector chosen by their peers.

Functions and Obligations of the BIDC

a. Formulate policies, plans, programs and projects to better assist, train and support the Banana Industry for its competitiveness and sustainability and the establishment of an efficient and integrated supply chain;

b. Call upon private sectors, cooperatives, academe to provide information and guidance pertaining to the banana industry farming;

c. Adequate supply and widespread use of tissue cultured planting materials to minimize risks and stronger resistance to disease and pests' infestation;

d. Submit annual and other periodic report to be submitted to the Department of Agriculture of the accomplishment of the Industry;

e. Identify areas for expansion to meet foreign and local demands;

f. Address issues pertaining to new diseases, tariffs, climate change challenges, regulations, among others.

g. Provide a development framework and implementation mechanisms for the optimum development of the banana industry in the Philippines.

h. Protect and preserve the native Philippine banana varieties.

i. Enhanced flow and quality of extension services for banana farming to facilitate adoption of Good Agriculture Practices for improved productivity and product quality;

j. Improved access to, availability, use, and utilization of organic fertilizer and other inputs: while reducing environmental costs and production losses;

k. Perform such other functions as may be necessary for the continued enhancement, growth and development of banana plantation and trade businesses in the country and for export.

Priority Projects for the Cavendish Industry (2022 - 2025)

1. Increase supply of quality Planting Materials
   - Accreditation of Tissue Culture Laboratories and Nurseries
   - Improvement of the of use established indexing laboratories
   - Establishment of disease indexing laboratories

2. Improvement of Productivity Level
   - Training of farmers for already available POTs for GAP, Pest and Disease Management and Postharvest Technologies
   - Establishment of model farm applying the best POTs

3. Expansion of Production Areas
   - Rehabilitation of Foc TR4 infested Cavendish Plantations applying all established PoTs for Fusarium wilt management

4. Moving up in the Value Chain
   - Formulation of a Cluster Development Plan
   - Product Quality Standardization for small growers
   - Certification and Branding assistance for small growers
   - Establishment of Postharvest facilities to assist small growers

5. Market Development
   - Cavendish Banana Feeding Program as part of Domestic Consumer Awareness Campaign
   - Establishment of Laboratory for MRL analysis
   - Negotiations for the Elimination of Tariff Rates
   - Compliance to Regulations of Target Markets
   - International and Domestic Consumer Awareness Campaign
   - Improvement of processed product standards
   - Participation in International Banana Trade Fair for Fresh Banana
   - Expand market access of farmers thru market linkage with institutional buyers, traders and other marketing platforms.
   - Provide logistic assistance to industry players

6. Resource Generation and Financing Strategies
   - Encourage Cavendish Growers (medium to large scale growers) to sign up for Crop Insurance
   - Include Banana as a Priority Crop in Government Financing Programs

7. Research and Development
   - Establishment of the Philippines Banana Research Institute (PBRI)
   - Establish a Varietal Selection/ Clonal Garden/ Seed Bank Center for efficient development of resistant banana varieties for major diseases
   - Development of reliable and efficient disease indexing
   - Application of precision agriculture technology – Imaging and GIS for disease management
   - Information technology dissemination and farmers' adaptation programs for efficient technology transfer
   - In Depth Cavendish Industry Value Chain and Market Analysis Studies

8. Policy Recommendations
   - Review and refiling of Banana Industry Bills enacted in Congress
   - Mandatory accreditation of Tissue Culture Laboratories and Nurseries
   - Creation of the banana Industry Development Council
   - Policy to strengthen monitoring and regulation of phyto-sanitary protocol compliance in banana plantations

COMMODITY INDUSTRY ANALYSIS: SABA INDUSTRY

Industry Summary

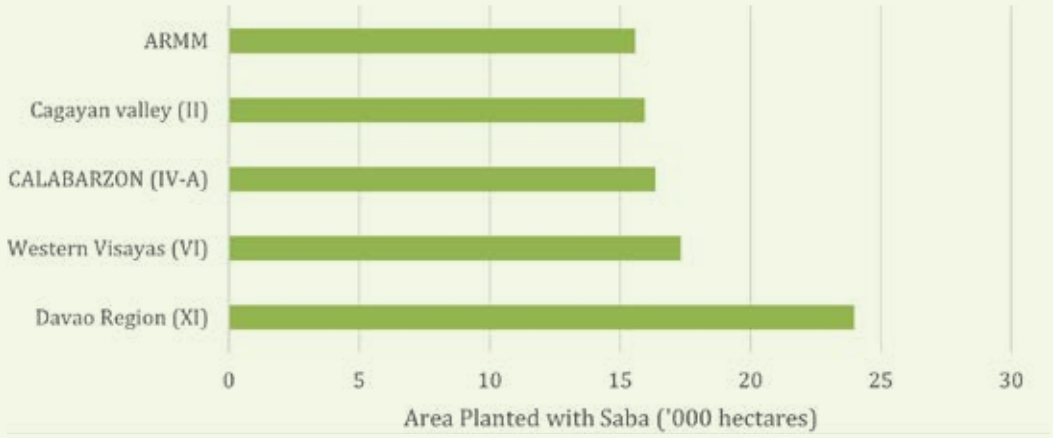
Saba banana variety is a complex commodity considering the various marketing scenarios in the different growing areas and the movement of the fresh products to its respective processors and consumers. The following observations were found:

1. Saba is planted in the backyard and at medium scale mostly in Luzon and Visayas provinces while it is planted at large scale in Mindanao Provinces. No significant increase in production and area harvested was observed in the last 10 years.
2. Productivity rate per hectare is highest in the Mindanao region, specifically SOCCKSARGEN and the Davao Region at almost 35 metric tons per hectare – coincidentally, these areas are also the highest Cavendish growing regions of the country
3. Major producers of Saba bananas are Mindanao regions (Number) which distributes all throughout the country. Support on transportation logistics is necessary.
4. Variation in buying schemes causes a 23% base price loss among Luzon Saba farmers which needs to be addresses by abolishing patalsik and patay system;
5. First fry producers utilize at least 38% of the raw Saba bananas, exclusive of the demands of the IQF bananas and local processors, thus increased in volume produced needs to be addressed to sustain the processing industries.
6. Trading and movement of different products need government support in terms of (1) fitted transportation vehicles, (2) regulation, (3) subsidy and (4) farm to market roads.
7. To curve the impact of the pandemic among Saba farmers depending on the snack food segment, product alignment support to processing market is necessary in the short-run.

Status of Saba Production

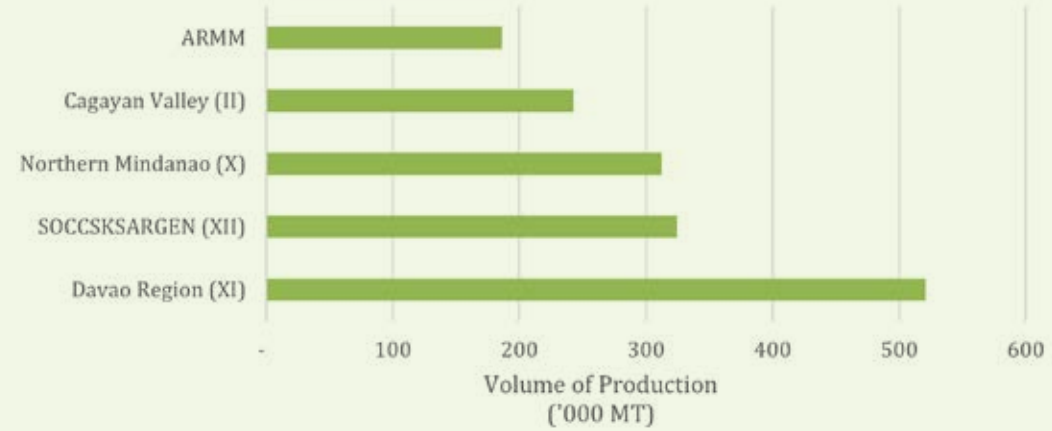
In the whole of the Philippines, according to the latest statistics, Saba can be found almost anywhere in the country, but mostly Saba plantations, relative to size of land area harvested - can be found in the Regions of Davao, Western Visayas, CALABARZON (Quezon, Laguna, Batangas) area, Cagayan Valley (Isabela, Quirino, Cagayan) in the North of the Philippines and the ARMM (Figure 25). The production of Saba in the Davao Region alone accounts for 20% of the total banana production in the Philippines (PSA 2021). However, it is important to note that the size of the land area harvested with Saba variety is not directly proportional to the volume of production in a given area. Figure 28 shows the volume of production of Saba variety based on the volume of harvested crops. The top 5 regions of the country are the following: Davao Region, SOCCKSARGEN, Northern Mindanao, Cagayan Valley and ARMM. Majority of these Saba plantations in Mindanao are for processing into banana chips and banana flour for export, while most of the Saba plantations in Luzon and Visayas are for local consumption. This makes Saba a very important crop for food security and foreign exchange.

FIGURE 25. TOP 5 REGIONS WITH HIGHEST HARVESTED AREA FOR SABA VARIETY



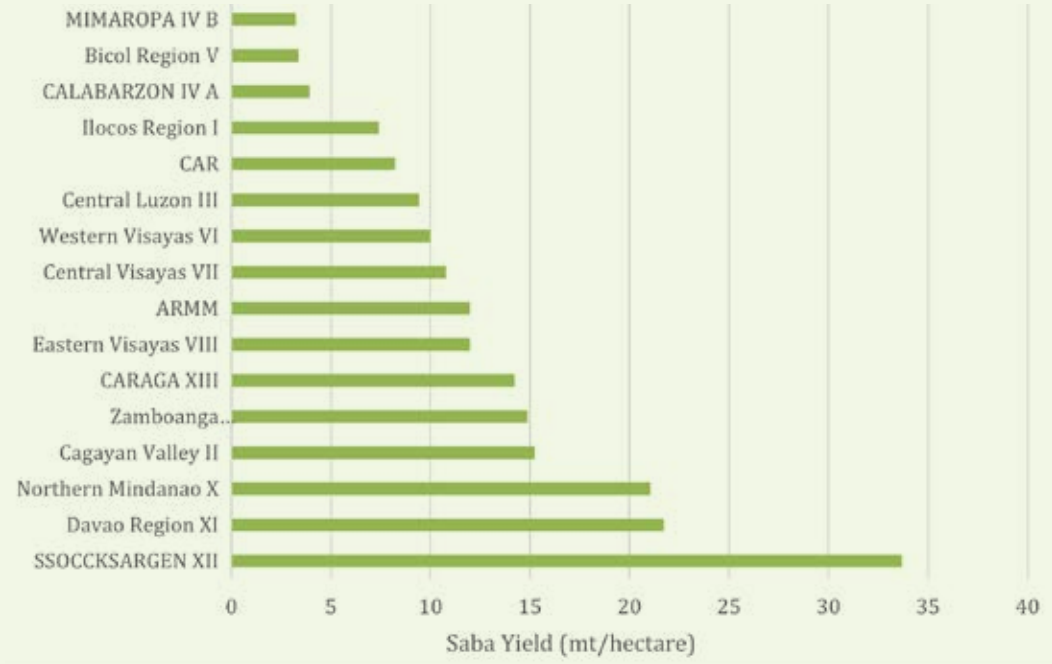
Source: Philippine Statistics Authority (2020)

FIGURE 26. TOP 5 REGIONS PRODUCING SABA VARIETY IN THE PHILIPPINES



Source: Philippine Statistics Authority (2020)

FIGURE 27. SABA VOLUME OF PRODUCTION FOR EVERY HECTARE OF LAND AREA HARVESTED

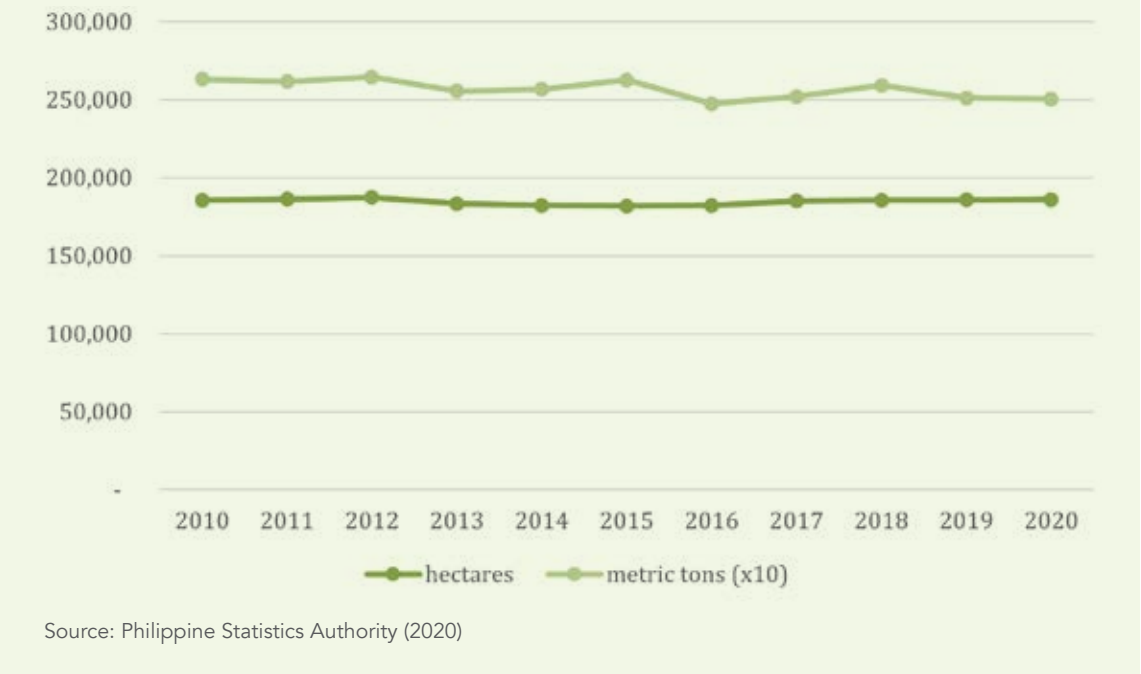


Source: Philippine Statistics Authority (2020)

The discrepancy between Figure 25 and Figure 26, based on 2020 data- show that higher yields (in metric tons) of Saba were harvested per hectare in SOCCKSARGEN and Northern Mindanao than the CALABARZON and Western Visayas plantations. This most probably indicates that, plantations in Mindanao are more efficient in Saba production than the plantations in Visayas and Luzon, except for Cagayan Valley. According to the data of 2020, highest production per unit (metric tons per hectare) was in SOCCKSARGEN, Davao Region and Northern Mindanao. It is important to note that yields of Saba in Cagayan Valley was also high and at par with the Mindanao crop yields (Figure 27).

The Saba volume of production and area planted with the variety, based on the 10-year data show that there has been no significant change over time (Figure 28). The data may indicate several probable concerns with regards to production, (1) there was no significant change in the volume of production over the last 10 years despite the introduction to farmers of technological intervention, (2) there was no realized expansion of Saba production over the last 10 years despite the increasing demand for fresh Saba & processed Saba, and (3) data gathered for the last years is not updated.

FIGURE 28. SABA VOLUME OF PRODUCTION AND AREA HARVESTED IN THE PHILIPPINES FOR THE LAST 10 YEARS



Source: Philippine Statistics Authority (2020)

Table 15 compares the volume of production and the size of land area harvested for Saba for each region of the country. The country has an average yield per hectare of a very low 12.59 metric tons relative to the potential yield of Saba as observed in the Saba yields in the Mindanao Region. Highest yield per hectare of approximately 21 – 33 metric tons is in Davao Region, Northern Mindanao and SOCCKSARGEN. These regions are noted for large commercial plantations of Saba and Cavendish for export. Lowest yield per hectare of approximately 3 metric tons is in CALABARZON (~16,000 hectares), MIMAROPA (~15,000 hectares), and Bicol Region (~9,000 hectares). These regions are known for backyard banana plantations and small-scale banana growers. It is also important to note that these regions are the ones frequently visited by typhoons.

In the Visayas, average yield per hectare is approximately 10.92 metric tons, which is very close to the efficiency of production in the ARMM. For Luzon, Cagayan Valley has an average yield per hectare of 15 metric tons, barely yielding 50% of the potential yield per hectare of Saba.

The discrepancy in yield efficiency between the Mindanao plantations and the Luzon plantations can be attributed to several factors. Among the factors that may be causing differences in yield and should be considered and given focus for research and development are the following – (1) Differences in weather/climate patterns, such as frequent occurrence of strong typhoons in the Luzon compared to Mindanao areas, as well as a more even rainfall distribution in some parts of the country (2) Field management of existing Saba Farms, including: sanitation, population control, fertilization, irrigation, pest and diseases, and (3) Other factors may include differences in Saba varieties/strains, quality of planting materials being used, among others.

TABLE 15. COMPARISON OF YIELDS PER HECTARE FOR SABA VARIETY AMONG THE REGIONS IN THE PHILIPPINES

Philippine Regions	Volume of Production (MT)	Area Harvested (has)	Yield per Hectare (MT/ha)
CAR	7,594	924	8.22
I Ilocos Region	22,263	3,008	7.40
II Cagayan Valley	242,973	15,952	15.23
III Central Luzon	27,383	2,908	9.42
IV-A CALABARZON	64,253	16,346	3.93

Philippine Regions	Volume of Production (MT)	Area Harvested (has)	Yield per Hectare (MT/ha)
IV-B MIMAROPA	39,617	12,283	3.23
V Bicol Region	33,377	9,917	3.37
Regional Values			
Total	**437,459**	**61,338**	
Average Yield/ha			**7.13**
VI Western Visayas	172,849	17,324	9.98
VII Central Visayas	134,467	12,461	10.79
VIII Eastern Visayas	164,120	13,703	11.98
Regional Values			
Total	**471,436**	**43,488**	
Average Yield/ha			**10.84**
IX Zamboanga Peninsula	130,669	8,780	14.88
X Northern Mindanao	312,368	14,841	21.05
XI Davao Region	520,930	23,970	21.73
XII SOCCKSARGEN	324,322	9,629	33.68
XIII CARAGA	121,282	8,537	14.21
ARMM	186,317	15,565	11.97
Regional Values			
Total	**1,595,887**	**81,322**	
Average Yield/ha			**19.62**
National Values			
Total	**2,504,782**	**186,148**	
Average Yield/ha			**13.46**

Areas with large production of Saba bananas were identified in Eastern Visayas and the island group of Mindanao.

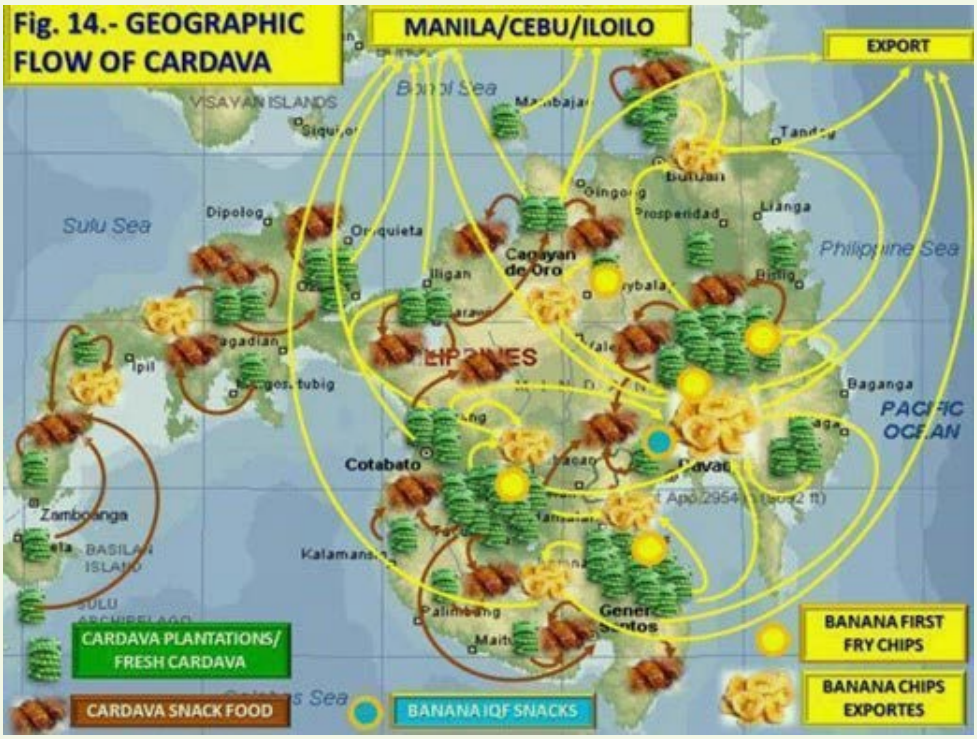
Figure 29 shows the movement of products in Eastern Visayas. There are several processors in the area which cater local and international market at minimal volume. Saba production is high in most areas yet Biliran and Samar Province augment the supply needed. Regional distribution also takes place wherein fresh fruits were delivered to the

different areas to reach the target market. Areas with established seaports are the key areas for distribution. As observed in the figure, markets outside the region are Manila, NCR, Bicol, CALABARZON, Cebu and Surigao. Surigao, though part of Mindanao, acquires its supply from Southern Leyte due to efficient logistic costs considering the distance.

FIGURE 29. DISTRIBUTION OF SABA BANANAS PRODUCED IN EASTERN VISAYAS

Adopted from: Value Chain Analysis of Cardava of Eastern Visayas (2017)

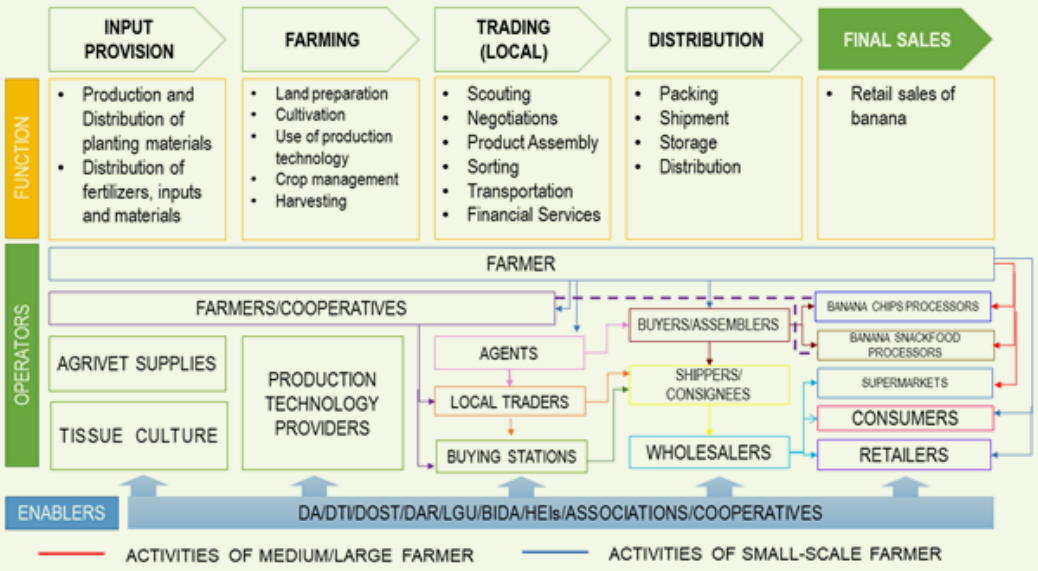
FIGURE 30. DISTRIBUTION OF SABA BANANAS PRODUCED IN MINDANAO



Adopted from: Boquiren & Idrovo (2014)

Saba production is high in Mindanao and the prominent products traded are fresh bananas, snack food, individual quick freeze snacks and banana chips both for local and international markets (Figure 30). As mentioned in the industry status, most of the top producing regions are found in Mindanao. According to the report from the Cluster-wide Value Chain Analysis, the markets of Saba banana in the Philippines from Mindanao are Manila, Cebu and Iloilo while product exports are Japan, United States of America, China, Germany and other nearby countries wherein Filipinos resides (Boquiren & Idrovo ,2014). With the existence of Cavendish plantations, the practices of producing banana became very familiar to Mindanao farmers which also served as an advantage in Saba production industry. Saba bananas from Mindanao also supplies for Eastern Visayas for their snack food and processing. It usually occurs whenever there's a deficit in supply commonly caused by (1) increase in demand, (2) low production during the period and (3) damages due to natural calamities visiting the area.

FIGURE 31. PRODUCT AND SUPPLY FLOW OF FRESH SABA BANANAS



(Information adopted from Boquiren & Idrovo, 2014; modified after KII Diagram by JFBMagnaye)

Supply and Product flow of Saba Bananas

In the Philippines, several areas have various inputs for their Saba production which are primarily influenced by (1) nature of production system (2) availability of planting materials, and (3) financial capacity of the farmers. Farmers outside Mindanao were more accustomed in using suckers which costs P5.00- 15.00 per piece while Mindanao Saba producers have more access to tissue-cultured planting materials at P20.00- 25.00 per piece. Tissue cultured planting materials in Luzon have high prices due to the limited supply which is pegged at P50.00. Despite the advantages of using tissue-cultured materials, farmers were constrained in adopting the technology due to (1) lack of readily available tissue culture plantlets, (2) cheaper cost of suckers and corms, (3) ease of management of suckers and corms (4) shorter lifespan of tissue cultured planting materials, and (4) general lack of farmer's awareness on benefits of tissue culture plantlets (VCA-CAR, 2017). Tissue culture laboratories which are providing Saba planting materials also face issues on forecasting the demanded volume. With their limited resources, most of them practice preorder schemes in order to ensure that the produced plantlets have buyers. Small scale farmers often do walk-in transactions which often lead to failure of buying the planting materials.

Various types of Saba banana were planted in the Philippines considering the diversity yet it was observed that the market demands different types for specific purpose. In Mindanao, Giant Cardava Variety (GCV) is preferred by most snack food processors while other processors prefer the Native Cardava Variety (NCV) is used for banana chips and IQF bananas (Boquiren & Idrovo, 2014). Other types of Saba can be sellable in the market for the taste and preference of consumers. Other value chain references were not indicative of the specific preferences of consumers for cooking banana in their respective areas.

Usage of pesticides and fertilizers were also variable in the Saba production. As the production of Saba in the country were dominated of small-scale farmers, they have practiced growing Saba without fertilizers as it is also productive even with minimal application. Whenever farm advisories were also presented to improve their yields, lack of capitalization is the most common reason for not following fertilizer recommendation rates and pest and disease control. Agricultural supply stores were observed to focus on supplying items needed by the major crops in the area unlike for banana which is commonly cultivated in the backyards. Unlike crops such corn and rice, enough support was not extended to Saba farmers in terms of production support. Programs were mostly on provision of planting materials and not for production phase of the farm. Some farmers also utilized organic materials as fertilizers such as animal manures and vermicompost to improve productivity. However, it was observed that organic amendments have not undergone analysis.

Saba production is dominated by practices which are (1) small-scale monocropping and (2) intercropping with different crops. Small-scale farmers usually cultivate an area of 0.25 to 1.0 hectares while intercropped areas have a range of 1-3 hectares. There are also banana growers who own up 100 ha of land dedicated for Saba who commonly hire people for the activities in the farm. The degree of engagement often segregates them as either farmer-grower or grower alone and their crops are not necessarily focused on banana. Saba bananas serve as intercrops to main crops such as Coconut or as shade crops for newly established orchards. Site selection for establishment of Saba production area is not very strict inclusive of not testing the soil for fertility as well.

Sixty percent (60%) of the total cost of production is spent during farming. Labor costs have increased from P150.00-P250.00 to P300.00- P500.00 per day depending in the area. Luzon-based farms have higher labor costs compared to other regions. In Biliran, a bayanihan for planting is practiced wherein community members have verbally agreed to help in planting the area provided that lunch is served (Value Chain Analysis of Cardava of Eastern Visayas ,2017).

Family members augment in doing the activities due to lack of capital. In some cases, for small-scale farmers, farm visits happen during harvesting since Saba bananas thrive with minimal maintenance. In cases of intercropped areas, farmers fertilize their main crop which then trickles to the Saba bananas. Bananas under intercropping schemes were observed to be more productive compared to small-scale monocropping systems.

Farm losses are either caused by (1) diseases and (2) natural calamities. Bugtok and Bunchy Top Banana Virus (BBTV) is the prevalent diseases encountered by most Filipino Saba farmers. Poor farm care and maintenance, and use of infected suckers and corms were the causes of disease incidents. Occurrence of natural calamities such as typhoon leads to leaf tearing and toppling of pseudostems. Aside from an estimated loss of 10% per mortality, damages due to natural calamities can reach up to 100% (Value Chain Analysis of Cardava of Eastern Visayas ,2017).

Traditional farming methods were practiced widely compared to data-supported production practices. Farming practices were expected to be aligned to the Good Agricultural Practices (GAP) for banana yet adoption was minimal due to investment-intensive requirements such infrastructures, foot baths and amenities. Technical expertise in terms of interpreting the practices and data management for GAP application was observed to discourage farmers as well. Out of all the Saba producing farms in the Philippines, GAP Certified farms did not reach even at 1%.

Absence of focused formal lending institutions for Saba production was observed. Farmers were inclined to informal lenders such as agents or buyers. Loaned amounts were not intended for farming activities but for the sustenance of the family or for education of children. In terms of clustered farming, farmers often enter to associations in order to attain price benefits (Boquiren & Idrovo, 2014). However, production in the farm

is not synchronized with the other farmers. Clustered fresh Saba banana products are the common output of the farmers.

During harvesting, a 23 kg average weight was observed. In well-maintained farms, it can reach up to 60 kg. The movement of products within the farm depends on the availability of animal-drawn sleds yet not all small-scale farmers own animals. Most farmers carry it themselves to the storage areas or marketing points. Due to the lack of postharvest and transport facilities, higher losses are incurred as well. The process is inefficient and resulted to 5-10% of losses due to bruising and mishandling. In other cases, losses can reach up to 20%.

Primary product movement is done by farmers in order to reach the buying stations. Depending on the distance from the market centers and the mode of transportation used, the costs will also vary (Table 16). Some farmers who have contacts with their buyers request for advance payments or bale to cover the cost incurred (Mojica et al, 2006). In other areas, farmers display their harvest near the highway which can be seen by traders (Boquiren & Idrovo, 2014).

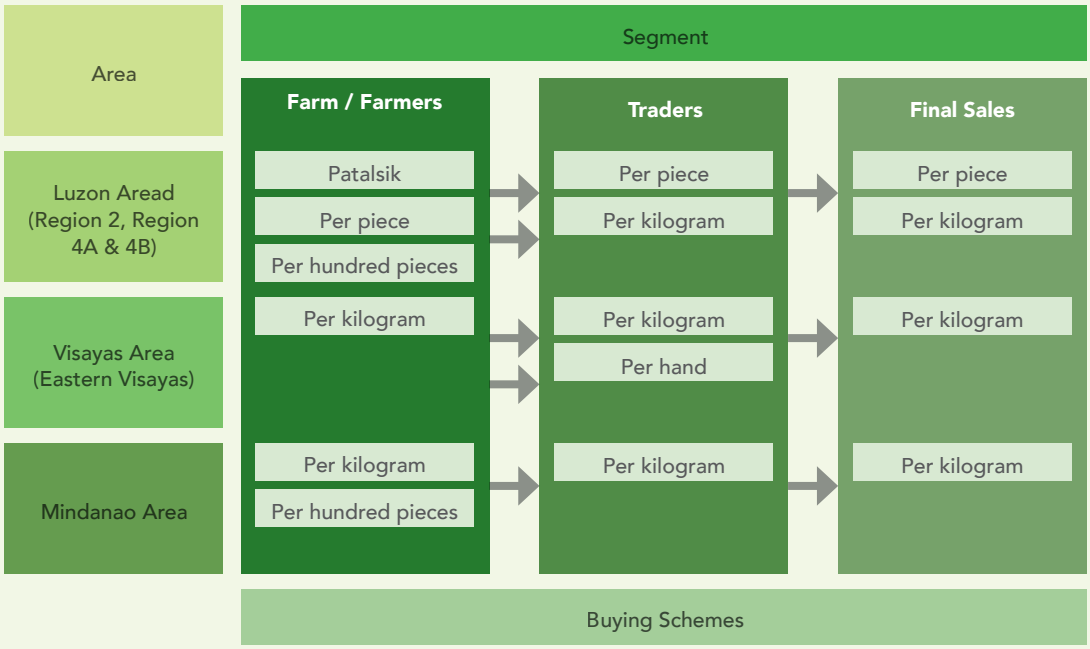
TABLE 16. MODE OF TRANSPORTATION USED BY FARMERS TO MOVE THEIR PRODUCT

Mode of Transportation	Description	Capacity	Required Fees
1. *Paragos*	Carabao-drawn cart which is commonly used in Luzon	3000 pieces of banana	P15.00/ 300 pcs or P20.00/ 1000 pcs
2. *Habal-habal*	A heavy-duty motorcycle with extensions to carry banana products	150 kilograms	P2.00 – 5.00/kg (depending on distance)
3. Use of Horses	Usually used in mountain areas wherein Carabao are not capable	100 kilograms	P1.00 – 1.50/kilogram
4. Tricycle	A motorcycle with an attached body which is usually used for human transportation	100 kilograms	P50.00 – 100.00/trip
5. Manual carrying	Manual labor which is usually done by the farmer or hired labor	Contracted labor or per piece arrangements	Contracted Labor: P200.00 – 350.00 (arawan) P25.00/1000 pcs (2006 price)

Source: KII, Mojica et al (2006)

Various buying schemes were observed in Saba trading (Figure 32) in the Philippines. Saba farmers in Luzon are losing an income of 23-33% due to various trading schemes (Table 17).

FIGURE 32. BUYING SCHEMES OF SABA BANANA AT THE DIFFERENT VALUE CHAIN SEGMENTS



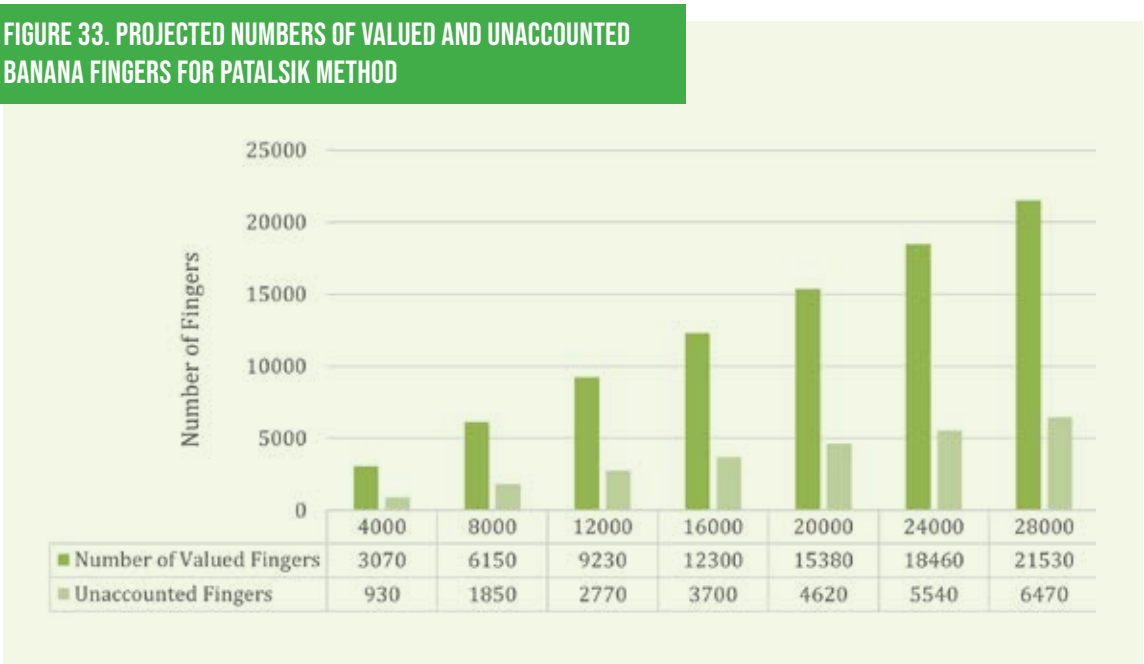
Source: KII, Mojica et al (2006)

TABLE 17. SABA FARMER'S INCOME AT FARM GATE PRICE FOR 1000 FINGERS AT DIFFERENT BUYING SCHEMES.

Computation	Buying Scheme			
	Patalsik	Patalsik/Patay in Quirino	Per Hundreds	Per Kilogram*
Number of hands (13 fingers/hand)	76	76	NA	NA
Value Fingers	760	760	1000	1000
Volume discount	NA	76	NA	NA
Final Value Fingers		684	1000	1000
Paid piece (2.5/pc) (6.5/kg)(70/100 pcs)	P380.00	P340.00	P700.00	P812.50
Allowance for Traders (pcs)	240 (24%)	316 (36.1%)	none	none

* 1 kilogram = 8 pcs

FIGURE 33. PROJECTED NUMBERS OF VALUED AND UNACCOUNTED BANANA FINGERS FOR PATALSIK METHOD



	4000	8000	12000	16000	20000	24000	28000
Number of Valued Fingers	3070	6150	9230	12300	15380	18460	21530
Unaccounted Fingers	930	1850	2770	3700	4620	5540	6470

The trading of banana happens through (1) middlemen and (2) direct selling (Boquiren & Idrovo, 2014) . Independent farmers often rely on agents while others who are members of cooperative engaged in collective marketing. Medium scale farmers can function as agents or traders in order to fill the needed volume in their respective markets which can either be processing plants or the retail markets. The defining factors in increasing engagement in the market are (1) financial capital, (2) linkages and network for selling the products, and (3) the allowable risks for losses in case of price fluctuations.

In terms of preference of traders, farmers have various considerations in choosing the whom they should sell their products. As there are periods wherein the supply cannot satisfy the quantity demanded, the trading relations are based on (1) payment and (2) nature of payment (Value Chain Analysis: Cardava Banana Cordillera Administrative Region, 2017). There can be various relationship within the market but there are identified common relationships:

a. **Kumpare/Kilala/Suki System** – farmers who declare loyalty to trader/buyer whom they transact regularly

b. **Agreement** - an arrangement made before the harvest season between a trader and farmer which is divided into two categories:

- Contract Agreement - usually between a trader and medium to large scale farmer, a written document with all the legalities is mentioned and specific volume, quality and time were stated as well.

- Verbal Agreement – usually done by small-scale farmers who often experience shortage on capital and resorts to a loan with a trader. The farmer is then compelled to sell his products to the trader.

c. **Pakyawan** – a nature of trade wherein the trader conducts a visit to the farm during the growing stage and estimates the potential harvest. The farmer is then given a price and once agreed, they can have advance payment. Though the farmer may not enjoy peak prices yet they are secured even if there are unfavorable events such as pest outbreak or typhoons.

d. **In most cases**, the farmers sell their harvest to traders offering the most competitive buying price.

There are several middlemen who help and earn through the trade of Saba bananas. Their nature and scope are different. The farmer or grower can also be a middleman in the process depending on their capacity to engaged in the industry. Figure 34 shows the linear movement of products move from each trade player in line with a small-scale farmer:

FIGURE 34. MIDDLEMEN INVOLVED IN THE SELLING OF SABA BANANAS

(Source: KII)

FIGURE 35. PROFIT SHARES (%) OF INDUSTRY PLAYERS IN FRESH SABA BANANAS PRODUCED FROM MINDORO

KEY PLAYER	FARMER	TRADER	RETAILER	
Selling Scheme	PATALSIK	PER PIECE	PER PIECE	PER KILOGRAM***
Cost and Return	Cost: P0.77 Returns: P2.50 Profits: P1.73	Cost: P0.52 Returns: P2.75 Profits: P2.23	Cost: P2.85 Returns: P3.75 Profits: P0.90	Cost: P22.80 Returns: P50.00 Profits: P27.20
PROFIT SHARE (%)	10.55%	66.08%	4.87%	18.39%
DURATION BEFORE REALIZATION	18 MONTHS	3 DAYS	1 WEEK	1 WEEK

* Adopted value from the report of the Development Academy of the Philippines on Saba (2013)
** Per piece capital since trading scheme have changed
*** 1 Kilogram = 8 pieces of banana

Collective Marketing

Collective marketing of Saba bananas often happens in organized groups with a binding by-law which reinforces the participation of the members (Boquiren & Idrovp, 2014; Value Chain Analysis: Cardava Banana Cordillera Administrative Region, 2017). With the situation in the areas of Quirino Province and Oriental Mindoro, it can resolve the issues on patalsik by selling their products to viajeros selling per piece and accordingly, the increase in their profit can reach up 100% (Mojica et al, 2006). However, in the case of individual small-scale farmers, they are not very participative considering that their earnings will be given 3 days after. With their needs, they would rather engage with the agent and be paid immediately.

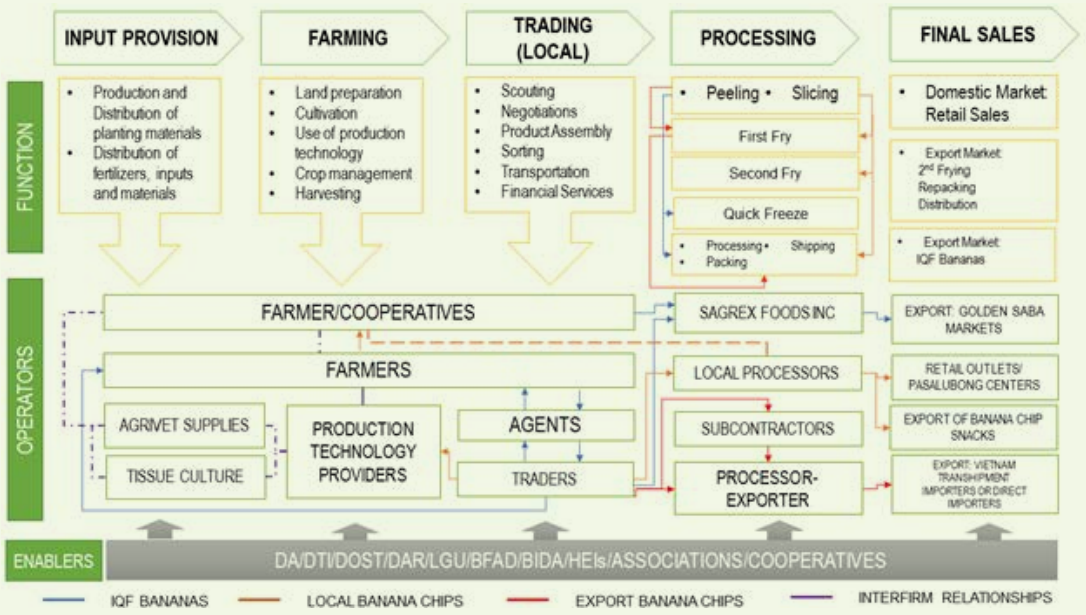
Processed Products:

Bananas Banana Chips And Individual Quick Freeze (IQF) Banana

Processed products from Saba bananas command higher prices compared to fresh banana. Processors have product specifications in terms of variety size and maturity of Saba bananas in order to produce the processed quality demanded. Figure 31 and Figure 36 showed the placements of processor in the product flow. The disparity in the volume demanded among processors affected the engagement of farmers. Processors for the

local market are often in small scale while those for the export market are operating in processing plants which caters tons of raw materials. On the other hand, Individual Quick Freeze (IQF) Saba is one of the growing exported products which commands higher price. Figure 40 shows the supply and product flow for the processed products.

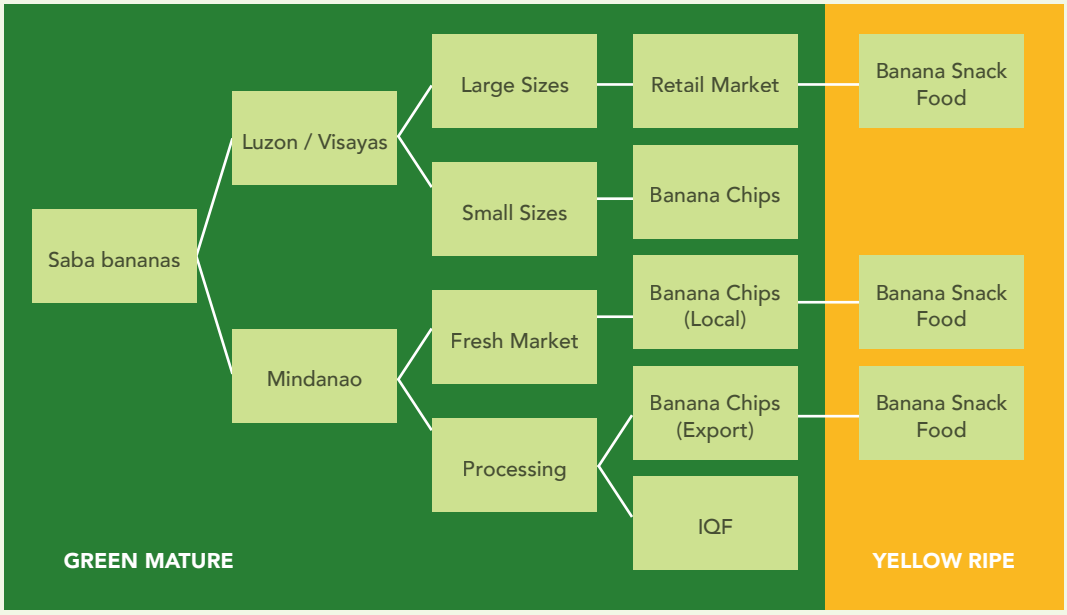
FIGURE 36. SUPPLY AND PRODUCT FLOW FOR PROCESSED SABA BANANA PRODUCTS



(Information adopted from Boquiren & Idrovo, 2014; modified after KII; Diagram by JFBMagnaye)

General supply and product flow for processed Saba banana is shown in Figure 36 while Figure 38 shows the flow per major island group. Luzon and Visayas trade large bananas in retail markets while smaller sizes are sold to processors. In Mindanao, sizes for local and processing markets are not considered due to "all-in" buying scheme. The processor is responsible for the selection of the banana traded to them. Moreover, banana acquired by banana chips and IQF processors are green mature while banana snack food sellers are yellow ripe. Some banana snack food sellers also buy ripened bananas from processors at a cheaper price (Boquiren & Idrovo, 2014).

FIGURE 37. DISTRIBUTION FLOW OF SABA BANANAS TO PROCESSORS



Source: Value Chain Analysis: Cardaba Banana Eastern Visayas, 2017; Diagram by JFBMagnaye

Banana Chips

Banana chips are sold as local and export products. An estimate of 4 kilograms of raw Saba bananas will produce 1 kilogram of chips for Eastern Visayas and Mindanao areas while in Palawan, it only takes 3 kilograms (Province of Palawan, 2016). Common factors affecting banana chip producers are (1) fuel and (2) oil. Traders engaged in procuring supply for banana chips often comply with the maturity index of the raw materials whereas the size is foregone considering that there are more competitive markets for those such as (1) retail markets and in the case of Mindanao, (2) other industries such as IQF bananas which both commands higher prices (Boquiren & Idrovo, 2014).

Demand for banana chips is already high. Boquiren & Idrovo (2014) presented demand data from European companies which translates to 25 40-ft containers of banana chips per year per company while an average of 10 40-ft container per year per company was demanded. Table 20 below presents the forecasted demand of banana chips and the major raw material as well. Based on the data presented on the country's current volume of production for Saba bananas, 29.02% is being utilized by the banana chips industry.

TABLE 18. FORECASTED ESTIMATES OF THE DEMAND OF THE EUROPEAN UNION FOR BANANA CHIPS

Size of Business	Number of Businesses	Number of Containers Demanded	Total Mass of Banana Chips Contained (MT)	Equivalent Raw Saba Bananas (MT)
Small/Medium Exporters	20	10	4896	19584
Company	21	25	12852	51408
Total	41	35	17748	70992

Data adopted from: Boquiren & Idrovo, 2014; containment data: Four Seasons Fruits Corp, 2020

Banana Chips Snack Production

Processing of banana into chips for snack purposes is done for both local and export markets (Table 19). Profit shares showed that processors and retailers earn more during export of products. Reduction of farmers' profit share is caused by the increase in selling prices of processors and retailers while buying price of bananas remained constant.

TABLE 19. PROFIT SHARE OF INDUSTRY PLAYERS IN BANANA CHIP PRODUCTION FOR LOCAL AND EXPORT FOR CALABARZON

Market	Industry Player		
	Farmer	Processor	Retailer
Local	33.53 %	40.67%	25.80%
Export	12.78%	51.38%	35.58%
Duration to realize Profit	18 months	3-7 days	3-7 days

Source: Almeyda & Obligado (2016)

Firms engaged in production range from sole proprietorship to cooperatives and international firms (Boquiren & Idrovo, 2014; Bollido & Cebu, 2020). Banana chips were often sold as giveaway or pasalubong items and as snacks in transportation terminal. Preparations have varied in order to cater the tastes and preferences. Most of them some were sold at P15.00 per 100 grams while others sell it per kilo at P200.00 depending on the packaging and flavor. However, the challenge of most processors in the local level is the registration of their products and the registration under the BFAD to ensure that their products are safe and to cater other markets as well which require other certifications. In terms of data on production and share of product supply, organized data is not yet published yet most of the supply were sourced from their locality with abundant raw materials (Bollido & Cebu, 2020).

Through the efforts of DTI, several events were organized for the processors to showcase their products (Sandrasari, 2019). However, despite the support and campaign for healthy food, the competition for chips is commonly dominated by corn-based and potato chips which can be bought at a cheaper price and the palate of consumers were customed to savory flavors instead of the sweet banana chips. Product innovation became difficult since market penetration is not well established (Bollido & Cebu, 2020).

First Fry Banana Chips

First fry dominates the volume being processed compared to those for snacks due to international demand. Profit gains are based on volume produced and in 2014, 38% of the annual volume of Saba banana were utilized by processors/exporters First fry banana chips serves as a raw material for different products by the importing country. It is considered as a healthy substitute to other ingredients and economically viable compared to other fruit ingredients (Boquiren & Idrovo, 2014).

In the current situation, most of the buyers aim to deliver to IQF banana and then the remaining will be delivered to the buying posts of banana chips. Usually, the bananas are delivered immediately to the processing areas. Buying price of raw materials for banana chips are similar to the farm gate price or sometimes lower since there is no sizing involved as long as the quality is satisfied. According to Boquiren and Idrovo (2014) qualities needed to be satisfied are as follows:

a. Variety – Native Variety
b. Semi mature – 90-105 days old
c. Unripe – green color of skin
d. Light yellowish color of flesh
e. Not less than 3 inches in length

The processors usually weigh the bananas delivered to them and the sorting for rejects occur during the processing proper. At this stage, an average of 25% loss was recorded by the processing plants. The rejected bananas are sold to banana snack food or to other processors as well. As to the price, it is not indicated. In terms of collective marketing, a minimum delivery of a metric ton is required per transaction and a minimal increase in payment is given to the organization. Farmers often find it difficult to participate in the

scheme since there is no uniformity in the harvesting of Saba, it takes time to reach the volume quota and some of them need the payment immediately as it is their source of income (Boquiren & Idrovo, 2014).

In terms of processors, there are various types depending on their transaction in the market. There are different processors involved known as the subcontractors and exporter processors. Subcontractors have no connections to the market but operates similarly like exporter processors. Subcontractors are normally situated near the farm areas in order to attain high volume of quality bananas. The produced chips are then forwarded to exporter processors. Exporter processors have the contacts to shipments and markets and finalizes to whom the products will be sold as well as the payment schemes. Most of them are paid via freight on board basis (FOB) which means that the chips are already paid once shipped. The products are then either distributed directly to receiving countries or either via transshipment process to Vietnam wherein further value adding is done. As a part of ASEAN Free Trade Agreement, there is no tariff paid accordingly thus exporter processor transfer the products to countries with lower tariffs to the importing countries. China has lower tariffs for products coming from Vietnam which is taken advantage by the exporter processors instead of directly shipping products to China and incur high tariffs which could be considered as income as well (Boquiren & Idrovo, 2014).

Cost Structures

As shown in Table 20, the processors have the highest value-added share among the different industry players followed by the farmer and the exporter. On the other hand, in terms of profit, the exporter has the largest share of profit compared to the first fry processor who did most of the value adding and the farmer's share for profit is also high yet the realization of this income is a longer period compared to other entities. The income of the exporter, aside from the profit margins, additional income can be enjoyed by the exporter as there are also incentives when the goods are delivered.

Though it is a favorable business, there are also stop-buying incidents or wherein the processing plants commonly ceases its operation for a certain period of time. Processors often face problems on storage facilities, shipment concerns as well as being one of the least prioritized processors by banana traders (See, 2021). It can be attributed that traders have the weakest and lowest financial position among the industry players. There are

times when the demanded quantity of the processing facility is high, yet the supply is very low. Since the industry focuses on the international market, any unfavorable relations or incidents with the shipping country or in the international context, the market of bananas can be readily affected.

FIGURE 38. AVERAGE PRICES FROM IMPORTING COUNTRIES FOR PHILIPPINE BANANA CHIPS

Source: https://www.exportgenius.in, 2021

TABLE 20. COST, PROFIT AND MARGINS OF PRODUCT AND SUPPLY FLOW INDUSTRY PLAYERS IN FIRST FRY BANANA CHIPS

Key Player	Product	Total Unit Cost	Added Unit Cost	% Added Unit Cost	Unit Price	Unit profit	% Added Unit Profit	Unit Margin	% Price
Farmer	Fresh	P10.76	10.76	23.01%	P20.00	P9.24	32.72%	P20.00	26.67%
Trader	Fresh	P24.00	P4.00	8.55%	P28.00	P4.00	14.16%	P8.00	10.67%
First Fry	Chips	P50.00	22.00	47.05%	P53.00	P3.00	10.62%	P25.00	33.33%
Exporter	Chips	P63.00	10.00	21.39%	P75.00	P12.00	42.49%	P22.00	29.33%
			P46.76			P28.24		P75.00	

Source: Boquiren & Idrovo 2015

Individual Quick Freeze Banana

Individual Quick Freeze (IQF) Banana is currently produced in Mindanao at the moment. The Golden Saba under Sagrex Foods Incorporated (SFI) utilizes high quality Native Saba bananas with distinct characteristics. In order to engage with the company, the trader must comply with the necessary orientations and trainings as well as to pass the delivery of products assessment.

FIGURE 39. PRODUCTS DERIVED FROM IQF BANANAS

Source: www.goldenSaba.com, 2021

Banana Snack Food

All over the Philippines, banana snack foods are commonly sold in small scale basis. It is also considered as a part of the Filipino cuisine or a street food as well since it is sold in streets near schools and areas with high traffic (Philippine Rural Development Project, 2017). Accordingly, snack food processors prefer ripe and large fruits which are commonly rejected by other industry players due to the lack of firmness for chips. Retailers also sell it at lower prices in order to have a breakeven for the spent capital on the product. Marketing of snack foods is easier yet it is also affected by the price of oil, sugar and fuel used for cooking. The increase in price of the inputs have increased the selling price of the products. As presented in the various value chain maps in the country, the sellers of snack foods have various preparation for their products and there were no standards or Good Manufacturing Practices (GMP) which can be the basis on computing the progress

of the industry. However, despite the size and lack of homogeneity, it was also presented that the banana snack food helps the traders by procuring unsellable products and converting them into products which usually caters the budget of the masses.

Strength, Weakness, Opportunity, and Threat (SWOT) Analysis

Cultivation of Saba varieties was not formalized until the recent years when the increase of demand for consumption and processing took place. Various enablers and processes were instrumental for its growth, however there are also concerns which need to be addressed to further strengthen the production and industries dependent on Saba as the primary raw material.

TABLE 21. SWOT TABLE FOR SABA VARIETY

Value Chain Segment	Target Industry Player	Strength	Weaknesses	Opportunities	Threats
Input Provision	Tissue culture laboratories (TCLs)	Effective and efficient protocols for Saba propagation	Inadequate information on demand forecast (Shortage on planting materials)	Partnerships for demand modeling and certification	Lack of access to quality planting materials and lack of financial capacity
	Private Financers (PFs)	Efficient lending process	Price monopoly and product control	Formal loan optimization	Situational preference
Farming	DA	Effective Packages of Technology (PoT)	Low adoption rate	Promotional activities	Possible resistance
	Farmers	Built-in cultural management expertise	Lack of market information	Synergistic market research collaboration	Unavailable resources
Trading	Traders	Effective support services	Disadvantageous marketing schemes	Effective market interventions	Possible marketing manipulation

Value Chain Segment	Target Industry Player	Strength	Weaknesses	Opportunities	Threats
Processing	Processors	High volume demand	Incompetent buying price	Equitable price support system	Price competition
	Processor-exporters	State-of-the-art large volume processing facility	Low processing efficiency	Volume-limited and Quality-driven processing facility	Competition from other countries
Distribution	Distributors	Effective market enablers	Possible market manipulation	Legal accreditation and recognition	Cancellation of orders and other buyers do not honor contract.
	Private Shippers	Effective physical distribution of products	Negatively affected by restrictions	Assisted establishment of logistics framework	Unstable freight rate
Final Sales	Sellers and retailers (SR)	High presence in markets	Severely affected by price fluctuations	Establishment of price support system	Possible organizational price monopoly

Cost and Return Analysis

Saba production in the Philippines has different technologies used which are based in Mindanao and in Luzon. The package of technology (Pot) from Mindanao is sourced from BPI while Luzon is the best practice from the University of the Philippines - Los Baños. The production costs of both PoT are presented.

TABLE 22. TOTAL PRODUCTION COST FOR ONE (1) CROPPING CYCLE AND FIRST RATOON OF SABA BANANAS IN MINDANAO (OLD POT)

INPUTS	Amount
Labor Inputs	P140,400.00
Material Inputs	P166,386.00
Management Cost (20% of LI+MI)	P61,357.20
Miscellaneous Cost (10% of LI+MI)	P30,678.60
Depreciation Cost (1.5 years)	P16,593.60
Total Production Costs	P415,415.40
Estimated Yield (kg)	35000 kg
Total Yield - Farm Loss @ 3%	33950 kg
Breakeven Price	P12.24
Total Income at Farmgate Price of P13.81*	P468,849.50
Total Net Profit	P53,434.10
Return of Investment (%)	13%

Source: Bureau of Plant Industry, 2013 *Mean farmgate price from PSA Assumptions: Population Density: 4 m x 4 m l Labor - P 300.00/MD, P450/MAD l Field Mortality = 20%; Chicken Dung - 30 kg/bag

TABLE 23. TOTAL PRODUCTION COST FOR ONE (1) CROPPING CYCLE AND FIRST RATOON OF SABA BANANAS IN LUZON (NEW POT)

INPUTS	Amount
Labor Inputs	P212,600.00
Material Inputs	P136,426.00
Management Cost (20% of LI+MI)	P69,805.20
Miscellaneous Cost (10% of LI+MI)	P34,902.60
Depreciation Cost (1.5 years)	P16,593.60
Total Production Costs	P470,327.40
Lakatan	46648 kg
Total Yield - Farm Loss @ 3%	45248.56 kg
Breakeven Price	P10.39
Total Income at Farmgate Price of P13.81*	P624,882.61
Total Net Profit	P154,555.21
Return of Investment (%)	33%

Source: UPLB case
Assumptions:
Population Density: 3 m x 4 m (833 plants/ha) l Labor - P 450.00/MD, P800.00/MAD
Chicken Dung - 50 kg/bag
Planting material cost is P 50/tc banana l Field Mortality = 20%
Population density is 833 plants/ha

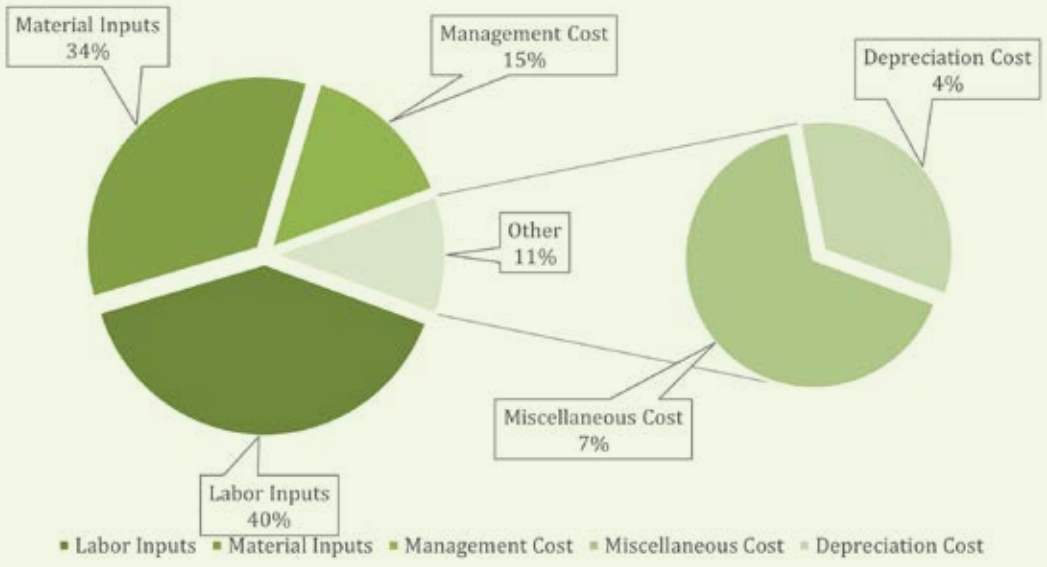
The costs of production varies due to the different rates of labor and practices in the Philippines. Rates of labor of Luzon is more expensive than in Mindanao due to higher living expenses near urban centers (National Wages and Productivity Commission, 2021). Production costs were modified to include management costs and miscellaneous cost to cover the expenses which are regularly incurred by farmers which are not paid. As an enterprise building activity, the production system should pay most of the efforts extended.

In Mindanao, it is observed that the material inputs have the highest share in terms of cost of production. Since the production system includes irrigation establishment, the cost of implementation is the highest among the material inputs needed. Moreover, labor in Mindanao have low wages compared to the counterparts in Luzon. Application of pest and disease control were also practiced by Mindanao farmers primarily due to large areas of banana monocropping. Large areas dedicated to monocropping have higher pest incidents compared to diversified cropping areas (Drenth & Kema, 2021)

Meanwhile, Luzon production practices have higher costs for labor inputs due to higher wage rates in the area. The practices were labor intensive compared to Mindanao. As compared, the PoT from Luzon will not establish an irrigation system and has zero utilization of pesticides which contributed to a lower cost of material inputs. Other costs (management, miscellaneous and depreciation) have similar rates as the computed value were proportional to the material and labor inputs.

Overall, the average labor input for Saba production for the projected period is 40% while material input is at 34% (Figure 40). Thus, it is a job generating activity in the surrounding areas of the farm or plantation and can contribute to economic activity. As most farm activities considered management efforts of the farm owner to be free, the production costs have included management fees for the individual looking after the farm. Miscellaneous costs cover other unmentioned expenses such as transportation and other explicit expenditures which might be incurred during the period. As presented, the monthly rate from the computed management costs were lesser than the monthly rate with a minimum wage. It implies that Saba farmers in the country must look into measures for other sources of income (Figure 41).

FIGURE 40. AVERAGE COST DISTRIBUTION (%) SABA PRODUCTION IN THE PHILIPPINES

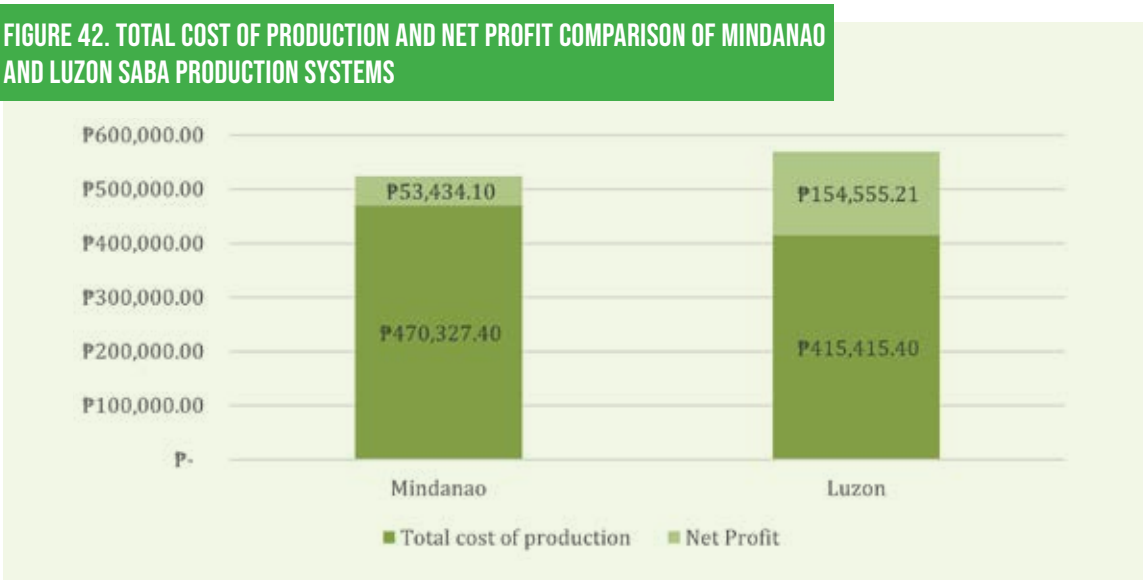


(Source: www.goldenSaba.com, 2021)

FIGURE 41. RELATIVE RATES FOR MONTHLY MANAGEMENT COST AND MONTHLY RATE (MINIMUM WAGE) IN SABA PRODUCTION

In terms of profitability (Figure 42), the PoT from Luzon have higher return of investment (ROI) of 33% compared to the practice in Mindanao with 13%. As prices were based on the reports from the Philippine Statistics Authority, changes in the prices can be observed through time. Moreover, price variation between markets can also be observed. Production practices in Mindanao can also adopt in order to have higher yields and attain higher ROI.

FIGURE 42. TOTAL COST OF PRODUCTION AND NET PROFIT COMPARISON OF MINDANAO AND LUZON SABA PRODUCTION SYSTEMS



Benchmark Analysis

Saba bananas are native varieties cultivated in the Philippines. Based on data, current productivity of Saba in the Philippines is lowest at 3 metric tons per hectare from Luzon and highest at 34 metric tons per hectare in Mindanao. Package of Technology for Saba production both in monocrop agricultural system and intercropping schemes are readily available yet few farms have engaged in its application. Accordingly, small scale production seemed to neglect use of inputs due to the cost and yield discrepancies were not very important for some farmers.

TABLE 24. PHILIPPINE GOOD AGRICULTURAL PRACTICES FOR BANANA PRODUCTION VS THE SMALL SCALE BANANA PRODUCTION PRACTICES

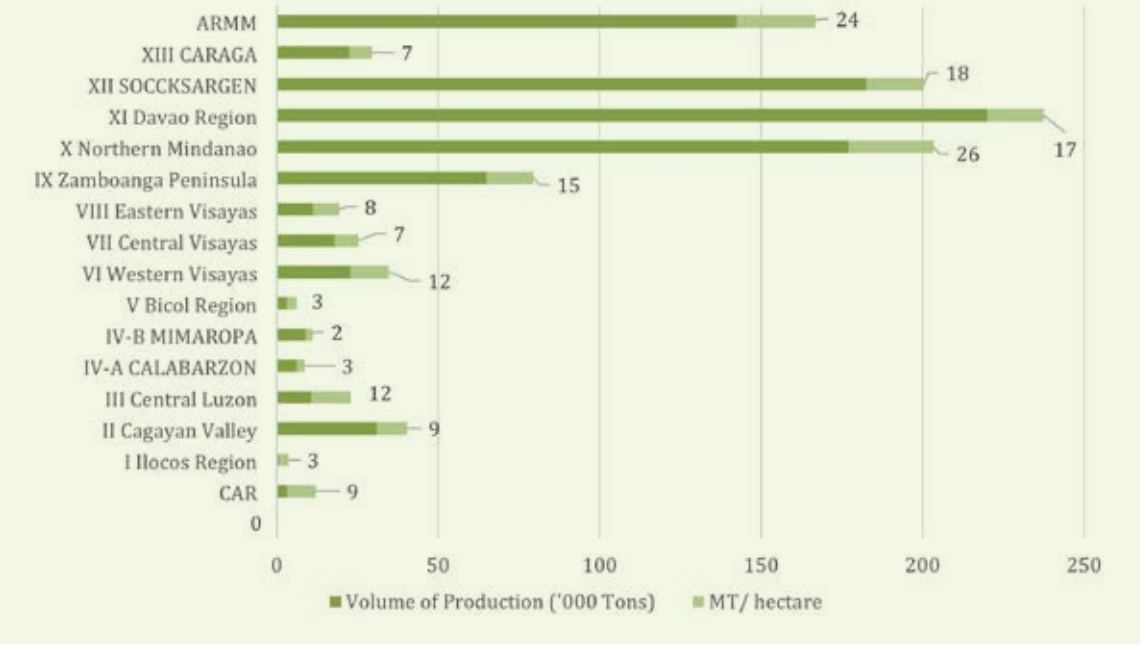
Cultural Management	Philippine GAP	Small Scale Growers Practice
Planting Materials	Tissue cultured materials from accredited TC laboratory	Use of plant suckers only sourced from any healthy-looking banana plant in the farm
Drainage and Irrigation	• Drainage canals (primary, secondary and tertiary) must be constructed to prevent water logging • In areas with pronounced dry periods, irrigation system is recommended – drip irrigation or under tree system	• Drainage canals are optional depending on the topography of the area • Farms usually rainfed, no irrigation system is put in place
Planting layout (depends on the banana variety being planted)	• Planting density: 625 – 833/ ha • Planting Distance: 4.0 m x 4.0 m 4.0 m x 3.0 m	Depends on the most convenient and efficient system established by the grower
Fertilization	Fertilizers should be applied based on the quantitative information on soil nutrient obtained through soil analysis	Fertilizers are occasionally applied

Cultural Management	Philippine GAP	Small Scale Growers Practice
Crop Protection	• To control the entry of diseases such as Moko, Bunchy Top, Bract Mosaic, Fusarium Wilt disease, the farm should regularly conduct survey for the presence of disease and implement eradication and treatment area interventions. • Visual inspection for the symptoms of diseases should be conducted regularly.	Visual inspection of the banana farm is not regular Disease management for banana farm is not usually applied
Mat Sanitation	• Removal of dried bracts from the pseudostem should be carried periodically to minimize insect infestation (scale insect, mealy bugs and aphids) • FPA-registered pesticides or oil should be sprayed in order to control the insect infestation and spread of diseases • During the operation, tools should be regularly disinfected using quaternary products to prevent spread of disease	Occasionally applied for farm sanitation, depending on the available labor for field operations
Fruit Care and Harvesting	• Bud injection - control of thrips by chemical/ non-chemical approach • Bunch spraying with fungicide a week after bud injection • Deflowering, defingering, hand pruning and debelling carried out either prior to bagging • Bagging should be done when all the hands have emerged, after the buds and false hands have been removed and after the bunch has been sprayed – to prevent scaring bettle damage	No fruit care practices are applied before harvesting

Cultural Management	Philippine GAP	Small Scale Growers Practice
Harvest Maturity Sorting Washing/ Cleaning	• harvest Saba 20-24 weeks after shooting • separate hands/fingers with damage or ripening • Necessary when bound for export	
Packaging	• use of wooden crate or carton boxes can delay ripening	

Based on Figure 43, comparing the volume of production and the productivity of the Saba variety under different conditions, significant difference may be observed from the Saba plantations in Mindanao and the Saba plantations in Luzon. Most Saba plantations in Mindanao are managed by big commercial banana plantations, similar to the Cavendish banana plantations. They may have the highest Saba productivity due to their application of the good agricultural practices recommended by the Department of Agriculture, although not all growers in Mindanao are GAP certified. In contrast to the productivity of Luzon Saba plantations, lowest productivity was observed in the Bicol Region, MIMAROPA and CALABARZON – mostly small-scale banana plantations, managed by local banana growers. These regions are also the typhoon prone areas which causes significant damage to banana plants and in many cases toppling down the pseudostem resulting in delays in harvesting time. Small scale growers in the country practice the usual neglect of banana plantations that promote the spread of pests and diseases of Saba that results to low productivity and bad quality produce (Aguilar and Gabertan, 2017). Another reason for the varying productivity could be the differences in rainfall patters. Most of the Saba production areas are rainfed and some regions have more evenly distributed rainfall than others.

FIGURE 43. VOLUME OF PRODUCTION AND PRODUCTIVITY PER UNIT AREA OF SABA VARIETY IN DIFFERENT REGIONS OF THE PHILIPPINES



In terms of government interventions, the improvement of Saba production through distribution of planting materials and expansion of areas of production is a part of the regular funding for 2021. Moreover, as a part of the productivity enhancement of the industry from Bayanihan 2, the Saba Industry Development Program which aims to strengthen the industry was given a budget of PHP 120,000,000.00. The program targeted (10) provinces namely North Cotabato, Lanao Del Norte, Davao Del Sur, and Agusan Del Norte in Mindanao; Samar and Leyte in the Visayas; and Apayao, Cagayan, Quezon, and Oriental Mindoro in Luzon. The said program committed an increase of 1% of increase in area of production which is estimated to be 2,279 hectares that would correspond to a 3% increase in volume of production or 74,370 MT (Department of Agriculture, 2020).

The growing demand for Saba bananas was observed in both fresh and processed products (Arado, 2018; Aebischer, 2019). Currently, several companies have engaged in producing banana chips for local and export markets yet shortage of supply was often encountered making their operations at 60-80% only. Compared to the practices of Thailand, their banana chips industry banks on quality even on a small scale. Operations

of small-scale banana chip producers only involve six (6) people who can fully operate the machinery and facilitate quality. Labor cost is reduced compared to processing plants on a large scale as practiced by others. Buyers then focus on the quality of products and clustered their purchases from small scale producers (Taizy Machinery Co., Ltd, 2020).

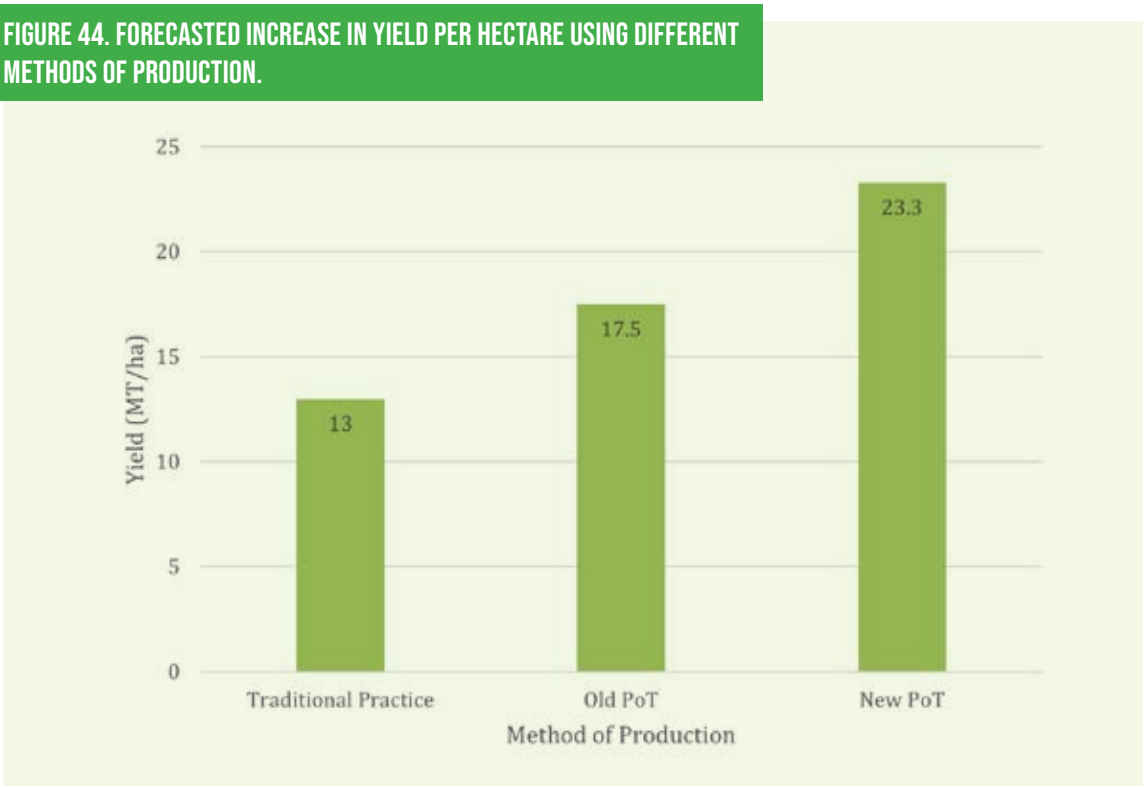
Growing of Saba was also recommended in the Fusarium Wilt Rehabilitation Program. Due to its pest tolerance, it is being used as crop/variety replacement for Cavendish plantations infected with Foc TR4 (Department of Agriculture, 2020). Conversion of areas to Saba varieties became an option in order to cater the skills of workers as planting other crops requires another skillset and the corresponding conditions may not be profitable for them. However, the price difference and market of Saba and Cavendish discouraged several growers who were accustomed to the income of the latter.

With the current production area for Saba variety, the productivity can be improved in terms of volume by using effective production technologies. Considering the budget allocation (Department of Agriculture, 2020) for the Saba industry, the demands from the locals in terms of products as well as the demand for exported products can be met. With the new PoT, use of productive variety, increase of plant population and nutrient management, a yield of 23.3 MT per hectare is forecasted to be reaped in the first cropping cycle and the following ratoons (Figure 44).

With the projected growth of the industry, the markets for the product should be identified. The growing local demand may not consume the 45% increase in volume. Since there have been observed differences in terms of Saba varieties/strains being grown in different regions, it is important to identify the best variety suitable to a particular locality and suit the specific needs of the consumers.

In terms of processing, Thailand's practice on small-scale banana chips production can be replicated in the country while targeting the international market as well. Instead of relying on multinational companies, support can be extended to clustered farmers who are producing Saba bananas as a form of value adding. Use of machinery which is readily available in the market is advantageous instead of targeting large production scales (Taizy Machinery Co., Ltd, 2020). This scheme can then address the issues on intermittent supply of bananas and promote the quality standards of banana chips produced.

FIGURE 44. FORECASTED INCREASE IN YIELD PER HECTARE USING DIFFERENT METHODS OF PRODUCTION.



Issues on Vietnam transshipment needs to be addressed by policy concerns. Companies engaging in the transshipment arrangement benefits from the low tariffs of Vietnam to the target country such as China and Japan (Mindanews, 2007). As the primary driver of engaging in such scheme is the high tariffs imposed by importing countries, mutual agreements might be necessary to directly sell the products. Distribution concerns with the possible increase in production can be supported by government initiatives for product transportation and shipments.

With its primary goal to supply the needs of local consumers, it is expected that with the expansion and rehabilitation efforts in the different key provinces, the price will become affordable to increase the consumption. Moreover, the Saba industry's growth can readily compete with its ASEAN counterparts as strategies on production, market-oriented variety selection, quality driven products and support on international trade can be given.

Market Trends and Prospects

The Saba market is progressing due to its international entry in all product forms. Gaining a global identity, its market prospect are in areas wherein cooking bananas are consumed. It is a competitive variety compared to Plantains as an advantage. In the local context, it is a growing substitute for carbohydrate staple due to its nutrient content.

Key Demand Drivers

Consumption of Saba bananas is often dependent on the price of the product while utilization for processing were driven by the market both in local and international buyers. External factors such as aftermaths of natural calamities and pandemic also affects the flow and distribution of products.

Locally, the demand for Saba product is in the form of snack food and consumers often regard it as a snack item instead of a carbohydrate source. Most of the communities in the Philippines have sellers of snack food products. As mentioned prior, the market of snack food are educational institutions and streets with high traffic. However, due to the pandemic, restrictions on movement for students led to losses of the sellers. Similar situation happened for areas with expected high traffic. Work from home and virtual classes affected the local consumption of products. However, home preparations for snacks included boiled Saba still contributes to consumption (Paubayon, 2014). In the aspect of processors for local banana chips, sales of giveaway items were affected. Sales were dependent on local tourist and visitors, and travelers. Thus, consumption and sales were reduced.

Though known as a healthy food alternative, individuals may prefer products which can translate to their value of money. In terms of snack foods, the possible marginal utility can occur wherein consumers feel the need to change their snacks to refresh the palate. Alternatives are everywhere in terms of bakeries, pastry shops and other food providers which are substitutes for bananas. Since the price of banana snack foods are also increasing due to the cost of production, consumers may prefer other snacks which are cheaper to be practical.

In the international markets, banana chips as snacks and first fry, and IQF bananas were the primary products exported. Markets have opened due to increasing demand for healthier cereal ingredient and snacks of other countries. IQF bananas were demanded by the Filipino diaspora overseas who are looking for Saba bananas and its snack food turon. Considering that there are 7,979,716 Filipinos residing abroad and their influence, the market of IQF bananas is expanding.

However, banana chips' demand can also shift when the market demands are not met and the goods are not delivered on time. With the rising small-scale processing of Thailand, importing companies might prefer the consistent supply. However, by improving the banana chips market in the local context, it can gain demand and mitigate the effects of unsold chips. Local markets will then increase their demand and offset the effects of the international market.

Market Prospects

Future market prospects for Saba bananas in the local level is forecasted to improve in the coming years with the improvement of production and varietal selection suited in the market. As it is aimed to have a regular supply, the prices will become more affordable for every consumer. Byproducts in the local markets are also assumed to become cheaper since the main ingredient will be cheaper. Ready to cook products such as the frozen turon (Golden Saba, 2020) can improve the product's niche in the future. Local consumption can also be increased through product promotion and information drive on the economic and health benefits of Saba bananas.

International marketing of fresh Saba bananas is also forecasted as Thailand began the trading for similar variety. Saba bananas are also considered as a substitute for other cooking bananas such as Plantain bananas which are produced mostly in the African continent (Maps of the World, 2016.) Its market potential can be further explored since some of the traditional markets for banana chips such as the USA and China are importing cooking bananas as well. However, a separate statistic on specific cooking bananas that are traded internationally is not yet presented to forecast possible market volume that the Philippines can target (Workman, 2021).

In terms of banana chips processing, the high demand of the USA and the corresponding tariff benefit is a good target. In the 45% increase of volume produced by the Philippines, quality bananas can be allocated to produce the chips demanded by the importers. With the traditional markets in Vietnam, China, United Kingdom and Germany, expansion to the European Union can be considered in the future. It is only possible when the stringent standards of the said market are met (Chips Machinery Manufacturer, 2018). In the local market, banana chips, alongside its product improvement in terms of processing and nutritional value, is a potential product niche for consumers who are looking into healthier options (Frey, 2020).

Other by-products such as banana blossoms and banana flower are already marketed in the local and international levels (PSA, 2021). Banana flower is considered as one of the meat substitutes for health-conscious communities while banana blossoms is considered as an ingredient in most Asian cuisines. The increasing population also shows that demand for food will also go in the same direction. Moreover, the increasing environmental concern also resorted to the use of banana leaves as material for food packaging. Due to the absence of leaf spraying, the leaves of Saba banana can be considered safe for utilization. Markets already sell banana leaves yet there are no data available as to the supplied volume and the actual demand. Such prospects are considerable opportunity for the Saba industry and expand the market through information drive to various consumers.

Areas for consideration

1. Implementation of a national buying scheme for Saba banana. Uniform buying scheme for Saba bananas should be implemented to counter losses. Considering the product and supply flow, per kilogram is profitable for farmers.
2. Conduct of field validation studies for the Value Chain Analysis of Saba. Actual field data from the industry players are necessary in order to provide sustainable interventions.
3. Updating of specific product standards for Saba bananas alone. With the growing international market, farmers need a updated guide to align their production practices to the market.

Target Setting for Saba Industry

Vision:

Recognition of the Philippine Saba as a premium and world-class cooking banana

Mission:

Saba industry aims to consistently meet world quality standards with good productivity, sustainable production practices, thus ensuring economic viability for its stakeholders.

Goals and Targets:

1. Increase farmer productivity by 1% for Saba (increasing productivity/ha)
2. Increase production area by at least 3% per year for Saba
3. Increase Market share in both Fresh Fruit and Value-added Products - such as Banana Chips, Banana Flour.
4. Attain 100% world standard product quality
5. Support Stakeholders in moving up in the Value Chain
6. Identify Resources and Financing windows for the Banana Value Chain players
7. Improve productivity related infrastructures and post-harvest facilities in the Banana value chain
8. Establish Banana Research and Development structures and systems
9. Strengthen the Banana Industry Governance through the establishment of the Banana Industry Council as the lead group for the Philippine banana directives

1. Short Term Target for 2022 - 2025

Table 15 shows the annual target for banana productivity from the year 2022 to year 2025, provided that all factors affecting banana production all over the country hold

stable for the next 5 years. Increasing productivity per hectare is the primary target for the next years, harvesting more fruits each year for every hectare of banana farm.

From recent discussions during the National Food Security Summit (NFSS), several factors were identified affecting banana productivity. The following production factors, if not properly addressed in the following years, may largely affect the short-term targeted productivity for 2022-2025.

Tissue cultured planting materials for Saba.

a. Accredited Tissue Culture Laboratories.

b. Rehabilitation of existing Saba farms in the country.

c. Improve market access and export volume for Saba.

TABLE 25. ANNUAL TARGET FOR SABA BANANA PRODUCTIVITY

	2021	2022	2023	2024	2025
Productivity 1% (tons/hectare)	13.46	13.59	13.73	13.87	14.01
Area Planted (hectares) 3%	186,147	191,731	197,482	203,406	209,508
Production (metric tons)	2,505,538	2,605,624	2,711,427	2,821,241	2,935,207

2. Medium Term Target (2026 - 2030)

Establishment of processing facilities in strategic areas of the country

As patterned from Thailand, smaller and efficient processing plants will be encouraged. It can be handled by clustered small groups or associations of Saba growers which are directed to a specific market either in local or international. Smaller processing plants became effective in optimizing production and attaining the required quality of the market. Investors are also inclined to smaller scale processing units due to the magnitude of risks and success rates.

3. Long Term Target (2031 - 2040)

Alongside the government's thrust by 2040, every Filipino enjoy a strongly rooted, comfortable, and secure life. It is envisioned that we will all enjoy a stable and comfortable lifestyle, secure in the knowledge that we have enough for our daily needs and unexpected expenses, that we can plan and prepare for our own and our children's future. Our family lives together in a place of our own, and we have the freedom to go where we desire, protected and enabled by a clean, efficient, and fair government (Ambisyon Natin 2040)

- Local farmers of Saba will realize a comfortable life (maginhawa) by increasing income of farmers thru long term sustainable production practices that will encourage higher production volumes and good quality produce
- Saba farmers will have a secured future (panatag) through stable and wider scope of local and international markets and dependable crop insurance policies
- With sustainable markets for Saba due to increasing local and world market demands for the processed bananas - established Filipino Owned Saba farms will be a stable source of employment for many Filipinos, thereby securing their source of income for the future.
- Promotion of agri-entrepreneurship to increase farmer's income through banana chip processing and value adding technologies for the Saba variety

Strategic Actions for the Saba Industry

1. Improvement of Productivity per unit area

Many of our Saba farms need rehabilitation and this also requires availability of tissue cultured Saba seedlings. Adaptation of the seedling delivery system model demonstrated in the paper of Molina et al. (2011). Also, plantations in Luzon and the Visayas should be rehabilitated into an intensified mono-cropping system to increase productivity for every hectare land area. Application of proven technologies such as application of fertilizers, banana sucker population management, application of appropriate irrigation system - to increase productivity should be applied in farmers' fields to demonstrate the profitability of Saba production.

- Establishment of seed system in top producing regions
- Accreditation of tissue culture laboratories and nurseries
- Improvement of use of established indexing laboratories

2. Increasing Quality and Productivity Level

Package of technologies for good post-harvest practices should be applied in all banana plantations to ensure the quality and acceptability of the bananas we sell in the domestic market and in the export market.

Preparation of information and extension materials should be improved and trainings should be implemented for banana growers and processors to ensure satisfaction of the export quality product standards.

- Training of farmers for already available POTs for GAP, Pest and Disease Management and Postharvest Technologies
- Establishment of model farm applying the best POTs
- Compliance to phytosanitary protocols

3. Expansion of Production Areas

Strategic planning should be made for expansion of production areas for Saba, Lakatan, Cavendish and other export potential banana varieties. Establishment of a national program for Banana Crop mapping (includes location of Saba plantations, cropping schedule and crop clustering) may also be considered to efficiently identify the best locations for plantation expansion and infrastructure establishments to enhance crop productivity and ensure proper post-harvest handling.

- Rehabilitation of Saba Plantations particularly in Luzon and Visayas areas
- Expansion of Saba production areas all over the Philippines
- Expand Intercropping of Saba and other banana cvs under coconut

4. Moving up in the Value Chain

- Formulation of a Cluster Development Plan
- Product Quality Standardization for small growers
- Certification and Branding assistance for small growers
- Establishment of Postharvest facilities to assist small growers

5. Market & Product Development

Expand market access of farmers thru market linkage with institutional buyers, traders and other marketing platforms.

- Provide logistic assistance to industry players
- International and Domestic Consumer Awareness Campaign
- Improvement of processed product standards
- Participation in International Banana Trade Fair for Fresh and Processed Banana Competitive Studies

6. Resource Generation and Financing Strategies

- Encourage Saba Growers (medium to large scale growers) to sign up for Crop Insurance
- Include Banana as a Priority Crop in Government Financing Programs

7. Research and Development

- Establishment of the Philippines Banana Research Institute (PBRI)
- Establish a Varietal Selection/ Clonal Garden/ Seed Bank Center for efficient development of resistant banana varieties for major diseases
- Varietal selection for dwarf Saba for resilience to adverse weather conditions in Luzon and Visayas
- Development of reliable and efficient virus disease indexing
- Genomic tagging of Philippine Saba /Cardaba
- Research on site specific nutrient management (SSNM) for Saba 'kalimacho' problem
- Screening of farmers' varieties to select clones perfect for different Saba processed products (cooking, banana chips, flour)
- Studies to explore different potential Saba processed products for export
- In Depth Cavendish Industry Value Chain and Market Analysis Studies

8. Intensify Technology Transfer

- Regular conduct of trainings for banana growers and extension workers
- Development of information and extension materials for banana growers education
- Annual Banana Congress

  An avenue for banana scientists, researchers and banana stakeholders to present up to date research findings on technologies that will improve banana production, pest and disease management, advances in production systems, latest market prospects and value adding technologies for processed banana

9. Policy Recommendations

- Review and refiling of Banana Industry Bills enacted in Congress
- Mandatory accreditation of Tissue Culture Laboratories and Nurseries
- Creation of the banana Industry Development Council
- Policy to strengthen monitoring and regulation of phytosanitary protocol compliance in banana plantations

COMMODITY INDUSTRY ANALYSIS: LAKATAN VARIETY

Industry Summary

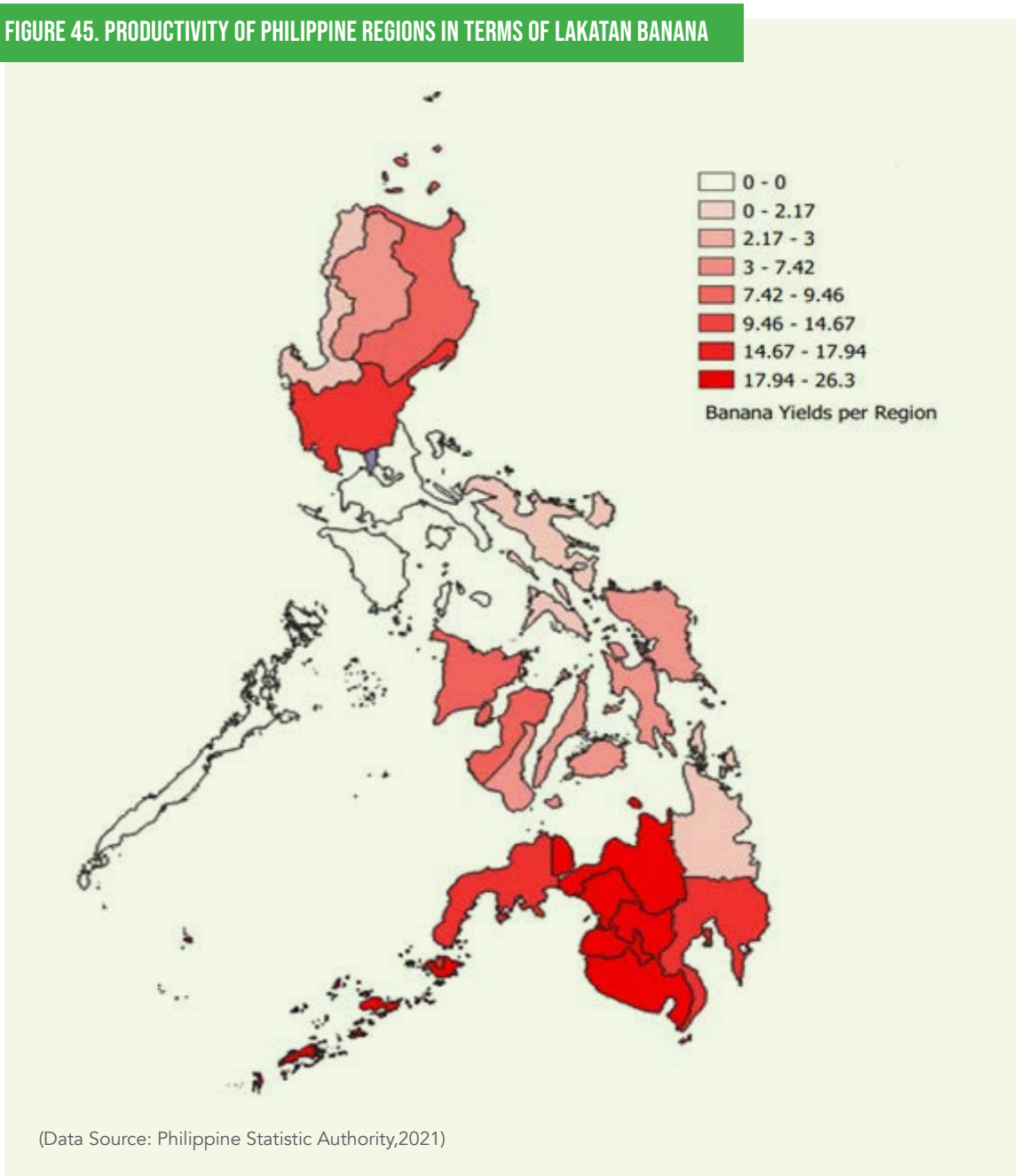
Lakatan is the most popular table/dessert banana in the Philippines and priced competitively compared to other bananas in the local market. The industry has the following characteristics:

1. The Lakatan industry is composed of 85-90% small land holding farms and 10-15% of large land holding farms which are owned by corporations and plantations (PRDP, 2015).
2. Current productivity measured in metric ton per hectare for Lakatan banana is at 11.02 (PSA, 2020) only compared to the projected 40 (BPI, 2013) entailing production interventions are still necessary.
3. Establishing a hectare of Lakatan banana farm requires an average of P873,198.05 (BPI, 2013) with an expected average return of investment (ROI) of 167%.
4. Marketing of Lakatan banana is primarily constrained by its relative short shelf life which affects its physical attributes. It can be addressed with transportation efficiency being one of the price determinants during selling (PRDP, 2015).
5. Adoption of Good Agricultural Practices for Banana in the Lakatan Industry is slow due to (1) high fixed cost for the requirements, (2) lack of technical knowledge for its implementation and (3) the certificate is irrelevant to their existing markets (PRDP, 2015)
6. Several market entities are involved in the physical distribution of Lakatan from Mindanao which entails that the activity also generates employment among middlemen (PRDP, 2015).
7. Production technologies should include the market perspective in terms of improving the shelf life during shipment as 60-70% of the products are marketed outside Mindanao (PRDP, 2015);

Key Production Areas of Lakatan Banana And Distribution

Lakatan production in the Philippines is dominated by Mindanao regions which supplies around 60-80% of the yield to other regions of the country. The main Lakatan-producing regions were Davao Region, SOCCKSARGEN, Northern Mindanao, ARMM and Zamboanga Peninsula, in the island of Mindanao (Figure 46).

FIGURE 45. PRODUCTIVITY OF PHILIPPINE REGIONS IN TERMS OF LAKATAN BANANA

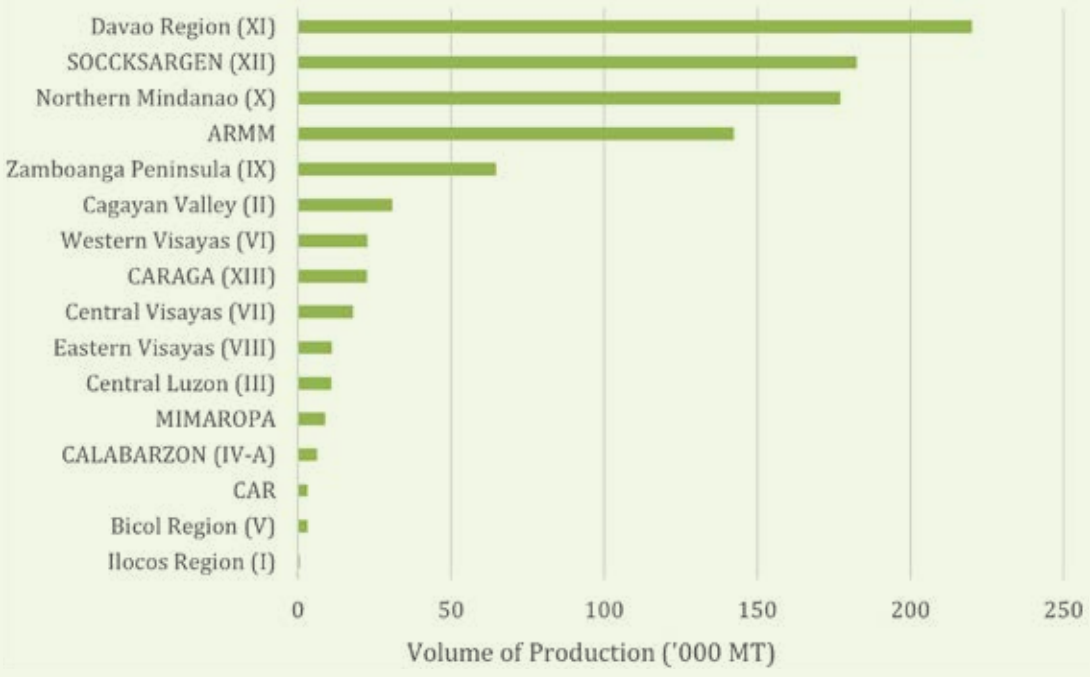


(Data Source: Philippine Statistic Authority,2021)

In the Davao Region alone, Lakatan produced in this area accounts for 23% of the total Lakatan production in the country. Lakatan in these top producing areas are usually shipped to other parts of the country and for local consumption. For Luzon, Lakatan production in Cagayan Valley of Luzon only ranked 6th on the list, mostly supplying the fresh banana demands of Northern Luzon.

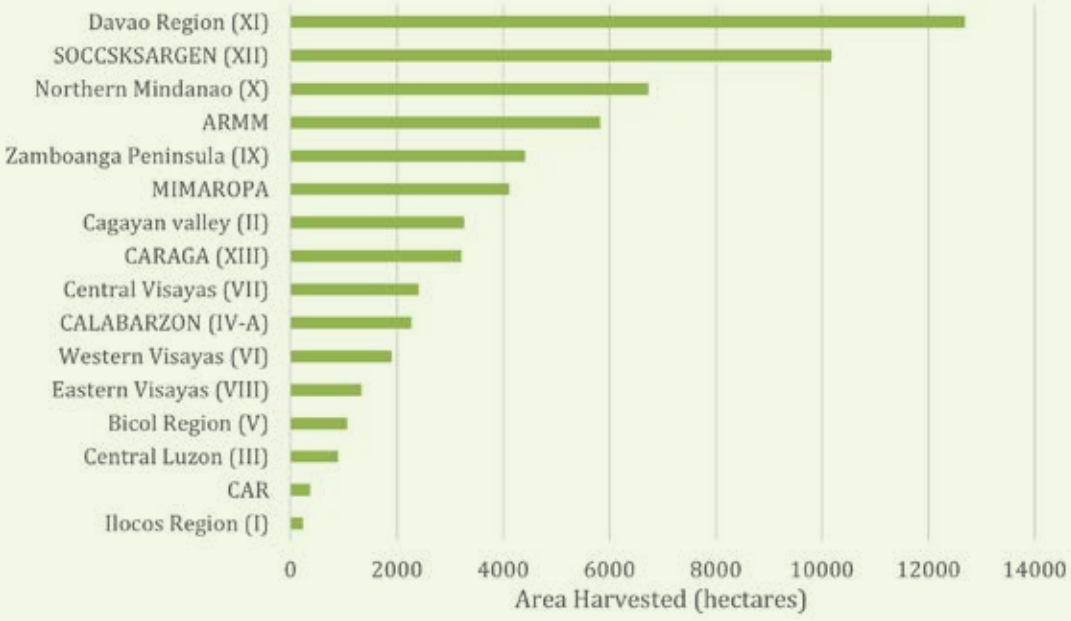
Figure 47 shows the size of the area harvested for the Lakatan Variety. Over all the country statistics for area harvested for the bananas, only 14% was planted with Lakatan. It is important to take notice that the size of the area harvested is not directly proportional to the volume of production (Figure 46) . Large areas of Lakatan plantations were observed from the top 5 regions of the country similar to the top 5 regions for the volume of Lakatan production. However, looking further, MIMAROPA showed high area of Lakatan plantation but shows very low yields per hectare, finding its 5th spot from the bottom of Lakatan production. This is a very clear evidence of very low yields per hectare, not evening hitting the potential yield for the variety.

FIGURE 46. VOLUME OF PRODUCTION OF LAKATAN VARIETY IN DIFFERENT REGIONS OF THE PHILIPPINES



Source: Philippine Statistics Authority (2020)

FIGURE 47. AREA HARVESTED (HECTARES) FOR LAKATAN VARIETY IN DIFFERENT REGIONS OF THE PHILIPPINES



Source: Philippine Statistics Authority (2020)

Table 26 shows the comparison between the volume of production for Lakatan and the size of land area planted with the banana variety. Highest yield per hectare was observed in the provinces of Northern Mindanao and the ARMM region with 24 to 26 metric tons yield per hectare which reveals the efficiency of their production system. Lowest yield per hectare were observed in the regions of Luzon, namely the CALABARZON, MIMAROPA, Ilocos Region and the Bicol Region. All regions have yield efficiency of only 2-3 metric tons per hectare.

The very low production of Lakatan in Luzon and in the Visayas can be attributed to several reasons. Luzon and Visayas experience severe weather conditions such as heavy rainfall and strong winds brought about by typhoons – this leads to breakage and toppling down of banana plants and thus resulting to reduced yield per unit area. Lakatan is highly susceptible to BBTV, and so the continued use of Lakatan suckers around the region creates very high disease pressure on the variety that leads to more disease incidences, thus reducing productive plants and therefore low yields per unit area. The application of inputs may also be one factor, low fertilizer inputs by small scale to medium

scale banana growers limits the yield potential of the Lakatan. Fertilizer inputs are usually expensive and so not many small scale growers will not invest money to increase yield of their crop plants. Leaf diseases like Sigatoka and other soil borne pests such as burrowing nematodes and weeds are also an important factor that if not managed properly, yields may will decline over time.

The Lakatan volume of production and area planted with the variety, based on the 10-year data show that there has been no significant change over time (Figure 49). The data may indicate several probable concerns with regards to production, (1) there was no significant change in the volume of production over the last 10 years despite the introduction to farmers of technological intervention, (2) there was no realized expansion of Lakatan production over the last 10 years despite the increasing demand for fresh bananas, and (3) data gathered for the previous years are not updated. (data accuracy)

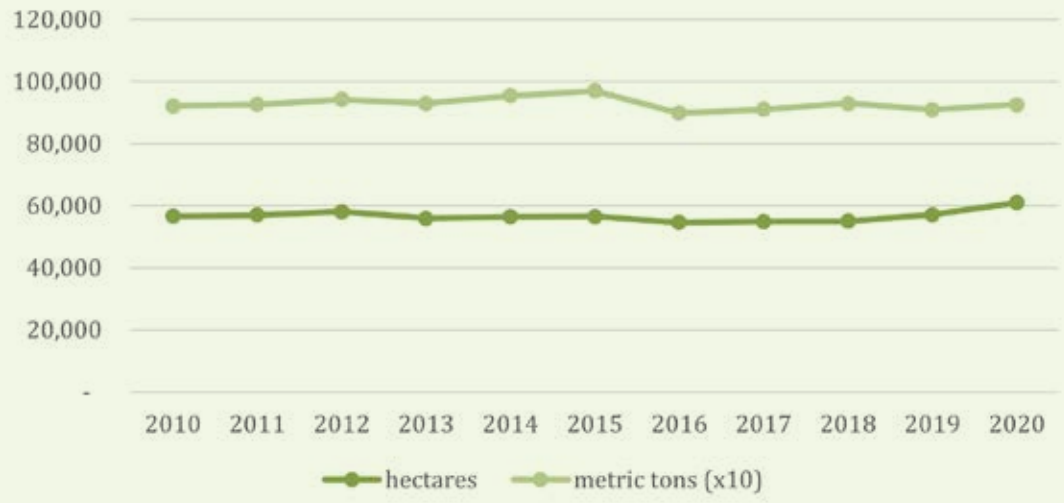
TABLE 26. COMPARISON OF YIELDS PER HECTARE FOR LAKATAN VARIETY AMONG THE REGIONS IN THE PHILIPPINES

Philippine Regions	Volume of Production (MT)	Area Harvested (has)	Yield per Hectare (MT/ha)
CAR	3,265	369	8.84
I Ilocos Region	700	235	2.99
II Cagayan Valley	30,928	3,269	9.46
III Central Luzon	10,886	900	12.09
IV-A CALABRZON	6,156	2,273	2.71
IV-B MIMAROPA	8,915	4,113	2.17
V Bicol Region	3,211	1,072	3.00
Regional Values			
Total	**64,061**	**12,232**	
Average			**5.24**
VI Western Visayas	22,796	1,908	11.95
VII Central Visayas	17,935	2,416	7.42
VIII Eastern Visayas	11,133	1,339	8.31
Regional Values			
Total	**51,864**	**5,663**	
Average			**9.14**

Philippine Regions	Volume of Production (MT)	Area Harvested (has)	Yield per Hectare (MT/ ha)
IX Zamboanga Peninsula	64,820	4,419	14.67
X Northern Mindanao	177,132	6,735	26.30
XI Davao Region	220,125	12,696	17.34
XII SOCCKSARGEN	182,522	10,175	17.94
XIII CARAGA	22,584	3,218	7.02
ARMM	142,407	5,825	24.45
Regional Values			
Total	**809,590**	**43,068**	
Average			**18.80**
National Values			
Total	**925,515**	**60,963**	
Average			**15.18**

Source: Philippine Statistics Authority (2020)

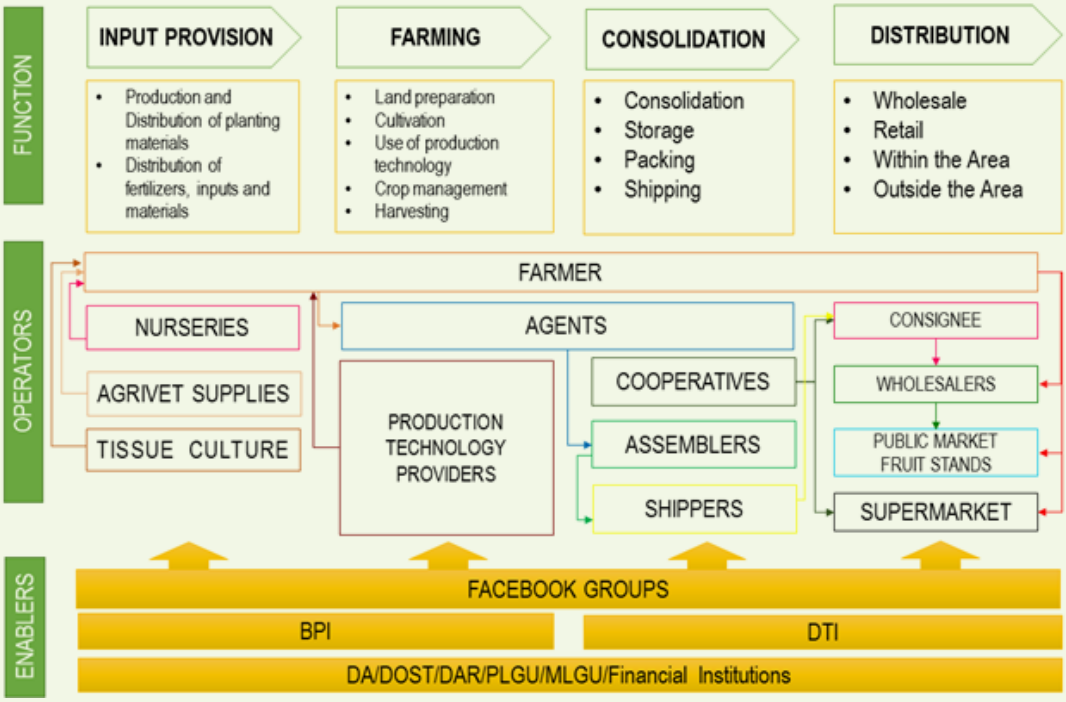
FIGURE 48. LAKATAN VOLUME OF PRODUCTION AND AREA HARVESTED IN THE PHILIPPINES FOR THE LAST 10 YEARS



Source: Philippine Statistics Authority (2020)

Supply and Product Flow for Lakatan Banana

FIGURE 49. SUPPLY AND PRODUCT DISTRIBUTION OF LAKATAN BANANA



Modified from the original: PRDP, 2015

Supply and product distribution of Lakatan banana is shown in Figure 49. Based on the figure, it can be observed that several operators are involved in the different stages of the production and physical distribution of the product. The number of traders involved depend on the capacity of the farmer and the distance of the target market. Some farmers can directly market their products to nearby wholesalers and public markets whereas farmers with large quantities of product can engage with supermarkets. However, if the product will be marketed outside the area of production, several middlemen are involved in order to effectively distribute the product. It usually happens for Lakatan bananas produced from Mindanao and marketed in key cities such as Cebu and Metro Manila (PRDP, 2015).

The Lakatan industry is composed of 85-90% small land holding farms and 10-15% of large land holding farms which are owned by corporations and plantations (PRDP, 2015).

Small holding farms have a land area below 5 hectares while large land holdings have much larger areas. Previous years have shown trends wherein the harvest of the small holding farms was limited to the marketing capacity of the farmers yet according to the interview, the involvement of middlemen have dominated the marketing part of the business.

Lakatan planting materials can either be suckers or plantlets produced from tissue culture laboratory. Since Lakatan is highly susceptible to BBTV, the use of tissue cultured planting materials is recommended. Tissue cultured planting materials should however be sourced out from accredited Laboratories. Virus indexing should be done to ensure that the explants being propagated are virus-free. In Luzon areas, there is a high demand for tissue cultured Lakatan but limited supply only. In some cases, there are available tissue cultured planting materials but no buyers. Hence it is important that the government should have a program to forecast the demand and availability of tissue cultured planting materials in areas for expansion.

Despite being true-to-type and cheaper, suckers are prone to be vector of soil-borne diseases which can affect production (Tripathi, 2016). Moreover, the current plant population density practiced by farmers is around 2100 to 2200 plants per hectare (Herradura et al, 2013). Thus, there is a high demand for quantity and quality planting materials. However, during replanting period for around 3 to 5 years depending on the occurrence of diseases, they are often unprepared for capitalization which can be due to (1) incompetent prices in the farm gate prices and (2) lack of financial management. Thus, they tend to use seemingly healthy suckers from unaffected plants instead of buying tissue cultured planting materials.

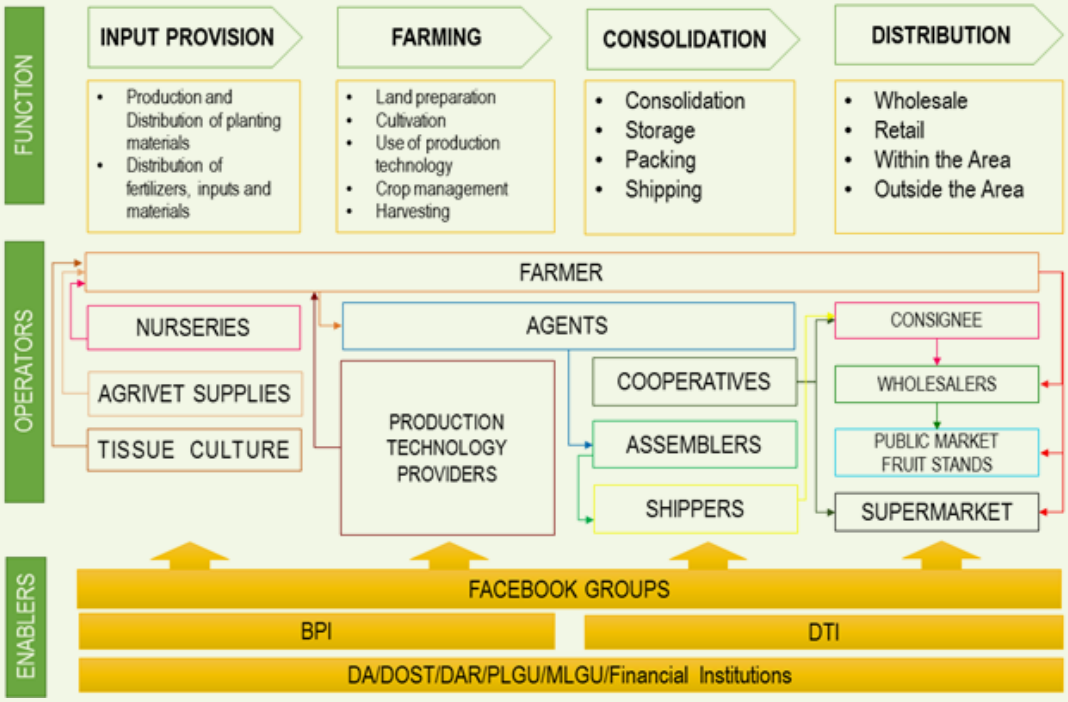
Good Agricultural Practices (GAP) for Lakatan farmers were also promoted by DA in order to establish better phytosanitary practices and improve their overall farm situation. Several seminars and trainings were even given by the department yet most were irresponsive due to (1) high fixed cost for the requirements, (2) lack of technical knowledge for its implementation and (3) the certificate is irrelevant to their existing markets as Lakatan is not an exported product. Some also see it as a tedious process which may not also affect their sales as it is dependent on the transactions of the

agent (PRDP, 2015). Based on such, interventions on simplifying the certification and considerations based on farm sizes can be another measure of implementation

The farming stage of Lakatan is estimated to cost at P350,000.00 – 450,000.00 covering the establishment cost up until to harvesting (Herradura et al, 2013). The postharvest operations were covered by the assemblers in order to satisfy the quality of products. An estimate of 15% of field mortality was also indicated for a population of 2100 to 2200 trees while bunch weight in the recent observation have reduced to 18 kg on average. The weight of the stalk is estimated to be at 2 kg. Taking all of these in consideration, a kilogram of Lakatan will cost P13.68 on average.

Profit Shares of Players

FIGURE 50. PROFIT SHARES OF INDUSTRY PLAYERS IN LAKATAN BANANA FROM MINDANAO

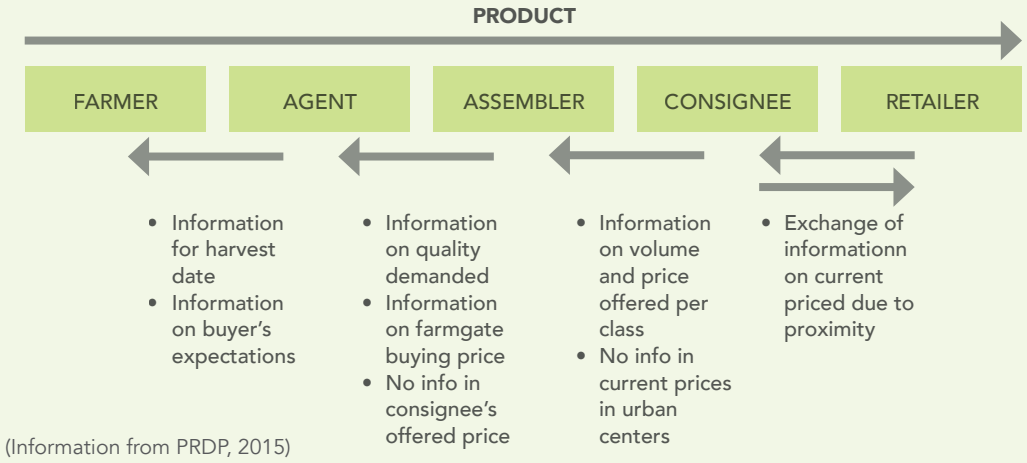


(Adopted from PRDP, 2015 Price Source: KI)

Using current market prices, the price movement during product distribution was followed to estimate the profit shares (Figure 50). Accordingly, the farmer has the highest profit share among all key players at 35.27%. However, when equated to a per day share, the agent gains the most at 14.32% after a day's work. In contrast, the farmer's profit share is only 0.07% per day. Since the product is not usually processed, the retailer has the highest risk being the end point. Reduced visual quality as well as excessive ripeness are factors for unmarketable Lakatan bananas (PRDP, 2015). There are also instances that shippers also own the products being transported. In such cases Shippers had the highest risk because they hold the highest volume of bananas and the biggest risk. If shipment is delayed by half a day, that means bananas in the container van are exposed under the sun at the port area for another 4 hours or so, until loading in the ship happens This is why addition of ice blocks in the container van became popular so that inside temperature will be brought down. Hence ripening of fruits is delayed, where bananas reached Manila port still almost 100% green. (Lizada, 1993; Artes et al,2013). Engaging in any part of the trade in Lakatan has its corresponding risks and profits.

Other industry players such as large farms and cooperatives often have similar risks but due to their entities as established businesses. They can participate in other businesses at ease compared to small farmers and they are informed about changes in the market. Compared to small scale farmers, their source about market trends are the agents. Aside from lacking the technical knowledge in growing Lakatan, they are also dependent on the farmer. The flow of information about the current market price in order to have better positions in price flow is necessary but often withheld by people. Figure 58 shows the interfirm relationship in terms of product distribution and price information.

FIGURE 51. INTER-FIRM RELATIONSHIPS OF LAKATAN INDUSTRY PLAYERS IN TERMS OF PRODUCT AND INFORMATION



(Information from PRDP, 2015)

Compared to the publication of placing the gains of the middlemen in a general context, PRDP (2015) have shown the different middlemen involved in product distribution and gains relatively small profit shares. Farmers have limited access and power over the buyers due to their personal capacities to reach the economies of scale. The market actors involved in the product distribution have assisted the marketing of Lakatan bananas to reach the final points of sales. Aside from delivering the products to the markets, the involvement of middlemen also generated jobs to the people involved (Figure 51). In order to move up the value chain, formalizing the middlemen by training them about value adding through transportation mediums can generate employment as well as enforce quality standards of the product.

Strength, Weaknesses, Opportunities and Threat (SWOT) Analysis

TABLE 27. SWOT TABLE FOR LAKATAN VARIETY

Value Chain Segment	Target Industry Player	Strength	Weaknesses	Opportunities	Threats
Input Provision	Tissue culture laboratories (TCLs)	Available production protocols	Concentrated in Mindanao	Effective and efficient seeding system	Price competition
	Private Financers (PFs)	Efficient lending process	Price monopoly and product control	Formal loan optimization	Situational preference
Farming	DA	Effective Packages of Technology (PoT)	Low adoption rate	Promotional activities	Possible resistance
	Workforce	Built-in cultural management expertise	Lack of market information	Synergistic market research collaboration	Absence of allocated funds
		High optimum yields	High postharvest losses	Effective postharvest intervention	
		Escalating industry interest	Product surplus	Harmonized production systems	
Consolidation	Assemblers	Established financing systems	Possible price and supply control	Institutional price regulation	Possible resistance
	Consignees/ Shippers	Strategic distribution schedule	High product losses	Effective product distribution assistance	Absence of allocated funds
Distribution	Consumers	High demand in Urban Centers	Absence of near production sites	Establish new production areas	Occurrence of natural calamities
	Retailers	Established retail points	Private control on product and price	Strategic commodity management	Retaliation and disengagement in the market

Cost And Return Analysis

Lakatan production is being practiced throughout the Philippines. However, there are different practices and recommendations which are being

TABLE 28. TOTAL PRODUCTION COST FOR ONE (1) CROPPING CYCLE AND FIRST RATOON OF LAKATAN BANANA IN MINDANAO

INPUTS	Amount (P)
A. LABOR INPUTS	285,000.00
B. MATERIAL INPUTS	399,503.00
Management Cost (20% of LI+MI)	136,900.60
Miscellaneous Cost (10% of LI+MI)	68,450.30
Depreciation Cost (1.5 years)	16,593.60
Total Production Costs	906,447.50
Estimated Yield (kg) (80,000 kg)	
Total Yield - Farm Loss @ 20% (64,000 kg)	
Breakeven Price	14.16
Total Income at Farmgate Price of P27.00*	1,728,000.00
Total Net Profit	821,552.50
Return of Invest (%)	91%

Source: Bureau of Plant Industry, 2013
Assumptions:
*Farmgate price base on national average from Philippine Statistics Authority
Population Density - 2000 hills (2.0 m x2.5 m)
Labor - P 300.00/MD, P450.00/MAD
Chicken Dung - 30 kg/bag

TABLE 29. TOTAL PRODUCTION COST FOR ONE (1) CROPPING CYCLE AND FIRST RATOON OF LAKATAN BANANA IN LUZON

INPUTS	Amount (P)
A. LABOR INPUTS	398,000.00
B. MATERIAL INPUTS	235,350.00
Management Cost (20% of LI+MI)	126,670.00
Miscellaneous Cost (10% of LI+MI)	63,335.00
Depreciation Cost (1.5 years)	16,593.60
Total Production Costs	839,948.60
Estimated Yield (kg) (80,000 kg)	
Total Yield - Farm Loss @ 20% (64,000 kg)	
Breakeven Price	13.12
Total Income at Farmgate Price of P45.00*	2,880,000.00
Total Net Profit	2,040,051.40
Return of Invest (%)	243%

Source: Estimated expenses from UPLB case
Assumptions:
*Farmgate price base on prevailing price in the area
Population Density - 2000 hills (2.0 m x2.5 m)
Labor - P 450.00/MD, P 800.00/MAD
Chicken Dung - 50 kg/bag
Planting material - P 50.00/pc
Farmgate Price - P 45.00/kg

The two (2) packages of technology were presented in order to assess the differences in costs and practices and he corresponding advantages. As observed, in terms of material inputs, the practice in Mindanao incurs higher costs compared to Luzon. Accordingly, Luzon do not practice utilization of pesticides and establishment of irrigation facility in order to control pests and water in the farm. In terms of labor inputs, higher labor inputs were incurred by the PoT in Luzon due to higher wages for farm workers and field maintenance rely on frequent labor activities. In lieu of utilization of pesticides, manual observations were done to respond and control disease. As the farms in Luzon are nearer to market centers, packaging materials were omitted as transportation will be shorter. The farm gate price is also higher in Luzon compared to Mindanao. However, when the production costs were projected in average, similar percentiles between the major costs were observed for Lakatan banana production as shown in Figure 53.

FIGURE 52. AVERAGE COST DISTRIBUTION (%) FOR LAKATAN BANANA PRODUCTION

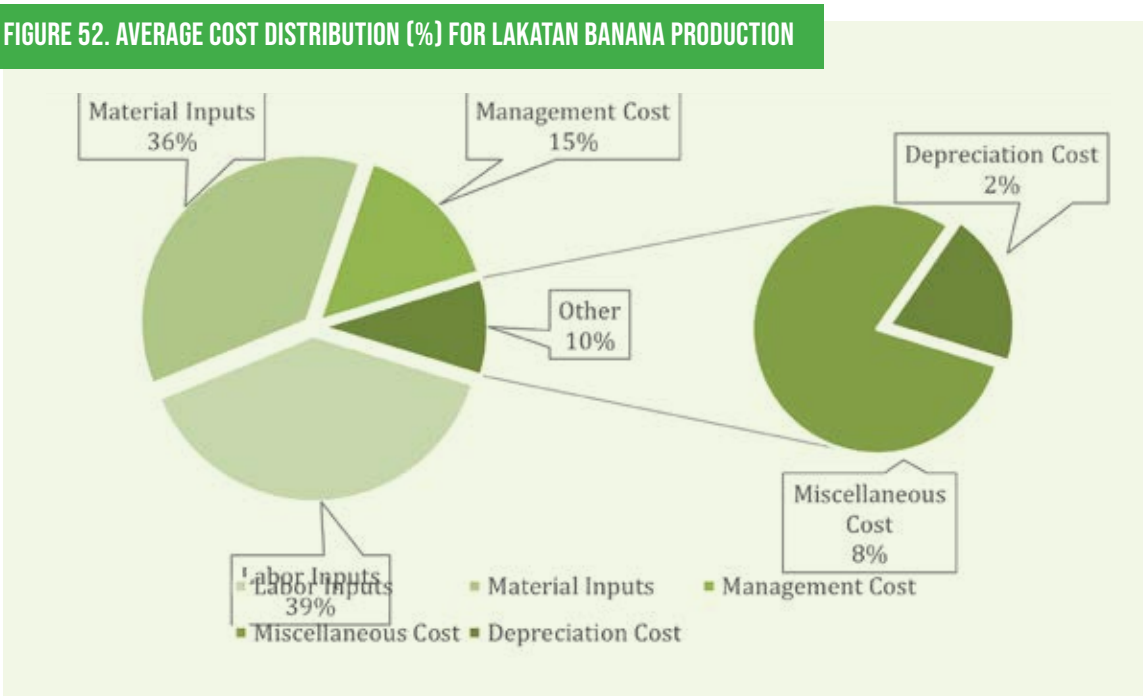


FIGURE 53. RELATIVE RATES FOR MONTHLY MANAGEMENT COST AND MONTHLY RATE (MINIMUM WAGE) IN LAKATAN PRODUCTION

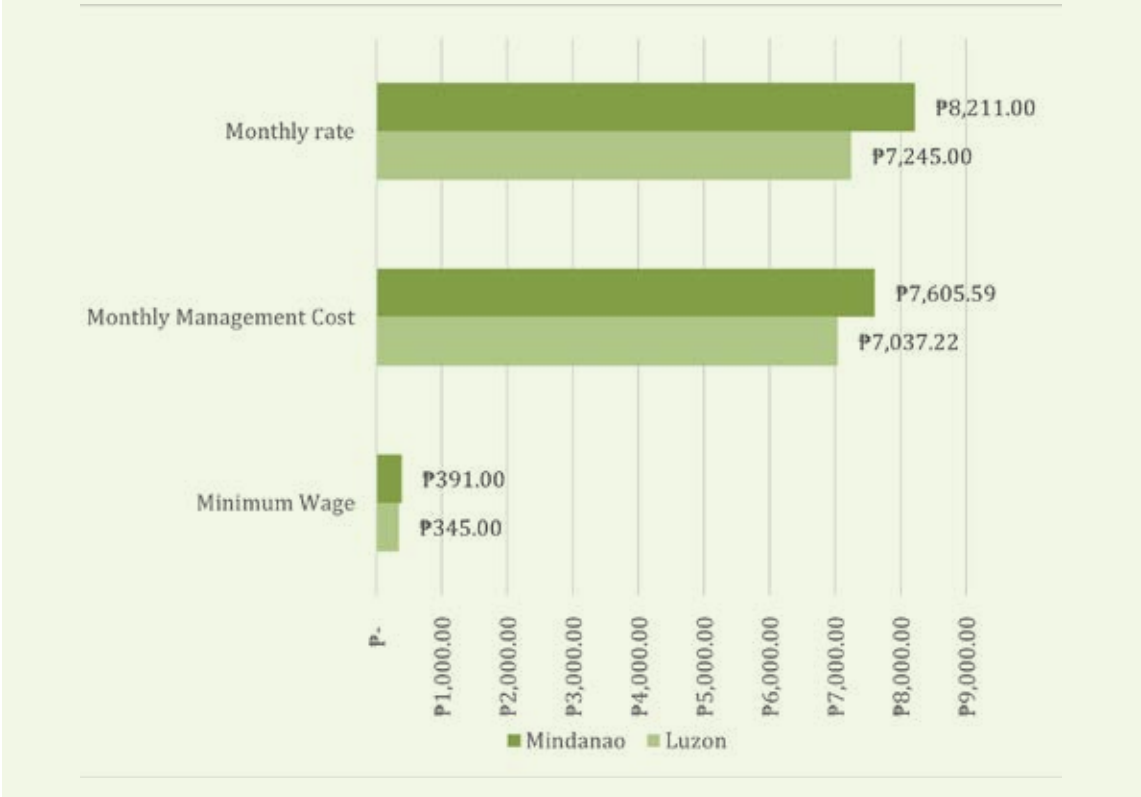
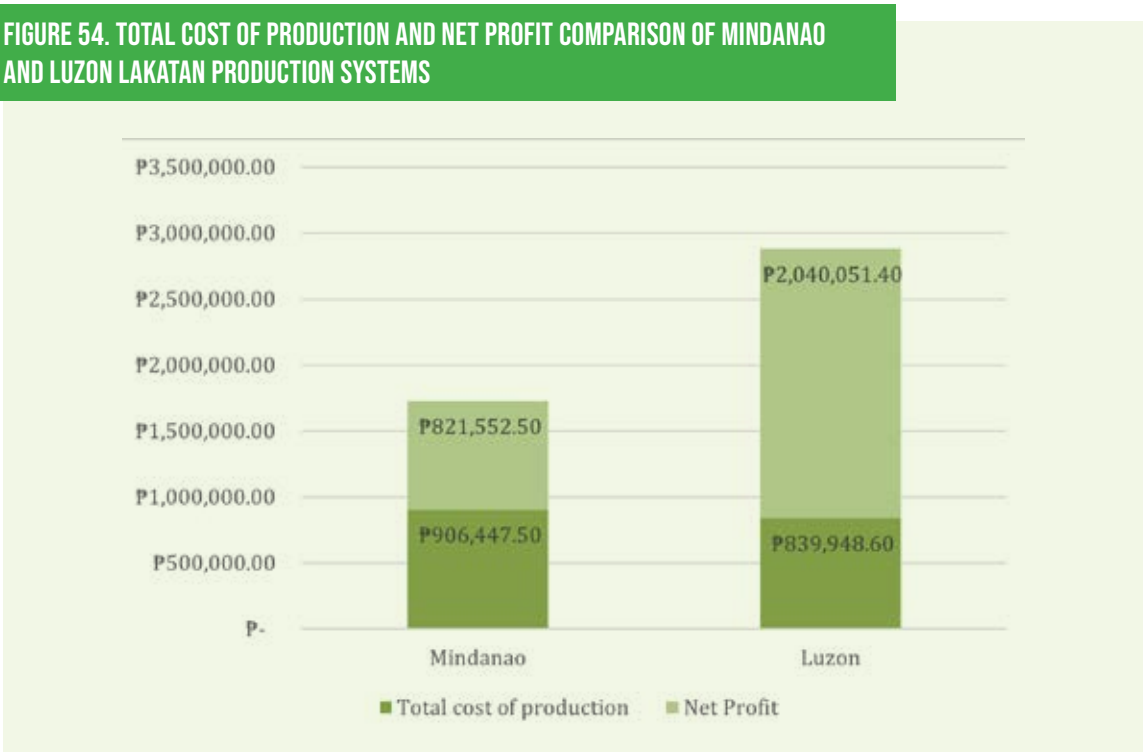


FIGURE 54. TOTAL COST OF PRODUCTION AND NET PROFIT COMPARISON OF MINDANAO AND LUZON LAKATAN PRODUCTION SYSTEMS



The management scheme in Lakatan banana farms is more tedious due to its sensitivity to diseases. Supervision in the farm is closely monitored in order to immediately respond to any problems in relation to the crops. In order to compensate the efforts, the management fee is added and compared in relation to the current minimum wage rates.

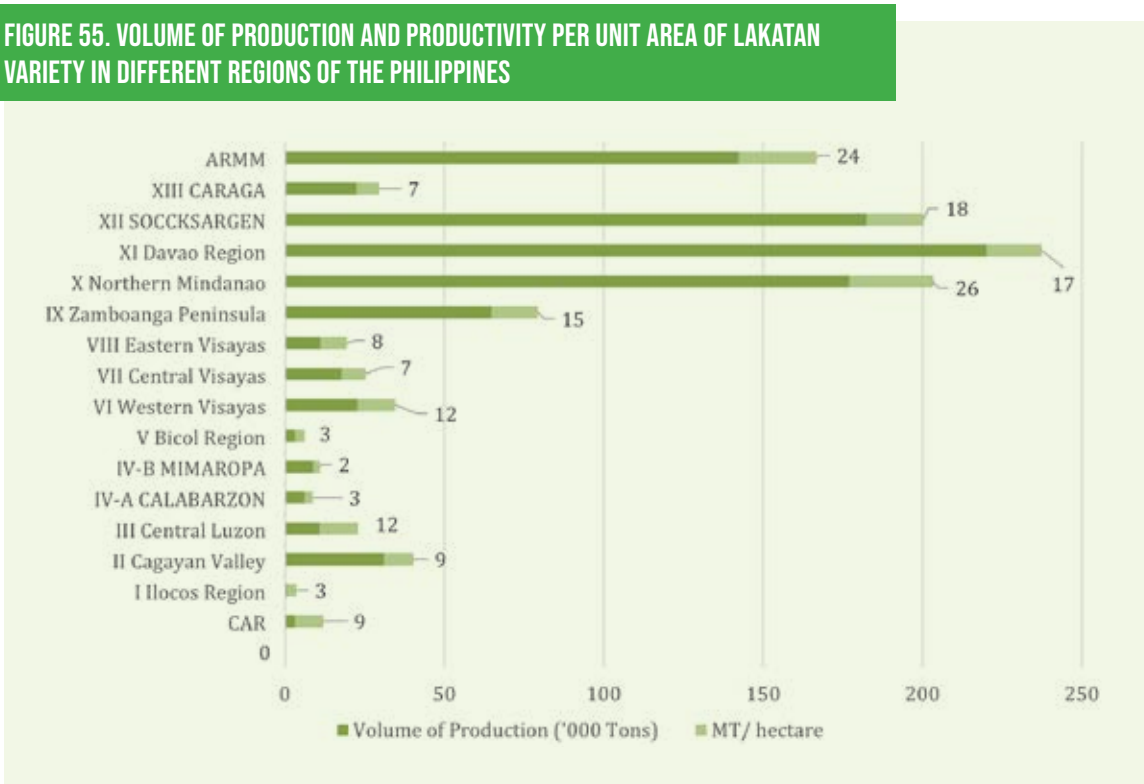
Based on the computed data (Figure 54) , the monthly management fee for Lakatan in either Luzon or Mindanao areas are close to the minimum wage being paid when they engage in farming activities. It can be deduced that it can somehow support the living standards in the area where the farm is located. In terms of profit analysis, both PoTs project high return of investment after the first cropping cycle and first ratoon.

High profits were projected in each PoT. Given that all conditions were favorable, Mindanao earns an ROI of around 91% while Luzon farmers can earn an ROI up to 243% (Figure 55). High profits in Luzon were due to high farmgate price compared to those in Mindanao and nearness to market centers which has high demand for Lakatan bananas. Harvest data include the plant crop and the ratoon which may take 18 months or more. While there is projected higher ROI in Luzon, it also bears a greater risk due to frequent occurrence of strong typhoons. It should be noted that Lakatan is also very susceptible to Fusaruim wilt Foc TR4 which is a major problem in Mindanao.

Benchmark Analysis

Lakatan bananas are highly demanded across the country for local consumption. It is as a matter of fact the top banana variety consumed in the whole of the Philippines as fresh table banana. Production of Lakatan is concentrated in Mindanao and highest productivity is observed in the island at 26 metric tons per hectare (Figure 55). Lowest productivity is at 2-3 metric tons per hectare in Luzon provinces (MIMAROPA, CALABARZON, Bicol Region and Ilocos). Package of technology (POT) for Lakatan is available and commonly practiced by farmers in commercial scale banana plantations such as the large plantations in Mindanao thus providing higher yields for the plantations. However, for small-scale monocrop plantations in other parts of the country, very low productivity is realized due to traditional banana production practices. Small banana growers' practices that are not in line with the suggested PoTs for Lakatan often result to prevailing banana diseases such as BBTV.

FIGURE 55. VOLUME OF PRODUCTION AND PRODUCTIVITY PER UNIT AREA OF LAKATAN VARIETY IN DIFFERENT REGIONS OF THE PHILIPPINES



Lakatan's development is a part of the regular program of DA. In 2021, the department targeted the distribution of 118,580 lakatan seedlings in the Philippines in order to improve its supply within two years (Department of Agriculture, 2020). However, the presence of other varieties of dessert bananas such as Latundan and Señorita opened cheaper alternatives whenever the price of Lakatan increased in the market.

In terms of exporting the product, Lakatan was exported to the United States of America in 2013 in an attempt to penetrate their banana market. The first shipment was done by Dole Food Company, Inc. with 3,000 metric tons (Rappler, 2013). However, there were no following shipments due to the problems on logistics considering the distance of the importing country as well as the problems on the reduced quality upon arrival (David, 2014).

Competitive Analysis

The local demand for Lakatan is high which corresponds to the possible volatility of prices. As production is concentrated in Mindanao, product movement is often limited by restrictions and may not reach the market centers as expected. Thus, it is timely to increase the areas of production near the market centers. Increasing the areas of production can mitigate price fluctuations. Areas in Luzon have the potential to produce Lakatan bananas for the nearby urban centers.

With the challenges on weather conditions for Luzon areas, a national cropping scheme can be strategic in order to alleviate price changes. As patterns of the weather can be forecasted for the whole year, strategic planting in the country can be practiced to control prices for consumers (Letta et al, 2021). For example, the occurrence of monsoon is forecasted during the rainy season. Thus, production projections in Luzon can be synced with the forecasted weather for reduced crop damage. Since production areas in Mindanao for Lakatan are not prone to damages due to typhoons, the projection for harvests can be during the planting stage of Luzon farmers.

Commodity movement can also be addressed through assistance from private-public partnerships. With the growing number of Lakatan farmers, they can be organized in order to work alongside for better market opportunities. According to Rajput et al (2021), the pandemic has caused a decrease in demand and price for fuel due to travel

restrictions. However, the restrictions have limited the movement of commodities as well resulting in an increase in prices of goods in the market all over the world. The issue was addressed in Bangladesh through partnerships of private and public firms by acknowledging the necessity of perishable products to reach the consumers as a pandemic response as well. More cold storages and transportation systems were also opened exclusively for agricultural products (Amjuth-Babu, 2020). This scheme can also be practiced by the Philippines.

In terms of engaging in international trade, Lakatan has a demand in the United States of America. However, it is hindered by its short shelf life which causes losses to the company. Due to the length of travel, Lakatan often fail to meet the quality standards of the market (David, 2014) Traditional export markets of Philippine bananas have higher preferences for the Cavendish variety.

Thus, the focus of Lakatan industry should be on stable supply in the Philippine market at reasonable prices for both producers and consumers. Possible crop improvement in terms of postharvest concerns can be addressed as well to penetrate the international market.

Market Trends and Prospects

The increase in Lakatan production is still targeted to meet the demands of the Filipinos at the country level. It is expected that with the increase in supply, the price will lower and can be affordable for everyone. Through that mechanism, increase in consumption and regularity of purchase from consumers can be profitable for farmers as well. Lakatan bananas are often consumed fresh yet high spoilage rates of around 30% results in overly ripe bananas. Overly ripe bananas are often used as an ingredient in banana cakes which is considered as a popular dessert in the Philippines (Palo et al, 2020).

Key Demand Drivers

Demand for Lakatan was observed to be all-time high as it is one of the favorite fruits in the Philippines. Individuals purchase Lakatan even when prices are too high in the market. As reported, individuals in the National Capital Region consume around 12 kg of Lakatan banana (Palo et al, 2020). However, the demand may reduce as well when other bananas will penetrate the market in instances that Lakatan is not available in the market. Latundan and Señorita are more frequent in the market based on its short fruiting cycle (Herradura et al, 2013).

Market Prospects

With the future developments for Lakatan, it is expected that the increase in supply will penetrate more market sizes in the country. Lakatan is foreseen to be available in all points of final sales to further promote it to the locals. Increase in consumption for every class of consumer is forecasted if the price will eventually be reduced. With the current consumption from NCR alone, the popularity of Lakatan as the most favored variety for table banana in the Philippines can be banked on as well. It can then compete for the market of Latundan and Señorita which could have settled with the varieties due to the expensiveness of Lakatan.

The current issues in postharvest life of Lakatan, market exploration is necessary to find nearby countries with Filipino diaspora who favor the consumption of the variety. Nearby ASEAN countries and the Middle East can be possible initial markets for the bananas. Though with a small success with the USA, continuous trading can lead to data and possible improvement of marketability of Lakatan to farther markets with lower tariffs.

Areas for Consideration

With the current findings on the situation of the Lakatan Industry, the following can be considered as alternative priority areas for development:

1. Development of efficient trade routes for Lakatan. Due to the short shelf life of

Lakatan and the distance of the markets (Cebu and Luzon markets), considerations for vehicles delivering the product (i.e. refrigerated vehicles)

2. Online trading and marketing support. Facilitating online market platforms can help farmers to connect to their respective buyers instead of relying solely on middlemen. With the digital age, marketing of products can be efficient as well.

Target Setting for the Lakatan Banana Industry

Vision/ Mission:

Philippine Bananas and Banana-related products to consistently meet world quality standards with good productivity, sustainable production practices, thus ensuring economic viability for its stakeholders.

Goals and Targets:

1. Increase farmer productivity by 1% per year for Lakatan (increase productivity/ha)
2. Increase production area by at least 1% per year for Lakatan
3. Increase Market in Fresh Fruits
4. Attain 100% world standard product quality
5. Support Stakeholders in moving up in the Value Chain
6. Identify Resources and Financing windows for the Banana Value Chain players
7. Improve productivity related infrastructures and post-harvest facilities in the Banana value chain (market preparations, packaging and transport)
8. Establish Banana Research and Development structures and systems
9. Strengthen the Banana Industry Governance through the establishment of the Banana Industry Council as the lead group for the Philippine banana directives

1. Short Term Target for 2022 - 2025

Table 35 shows the annual target for banana productivity from the year 2022 to year 2025, provided that all factors affecting banana production all over the country hold stable for the next 5 years. Increasing productivity per hectare is the primary target for the next years, harvesting more fruits each year for every hectare of banana farm.

From recent discussions during the National Food Security Summit (NFSS), several factors were identified affecting banana productivity. The following production factors, if not properly addressed in the following years, may largely affect the short term targeted productivity for 2022-2025.

a. Tissue cultured planting materials for Lakatan.

Based on the NFSS discussion, very limited supply of planting materials limit the area expansion of banana farms all over the country. Expansion of farm area for Lakatan were limited the past years due to unavailability of tissue cultured seedlings due to the absence of an established banana tissue culture seedling system. If expansion of area will be the target for the next few years, then it is very important to facilitate production and delivery of tissue cultured seedlings from accredited and capable tissue culture laboratories in the country. For Luzon particularly, availability of tissue cultured seedlings for Lakatan can be ensured by adapting the model of Molina et.al (2009) for seedling delivery system through public-private partnership in rehabilitating small scale Lakatan plantations in Luzon.

The model involved the partnership between the private and public stakeholders. The private sector (tissue culture laboratory) will provide the indexed tissue cultured seedlings while the public sector (small banana growers) will receive the seedlings and establish them in local nurseries for field planting. Other State Colleges and Universities (SUCs) and government institutions previously supported/capacitated by DA may also help in the production of quality planting materials. It is important to forecast the demand and availability of the tissue culture planting materials to effectively implement this scheme.

b. Accredited Tissue Culture Laboratories.

There are few commercial tissue culture laboratories that will provide a stable supply of planting materials for Lakatan. As discussed during the NFSS, it was mentioned that for expansion to be realized, there should be enough supply of planting materials. However, in the country we have a poor seedling system for Lakatan. We can learn from the seedling delivery system established in commercial Cavendish growing areas such as Region XI and several parts of Mindanao. It is notable that they have existing commercial tissue culture laboratories catering to the needs of the local growers primarily for Grand Naine and Fusarium WIlt TR4 Resistant varieties. The laboratories get orders for planting materials almost a year before the planting season, they deliver the seedlings to the growers from the culture bottles in trays and the growers pot them out in nurseries in preparation for field establishment.

c. Rehabilitation of existing Lakatan farms in the country.

There is also the factor of improving the productivity of the existing Lakatan plantations. Based on the recent data, approximately 57,000 hectares of land in the country is planted with Lakatan. However, very low yields per unit hectare is realized in these farms. Many of our farms need rehabilitation and this also requires availability of tissue cultured seedlings. Also, many Lakatan plantations should be rehabilitated against BBTV and Foc TR4 in Mindanao into an intensified mono-cropping system to increase productivity for every hectare land area. Application of proven technologies such as application of fertilizer application, sucker management, application of appropriate irrigation system - to increase productivity should be applied in farmers' fields to demonstrate the profitability of Lakatan production.

d. Strengthening extension services

Training of Lakatan farmers on the application of Good Agricultural Practices (GAP) for productivity and quality Lakatan fruits.

TABLE 30. TARGET FOR LAKATAN BANANA PRODUCTIVITY

	2021	2022	2023	2024	2025
Productivity 1% (tons/hectare)	15.18	15.33	15.49	15.64	15.80
Area Planted (hectares) 1%	60,962	61,571	62,187	62,809	63,437
Production (metric tons)	925,403	944,003	962,978	982,334	1,002,079

2. Medium Term Target (2026 - 2030)

- Establishment of additional post-harvest and transportation facilities in strategic areas of the country.
- Market development for other potential banana varieties for export (Latundan and Señorita variety)

3. Long Term Target (2031 - 2040)

Alongside the government's thrust by 2040, every Filipino enjoy a strongly rooted, comfortable, and secure life. It is envisioned that we will all enjoy a stable and comfortable lifestyle, secure in the knowledge that we have enough for our daily needs and unexpected expenses, that we can plan and prepare for our own and our children's future. Our family lives together in a place of our own, and we have the freedom to go where we desire, protected and enabled by a clean, efficient, and fair government (Ambisyon Natin 2040)

- Local farmers of Lakatan will realize a comfortable life (maginhawa) by increasing income of farmers thru long term sustainable production practices that will encourage higher production volumes and good quality produce
- Lakatan farmers will have a secured future (panatag) through stable and wider scope of local and international markets and dependable crop insurance policies
- With sustainable markets for Lakatan due to increasing local and world market demands for the fresh bananas - established Filipino Owned farms will be a stable source of employment for many Filipinos, thereby securing their source of income for the future.
- Promotion of agri-entrepreneurship to increase farmer's income

Strategic Actions

1. Improvement of Productivity per unit area (1%)

Many of our Lakatan farms need rehabilitation and this also requires availability of tissue cultured seedlings. Adaptation of the seedling delivery system model demonstrated in the paper of Molina et al (2009). Also, plantations in Luzon and the Visayas should be rehabilitated into an intensified mono-cropping system to increase productivity for every hectare land area. Application of proven technologies such as application of fertilizers, banana sucker population management, application of appropriate irrigation system - to increase productivity should be applied in farmers' fields to demonstrate the profitability of Saba production.

- Establishment of seed system in top producing regions
- Accreditation of tissue culture laboratories and nurseries
- Improvement of use of established indexing laboratories

2. Increasing Quality and Productivity Level

Package of technologies for good post-harvest practices should be applied in all banana plantations to ensure the quality and acceptability of the bananas we sell in the domestic market and in the export market.

Preparation of information and extension materials should be improved and trainings should be implemented for banana growers and processors to ensure satisfaction of the export quality product standards.

- Training of farmers for already available POTs for GAP, Pest and Disease Management and Postharvest Technologies
- Establishment of model farm applying the best POTs
- Compliance to phyto sanitary protocols

3. Expansion of Production Areas (1%)

Strategic planning should be made for expansion of production areas for Lakatan, and other export potential banana varieties. Establishment of a national program for Banana Crop mapping (includes location of Saba plantations, cropping schedule and crop clustering) may also be considered to efficiently identify the best locations for plantation expansion and infrastructure establishments to enhance crop productivity and ensure proper post-harvest handling.

- Rehabilitation of Lakatan Plantations particularly in Luzon and Visayas areas
- Expansion of Lakatan production areas all over the Philippines

4. Moving up in the Value Chain

- Formulation of a Cluster Development Plan
- Product Quality Standardization for small growers
- Certification and Branding assistance for small growers
- Establishment of Postharvest facilities to assist small growers
- Improved handling, packaging, and transport of bananas for local and export markets

5. Market Development

- International and Domestic Consumer Awareness Campaign
- Participation in International Banana Trade Fair for Fresh and Processed Banana Competitive Studies
- Expand market access of farmers thru market linkage with institutional buyers, traders and other marketing platforms.
- Provide logistic assistance to industry players

6. Resource Generation and Financing Strategies

- Encourage Lakatan Growers (medium to large scale growers) to sign up for Crop Insurance
- Include Banana as a Priority Crop in Government Financing Programs

7. Research and Development

a. Fusarium Wilt TR4 Disease Management

The following are recommendations for Fusarium wilt management in Lakatan plantations in Mindanao:

- The use of true to type Lakatan resistant varieties derived from accredited tissue culture laboratories. Several large banana companies have their own selection of the TBRI resistant clones – which are not accessible to small banana growers, use of these clonal selections will ensure productivity of the Cavendish bananas even in Foc TR4 infested areas
- Training of small banana growers on the proper management of the resistant varieties. Recommended inputs must be applied on resistant varieties to maintain its resistance to the disease.
- Philippine research institutions may conduct research on further clonal selections for adaptable resistant Cavendish varieties in the country
- Regional field units in Lakatan growing areas must regularly visit and inspect banana plantations for further spread of Foc TR4 in Cavendish or Lakatan plantations in the area

b. Development of Lakatan with resistance to Foc TR4

Lakatan is known highly susceptible to Foc TR4 in Mindanao areas. Research on the improvement of Lakatan variety with Foc TR4 resistance through induced clonal variation and other non-conventional techniques would be useful.

c. Development of Tissue Culture Seedling System - for management of BBTV in small-medium scale Lakatan plantations

The model demonstrated by Molina et.al. (2009) for the rehabilitation of the Lakatan industry in Luzon can be adapted for the development of the tissue culture

seedlings delivery system. The program involved the development of an affordable, village level TC seedlings delivery system and the promotion of TC technology for adoption by small-scale farmers. From this collaborative program, a sustainable and effective banana production system and the BBTD management model was developed. It provided a roadmap for operational partnerships between and among the stakeholders. This model proves the viability of private-public partnerships where risks and responsibilities are shared among stakeholders, and eventually, they all reap loads of benefits. Application of this model resulted in improved technology uptake and increase in banana farmers' income and overall yield. To measure effectivity of the delivery system, small scale banana growers will continue to apply and share this model with other banana growers in the Philippines – this will be a healthy sign towards full rehabilitation and recovery of the banana industry.

- Establishment of the Philippines Banana Research Institute (PBRI)
- Establish a Varietal Selection/ Clonal Garden/ Seed Bank Center for efficient development of resistant banana varieties for major diseases
- Varietal selection for dwarf Saba for resilience to adverse weather conditions in Luzon and Visayas
- Studies to explore different potentials of Lakatan banana as processed products or as fresh bananas
- In Depth Lakatan Industry Value Chain and Market Analysis Studies

8. Intensify Technology Transfer

- Regular conduct of trainings for banana growers and extension workers
- Development of information and extension materials for banana growers education
- Annual Banana Congress

  An avenue for banana scientists, researchers and banana stakeholders to present up to date research findings on technologies that will improve banana production, pest and disease management, advances in production systems, latest market prospects and value adding technologies for processed banana

9. Policy Recommendations

- Review and refiling of Banana Industry Bills enacted in Congress
- Mandatory accreditation of Tissue Culture Laboratories and Nurseries
- Creation of the banana Industry Development Council
- Policy to strengthen monitoring and regulation of phyto-sanitary protocol compliance in banana plantations

Monitoring and Evaluation

Monitoring and Evaluation are important components of any development system to be able to assess progre

ss and development. Defining and quantifying success indicators is critical as it not only provides direction for the implementers, but it also focuses the investments and resources poured into the development process. As important as having clear and quantifiable indicators is having a monitoring structure and system that gathers, consolidates, analyzes, and evaluates the results for use in improving and elevating subsequent implementation cycles. Such a structure and system must be put in place to monitor and evaluate objectively and be supported by all stakeholders in order to be effective, reliable, and credible.

TABLE 31. BANANA INDUSTRY ACTION PLAN (RESPONSIBILITY MATRIX)

These plans and programs were developed by the stakeholders, to be implemented and monitored by the appropriate Government agencies and in tandem with the BIDC and other stakeholders.

LEGEND: NEEDS FUNDING | NO FUNDING NEEDED

Strategy/ Activities	Program/Activity/Project	Physical Targets				Budgetary Requirement ('000)				Responsible Stakeholders
		2023	2024	2025	TOTAL	2023	2024	2025	TOTAL	
Increase supply of quality Planting Materials	**Seedling System Establishment**					**88,500**	**93,000**	**62,000**	**243,500**	
	Tissue Culture Laboratory Establishment	15	19	13	47	30,000	40,000	20,000	90,000	DA, BAR, BPI, SUCs, LGU, ATI and Private Sector
	Tissue Culture Laboratory Upgrading	22	20	16	58	44,000	40,000	32,000	116,000	
	Nursery Establishment	18	17	13	48	10,500	8,500	6,500	25,500	
	Training on Tissue Culture Propagation	16	18	14	48	4,000	4,500	3,500	12,000	
	Establishment of Indexing Laboratories	8	8	8	24	2,000	2,000	2,000	6,000	
Improvement of Productivity Level						**132,550**	**132,250**	**132,250**	**397,050**	

Strategy/ Activities	Program/Activity/Project	Physical Targets				Budgetary Requirement ('000)				Responsible Stakeholders
		2023	2024	2025	TOTAL	2023	2024	2025	TOTAL	
	Package of Technology (POT) for GAP	115	115	115	345	57,500	57,500	57,500	172,500	DA, ATI, BPI, BAR, DOST-PCAARRD and SUCs
	Training on Postharvest Quality Improvement	115	115	115	345	57,500	57,500	57,500	172,500	DA, ATI, BPI, BAR, DOST-PCAARRD and SUCs
	Provision of Production Inputs	125	120	120	365	7,500	7,200	7,200	21,900	DA and BPI
	Regular Soil Analysis	100	100	100	300	50	50	50	150	DA,BSWM and LGU
	Establishment of Model Farms	50	50	50	150	10,000	10,000	10,000	30,000	DA, ATI, BPI, BAR, DOST-PCAARRD and SUCs
Expansion of Production Areas						**55,000**	**55,000**	**55,000**	**165,000**	
	Rehabilitation of Production Areas	100	100	100	300	5,000	5,000	5,000	15,000	DA, BPI and LGUs
	Expansion of Production Areas	100	100	100	300	50,000	50,000	50,000	150,000	DA, BPI and LGUs
Moving up in the Value Chain						**20,000**	**30,000**	**20,000**	**70,000**	
	Clustering of Farms	25	25	25	75					DA and CDA

Strategy/ Activities	Program/Activity/Project	Physical Targets				Budgetary Requirement ('000)				Responsible Stakeholders
		2023	2024	2025	TOTAL	2023	2024	2025	TOTAL	
	Development of a Cluster Development Plan	25	25	25	75					DA, ATI, BPI, BAR, DOST-PCAARRD, SUCs and DTI
	Product quality standardization	1	1	1	3					DA and DTI
	Certification and Branding	25	25	25	75					DA and DTI
	Establishment of Processing and Post-harvest Facilities	10	15	10	35	20,000	30,000	20,000	70,000	DA, PHILMECH, DOST-PCARRD and DTI
Market Development						**500**	**500**	**500**	**1,500**	
	Compliance to trade regulations of target markets									DA and DTI
	Negotiations for the elimination/reduction of Tariff Rates									DA and DTI
	International and Domestic Consumer awareness campaign	5	5	5	15	500	500	500	1,500	DA and DTI

Strategy/ Activities	Program/Activity/Project	Physical Targets				Budgetary Requirement ('000)				Responsible Stakeholders
		2023	2024	2025	TOTAL	2023	2024	2025	TOTAL	
Resource generation and Financing Strategies										
	Include Banana as a Priority crop in Government Financing Programs									ACPC, DBP and LBP
	Encourage farmers to sign up for Crop Insurance									DA and PCIC
Research and Development						**16,000**	**16,000**	**16,000**	**48,000**	
	Establishment of a Banana Research Institute (BRI)									DA, BAR, BPI, SUCs, LGU and Private Sector
	Establish a Varietal Selection/ Clonal Garden/ Seed Bank Center	5	5	5	15	5,000	5,000	5,000	15,000	DA,BAR,BPI,SUCs and DOST-PCAARRD
	Field Trials for Management of Common Banana Pests and Diseases	1	1	1	3	2,000	2,000	2,000	6,000	DA,BAR,BPI,SUCs and DOST-PCAARRD
	Development of cost-effective indexing method for major banana diseases	1	1	1	3	2,000	2,000	2,000	6,000	DA,BAR,BPI,SUCs and DOST-PCAARRD

Strategy/ Activities	Program/Activity/Project	Physical Targets				Budgetary Requirement ('000)				Responsible Stakeholders
		2023	2024	2025	TOTAL	2023	2024	2025	TOTAL	
	Development of resistant varieties for major diseases of banana	1	1	1	3	2,000	2,000	2,000	6,000	DA,BAR,BPI,SUCs and DOST-PCAARRD
	Application of precision agriculture technology, Imaging, GIS to plantation and pest/ dosease management	1	1	1	3	5,000	5,000	5,000	15,000	DA,BAR,BPI,SUCs and DOST-PCAARRD
Intensify Technology Transfer							**5,000**	**5,000**	**10,000**	
	Inventory of Banana Research and Development Intiatives									DA,BAR,BPI,SUCs and DOST-PCAARRD
	Establishment of a Banana Database		1				5,000	5,000	10,000	DA,BAR,BPI,SUCs and DOST-PCAARRD
	Research and Development Dissemination and Adaptation									DA, ATI, BAR,BPI,SUCs and DOST-PCAARRD

Strategy/ Activities	Program/Activity/Project	Physical Targets				Budgetary Requirement ('000)				Responsible Stakeholders
		2023	2024	2025	TOTAL	2023	2024	2025	TOTAL	
Policy Recommendations						**2,000**	**2,000**	**2,000**	**6,000**	
	Inventory of bills filed/ enacted in Congress in relation to the Banana industry for review and refilling									DA
	Mandatory Accreditation of Tissue culture laboratories and nurseries									DA and BPI
	Creation of a Banana Industry Development Council									DA and Private Sector
	Strengthen the monitoring and regulation of phyto-sanitary protocol compliance in plantations					2,000	2,000	2,000	6,000	DA and BPI
Total						**314,550**	**328,750**	**287,750**	**931,050**	

TABLE 32. BANANA INDUSTRY DEVELOPMENT INDICATORS

Goal/ Objective	Indicator	Means of Verification
Increased export volume and value	Increase in export volume and value	PSA
Increased yield and volume	Increase in yield and volume	PSA
Increased production area	Increase in area planted for banana	PSA
Increased production capacity of tissue culture laboratories		BAR, SUCs
Rehabilitation of Areas affected by Fusarium Wilt	Number of areas rehabilitated	LGU and DA RFO reports
Support Stakeholders in moving up in the Value Chain	No. of Cluster Areas with Development Plan Agribusiness enterprise established	DA, DTI Reports
Expansion of market opportunities	Increase in volume and value of export Increase in export market share	Export Statistics PhilExport Reports PQS Reports
Identify Resources and Financing windows for the Banana Value Chain players	Increase in number of credit/ insurance beneficiaries Total Amount of financing accessed	DA ACPC Reports LBP Reports BOI Reports
Establishment of a Banana Research Institute	Presence of a Banana Research Institute	House Bills Passed
Increased public investment for the industry	Increased in project activities implemented for the industry	BAR Reports HVCDP Reports/ Budget Allocation
Increased Value of Processed Products	Increase in Value of Processed Products	DA, DTI Reports

REFERENCES

7-Eleven Philippines. 2018. Duo Bananas [video advertisement]. Retrieved from https://www.facebook.com/watch/?v=10157501648103228 on September 16, 2021.

7-Eleven Philippines. Sweetened Saba. Retrieved from https://www.facebook.com/711philippines/posts/10159019080773228 on September 14, 2021.

Aebischer, C.2019. Export potential for Philippine Saba. AsiaFruit. Retrieved from http://www.fruitnet.com/asiafruit/article/177823/export-potential-for-philippine-Saba on September 5, 2021

Agricultural Training Institute - Cordillera Administrativer Region. Good Agricultural Practices (PhilGAP) [brochure].Retrieved from https://ati.da.gov.ph/ati-car/sites/default/files/GAP_Brochure.pdf on September 16, 2021.

Almeyda, S.M.C. & M.E.C.B. Obligado.2016.VALUE CHAIN ANALYSIS ON BANANA INDUSTRY (Saba, Latundan, Lakatan, andSeñorita): CALABARZON/REGION IV-A. Department of Agriculture - Regional Field Office IV-A.

Amjath-Babu, T.S., Krupnik, T.J., Thilsted, S.H. et al. Key indicators for monitoring food system disruptions caused by the COVID-19 pandemic: Insights from Bangladesh towards effective response. Food Sec. 12, 761–768 (2020). https://doi.org/10.1007/s12571-020-01083-2

Arado, J.P.2018.Demand for Saba bananas increasing. Sunstar. Retrieved from https://www.sunstar.com.ph/article/1755375/Davao/Business/Demand-for-Saba-bananas-increasing on September 8, 2021.

Artes, L.A.A, M.V. Maunahan and P.A.Nuevo.2013. An analysis of the supply chain of bulk-loaded bananas from Mindanao to Luzon, the Philippines. ACTA Horticulturae 1006:71-76.

Berill, A. 2019. Banana blossom: the next vegan food star with the texture of fish [online article]. The Guardia. Retrieved from https://www.theguardian.com/food/2019/mar/16/banana-blossom-vegan-food-fish-texture-sainsburys on September 15, 2021.

Bi, F., Meng, X., Ma, C., & Yi, G. (2015). Identification of miRNAs involved in fruit ripening in Cavendish bananas by deep sequencing. BMC genomics, 16(1), 1-15.

Blomme, G., Dita, M., Jacobsen, K. S., Pérez Vicente, L., Molina, A., Ocimati, W., ... & Prior, P. (2017). Bacterial diseases of bananas and enset: current state of knowledge and integrated approaches toward sustainable management. Frontiers in plant science, 8, 1290.

Bollido, M. E., & Cebu, E. H. (2020). Technology Impact Assessment of Banana Slicing Machine. Technology, 16(06).

Boquiren, M. & I. Idrovo. 2014. Value chain and competitiveness strategy: Cardava banana Mindanao.Philippine Rural Development Plan.

Business Mirror.2020.PHL's banner fruit export is slowly but surely losing its global market foothold. Retrieved from https://businessmirror.com.ph/2020/07/11/phls-banner-fruit-export-is-slowly-but-surely-losing-its-global-market-foothold/ on September 16, 2021

Bussell, J. (2018). When do middlemen matter? Evidence from variation in corruption in India. Governance, 31(3), 465-480.

Byerlee, D., & Viswanathan, P. K. (2018). Plantations and economic development in the twentieth century: the end of an era?. In Agricultural Development in the World Periphery (pp. 89-117). Palgrave Macmillan, Cham.

Center for Trade Union and Human Rights.2013. The Labour and Environmental Situation in Philippine Banana Plantations Exporting to New Zealand [pdf]. Retrieved on October 5, 2021 from https://www.oxfam.org.nz/

Chase, R. and N. Roux. (2020). How COVID-19 is impacting banana-producing countries. Alliance of Bioversity International and CIAT Banana Program. Retrieved from https://www.bioversityinternational.org/news/detail/how-covid-19-is-impacting-banana-producing-countries/

Chips Machinery Manufacturer.2018.Industry analysis of the banana chips in the Philippines. Retrieved from https://potato-chips-machine.com/chips-making-news/industry-analysis-of-banana-chips-in-philippines.html on September 19, 2021

Damasco, O.P., F.M. Dela Cueva, J.C. Descalsota, R.P. Tayobong. 2019. Gamma Radiation and In Vitro Induced Banana Bunchy Top Virus (BBTV) Resistant Mutant Lines of Banana cv 'Lakatan' (Musa sp., AA). Philippine Journal of Science 149 (S1): 159-173, Special Issue on Nuclear S&T.

David, E.2014. Philippines not yet a viable source for bananas for US. The Invisible Hand. Retrieved from https://bizeconreporting.journalism.cuny.edu/2014/04/10/philippines-not-yet-a-viable-source-for-bananas-for-us/ on September 14, 2021.

dela Cruz Jr., F.S.; Gueco, L.S.; Damasco, O.P.; Huelgas, V.C.; dela Cueva, F.M.; Dizon, T.O.; Sison, M.L.J.; Banasihan, I.G.; Sinohin, V.O.; Molina, Jr., A. 2008. Farmer's handbook on introduced and local banana cultivars in the Philippines. Bioversity International. 67pp. https://www.bioversityinternational.org/fileadmin/user_upload/online_library/publications/pdfs/1376.pdf

Deluna, R. S., Hinlo, J. E., & Ayala, M. L. (2016). Impact evaluation of banana insurance program of the PCIC in the Davao region (No. 2016-42). PIDS Discussion Paper Series.

Department of Agriculture. 2020. DA allots P262M for banana R&D vs fusarium wilt; increase production, exports. Retrieved from https://www.da.gov.ph/da-allots-p262m-for-banana-r-increase-production-exports/ on September 15, 2021

Department of Agriculture.2020. Department Circular No.03 Series of 2020. Retrieved from http://bpi.da.gov.ph/bpi/images/WEB%20NEWS%20ARTICLE/2021/DC%20No.%203%20Series%20of%202020%20-%20Revised%20General%20Guidelines%20for%20the%20Accreditation%20of%20Plant%20Tissue%20Culture%20Facility%20%28PTCF%29%20for%20the%20Production%20of%20Quality%20Planting%20Materials.pdf on September 18, 2021.

Department of Foreign Affairs.2015. Distribution of Filipinos Overseas. Retrieved on November 9, 2021 from https://dfa.gov.ph/distribution-of-filipinos-overseas

Department of Labor and Employment Region 11. 2010. Voluntary Code of Good Practices on DECENT WORK+ in the Banana Industry of Region 11. Retrieved on October 3, 2021 from https://blr.dole.gov.ph/wp-content/uploads/2020/01/RO-11-Banana.pdf

Department of Trade and Industry - Bureau of Product Standards. 2013. Code of Good Agricultural Practices (GAP) for banana. Retrieved from http://www.bafs.da.gov.ph/bafs_admin/admin_page/pns_file/2021-02-24-PNS-BAFPS%20129-2013%20-%20GAP%20Banana(1).pdf on September 11, 2021

Department of Trade and Industry. 2013. Philippine National Standards Code of Good Agricultural Practices (GAP) for Banana Production. Bureau of Agriculture and Fisheries Product Standards (BAFPS). PNS/BAFPS 129:2013 ICS 67.020

http://www.bafs.da.gov.ph/bafs_admin/admin_page/pns_file/2021-02-24-PNS-BAFPS%20129-2013%20-%20GAP%20Banana(1).pdf

Dotto, J., Matemu, A. O., & Ndakidemi, P. A. (2018). Potential of cooking bananas in addressing food security in East Africa.

Drenth, A., & Kema, G. H. J. (2021). The vulnerability of bananas to globally emerging disease threats. Phytopathology, (ja).

Drenth, A., & Kema, G. H. J. (2021). The vulnerability of bananas to globally emerging disease threats. Phytopathology, (ja).

Eusebio, J. E. E. J. E., Joselito, A. P., Payot, J. A., & Carpio, A. T. (2002). The Philippine banana industry: Status and prospects. Advancing banana and plantain R&D in Asia and the Pacific-Vol. 11, 107.

FAO 2021. Banana Facts and Figures. https://www.fao.org/economic/est/est-commodities/bananas/bananafacts/en/#.YYf7gGBBzIV

FAOSTAT.2021. Ecuador: Area of Production for bananas in 2016. Retrieved from http://www.fao.org/faostat/en/#data/QCLon September 16, 2021

Food and Agriculture Organization.2016. Good Agricultural Practices for Banana. Retrieved from http://www.fao.org/3/i6917e/i6917e.pdf on September 16, 2021

Food and Agriculture Organization.n.d.Seed system [website]. Retrieved from http://www.fao.org/agriculture/crops/thematic-sitemap/theme/seeds-pgr/seed-sys/en/ on September 11, 2021.

Fox, J. (2019). The politics of food in Mexico. Cornell University Press.

Francisco, C.Q. (2020) Banana exporters push gov't to set cap on exit prices. Retrieved from https://www.bworldonline.com/banana-exporters-push-govt-to-set-cap-on-exit-prices/ on September 20, 2021

Frey, M. Banana Chip Nutrition Facts and Health Benefits. Retrieved from https://www.verywellfit.com/banana-chip-nutrition-facts-and-health-benefits-4847168 on September 19, 2021

Gilsenan, M. B. (2015). Data handling: observatories/databases/data storage/legal framework: EFSA data collection. In Options Méditerranéennes. Series A: Mediterranean Seminars. CIHEAM-IAMZ, Zaragoza (Spain)-EFSA, European Food Safety Authority, Paarma (Italy).

Golden Saba.n.d.Golden Saba: Home. Retrieved from https://www.goldenSaba.ph on September 8, 2021.

Herradura, L. E., L.C. Generalao, B.T. Dionio, V.P. Ugay, A.B. Molina. 2018. Management of Fusarium wilt tropical race 4 (Foc TR4) in the Philippines. In: TROPED '18, International conference on tropical fruit pests and diseases "Sustainable solutions for tropical fruit pests and diseases", Kota Kinabalu, Sabah, Malaysia, 25-27 September 2018. International Tropical Fruits Network (TFNet) Selangor Malaysia. http://itfnet.org/troped2018/index.PHP

Herrradura, L.E., R.A. del Valle, & J.A. Pabuaya.2013. Bureau of Plant Industry: Banana production guide.Philippines. Retrieved from http://bpi.da.gov.ph/bpi/images/Production_guide/pdf/BANANA.pdf on September 12, 2021

Hidayat, D., Anisti, A., Suhartini, T., Sandini, D., & Fatimah, F. (2019, May). The City Branding Component of Lampung Province Indonesia: Nemui-Nyimah and Banana Chips. In Proceeding Interuniversity Forum for Strengthening Academic Competency (Vol. 1, No. 1, pp. 323-331).

Human Rights Watch.2002. Tainted Harvest: Child Labor and Obstacles to Organizing on Ecuador's Banana Plantations. United States of America

International Trade Center (ITC). 2021. List of exporters for the selected product in 2020. Trade Map Statistics for International Business and Development. https://www.trademap.org/Country_SelProduct.aspx

Juego, B. (2020). Addressing the pandemic in the Philippines necessitates a new economic paradigm. Developing Economics, 13.

Kabir, R.A. 2021. Banana ketchup - Can it dethrone tomato ketchup?. The Financial Times. Retrieved from https://thefinancialexpress.com.bd/views/views/banana-ketchup-can-it-dethrone-tom, ato-ketchup-1625478338 on September 17, 2021.

Kaundinya, R. (2019). The Seed Bill needs to be tweaked to serve the interests of all stakeholders better.

Lee, David. (2005). Agricultural Sustainability and Technology Adoption: Issues and Policies for Developing Countries. American Journal of Agricultural Economics. 87. 1325-1334. 10.1111/j.1467-8276.2005.00826.x.

Letta, M., Montalbano, P., & Pierre, G. (2021). Weather shocks, traders' expectations, and food prices. American Journal of Agricultural Economics.

Lizada, MCC.1993. Postharvest handling of tropical fruits. Champ BR, E.Highly and GI Johnson (eds). ACIAR Proceedings No.50.

Lobanova, A., Liersch, S., Tàbara, J. D., Koch, H., Hattermann, F. F., & Krysanova, V. (2017). Harmonizing human-hydrological system under climate change: A scenario-based approach for the case of the headwaters of the Tagus River. Journal of Hydrology, 548, 436-447.

Loquias, Melissa & Digal, Larry & Placencia, Shemaiah Gail & Astronomo, Ivi & Orbeta, Marvin Louie & Balgos, Carol. (2021). Factors Affecting Participation in Contract Farming of Smallholder Cavendish Banana Farmers in the Philippines. Agricultural Research. 10.1007/s40003-021-00544-0.

Lumawag, R.J.F.2019. Agri export opportunities. Sunstar Davao. Retrieved from https://www.sunstar.com.ph/article/1787065/Davao/Business/Agri-export-opportunities on September 14, 2021

Maclean, K., Farbotko, C., Mankad, A., Robinson, C. J., Curnock, M., Collins, K., & McAllister, R. R. (2018). Building social resilience to biological invasions. A case study of Panama Tropical Race 4 in the Australian Banana Industry. Geoforum, 97, 95-105.

Maps of the World.2016. Top 10 Plantain Producing Countries. Retrieved from https://www.mapsofworld.com/world-top-ten/plantain-producing-countries.html on September 17, 2021

Martin, H. M., Durr, D., Smith, L. M., Finke, R., & Cherry, A. (2017). Analysis of GMO food products companies: financial risks and opportunities in the global agriculture industry. African Journal of Economic and Sustainable Development, 6(1), 1-17.

Mindanews.2019. P500M needed to put up banana research center. Retrieved from https://www.mindanews.com/top-stories/2019/08/p500m-needed-to-put-up-banana-research-center/ on September 16, 2021.

Mojica, L., A.T. Banzon & S.B. Lico. 2006. An Analysis of Marketing Efficiency and Development of Innovative Marketing Strategies for Small-Hold Growers of Banana.

Molina, A.B., E. Fabregar, V.O. Sinohin, G. Yi and A. Viljoen. 2009. Recent Occurrence Of Fusarium Oxysporum F. Sp. Cubense Tropical Race 4 In Asia. May 2009. Acta Horticulturae 828(828):109-116 DOI: 10.17660/ActaHortic.2009.828.10

Naik, K. S., & Deshmukh, P. R. (2016). Knowledge and adoption of recommended package of practices by banana growers. Agri Update11, 1, 41-44.

National Wage and Productivity Commission. 2021. Current Real Minimum Wage. Retrieved from https://nwpc.dole.gov.ph/stats/current-real-minimum-wage-rates/ on September 20, 2021.

Nozawa, K. (2017). Banana production and cooperatives in the Philippines: a structure for self-reliance of farmer growers under agrarian reform. Philippine Review of Economics, 53(2), 119-146.

Ochave, K. 2020. Banana exports projected to decline 20% in 2020. Business World. Retrieved from https://www.bworldonline.com/banana-exports-projected-to-decline-20-in-2020/ on September 17, 2021.

Pabuayon, I. (2014). Commercialization Patterns of Saba Banana in Quezon Province, Philippines.

Palo, A.S.M, M.A. Rosetes, & D.P. Cariño.2020. COVID-19 and food systems in the Philippines. Retrieved from https://www.aciar.gov.au/sites/default/files/2020-11/covid-chapter7.pdf ib September 18, 2021

Patil, S. M., Kumari, V. C., Sumana, K., Sujay, S., Tejaswini, M., Shirahatti, P. S., & Ramu, R. (2021). Sustainable development of plant tissue culture industry: The Indian scenario. Journal of Applied Biology & Biotechnology Vol, 9(2), 18-27.

Philippine Rural Development Project (PRDP).2017. Value Chain Analysis: Cardava Cordillera Administrative Region. Philippines

Philippine Rural Development Project (PRDP).2017. Value Chain Analysis and Competitiveness Strategy: Lakatan Banana Mindanao.Philippines

Philippine Rural Development Project. 2017. Value chain analysis: Cardaba banana Eastern Visayas

Piñeiro, V., Arias, J., Dürr, J., Elverdin, P., Ibáñez, A. M., Kinengyere, A., ... & Torero, M. (2020). A scoping review on incentives for adoption of sustainable agricultural practices and their outcomes. Nature Sustainability, 3(10), 809-820.

Produce Report.2020. Philippine Banana Exports Down 10%, Chinese Demand Declines [published August 19,2021]. Retrieved from https://www.producereport.com/article/philippine-banana-exports-down-10-chinese-demand-declines on September 16, 2021.

Province of Palawan.2016.Value chain analysis for banana chips

PSA 2021. Fruits: Supply Utilization Accounts by Commodity, Year and Item. https://openstat.psa.gov.ph/PXWeb/pxweb/en/DB/DB__2B__AA__SU/0012B5FSUA4.px/?rxid=74a0b5e1-c8a7-4a16-ab93-d59a9d54a1e4

Rappler.2013. PH is first Asian country to export bananas to US.Rappler. Retrieved from https://www.rappler.com/business/philippines-first-asian-country-banana-export-to-us on September 5, 2021

Sandrasari, D. A. (2019, November). Empowerment Of Women Community Through Processing Of Banana Chips. In ICCD (Vol. 2, No. 1, pp. 623-626).

Secretario, S. (2017). Revisiting the adoption of the Philippine Good Agricultural Practices (PhilGAP) Certification Programme: a case study of Cavendish banana plantations: a thesis prepared in partial fulfillment of the requirements for the degree of Master of AgriScience at Massey University, New Zealand (Doctoral dissertation, Massey University).

Sereke, F., Dobricki, M., Wilkes, J., Kaeser, A., Graves, A. R., Szerencsits, E., & Herzog, F. (2016). Swiss farmers don't adopt agroforestry because they fear for their reputation. Agroforestry systems, 90(3), 385-394.

Staver, C. (2018). Good agricultural practices: an end point or a starting point for more sustainable banana production?. In Achieving sustainable cultivation of bananas (pp. 179-214). Burleigh Dodds Science Publishing.

Subert, M. P. (2017). Perceptions of enhanced freshness formulation technologies and adoption decisions among smallholder banana farmers in Morogoro, Tanzania (Doctoral dissertation, Sokoine University of Agriculture).

Sullivan, G. M. (2019). Impact of Government Policies on the Performance of the Livestock-Meat Subsector. In Livestock Development in Subsaharan Africa (pp. 143-159). CRC Press.

Suman, S. (2017). Plant tissue culture: A promising tool of quality material production with special reference to micropropagation of banana. Biochem. Cell. Arch, 17(1), 1-26.

Taizy Machinery Co., Ltd.2020.What are the advantages of the Thailand banana chip business?. Retrieved from https://potatochipsprocessing.com/thailand-banana-chips-business-plant-for-sale/ on September 18, 2021

Theirs, R. 2019. TR4 and China's boom and bust banana sector. Promusa. Retrieved from https://www.promusa.org/blogpost585-TR4-and-China-s-boom-and-bust-banana-sector on September 18, 2021.

Thiers, R. (2019). Flying bananas: small producer tactics and the (un) making of Philippine banana export chains. The Journal of Peasant Studies, 46(2), 337-357.

Tinzaara, W., Gold, C. S., Ssekiwoko, F., Bandyopadhyay, R., Abera, A., & Eden-Green, S. J. (2006). Role of insects in the transmission of banana bacterial wilt. African Crop Science Journal, 14(2), 105-110.

TSAHA, T. (2015). A comparative assessment of factors influencing loan repayment under contract farming for sugar-beans and bananas in Mutema and Chibuwe-Musikavanhu irrigation schemes in Chipinge district (Doctoral dissertation, AFRICA UNIVERSITY).

Ucat, Rosanna & Cruz, Jennifer. (2019). Postharvest Grading Classification of Cavendish Banana Using Deep Learning and Tensorflow. 1-6. 10.1109/ISMAC.2019.8836129.

Uloh, E. V., & Alimba, J. O. (2017). Market Structure And Conduct Of Banana Fruits Marketing In South East Nigeria. Development And Innovation.

Workman, D.2021.Bananas Imports by Country. Retrieved from https://www.worldstopexports.com/bananas-imports-by-country/ on September 19, 2021

Yeung, M., Kerr, W. A., Coomber, B., Lantz, M., & McConnell, A. (2018). Declining harmonization in maximum residue levels for pesticides. British Food Journal.>M,



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