OFFICE OF THE UNDERSECRETARY
HIGH VALUE CROPS AND RURAL CREDIT

PHILIPPINE MANGO INDUSTRY ROADMAP 2017-2022

INPUT ➡ PRODUCTION ➡ POSTHARVEST ➡ MARKET ➡ CONSUMER

The Department of Agriculture spearheaded the formulation and integration of the Philippine Mango Industry Roadmap in consultation with the industry stakeholders.

The said roadmap shall serve as a guide to all industry stakeholders for optimal realization of the targets set for 2017-2022. A periodic review of the roadmap shall also be undertaken to ensure that commitments by member-agencies and institutions are effectively carried out and next steps are instituted to sustain the initiatives and ensure the continuous development and growth of the Philippine Mango Industry.

The roadmap is envisioned as the embodiment of how the industry will achieve its goals of inclusive growth through a value chain approach, as well as increased and sustained yield and incomes, improved farm productivity and enhancement of farmers' capabilities and skills.

The document includes a narrative of the general production and market trends, development milestones, opportunities, and industry targets as well as the harmonized programs and projects of various concerned agencies to achieve these targets. The strategic interventions, programs and other activities from the national down to the local levels will be anchored on the roadmap.

In this regard, the Philippine Mango Industry Roadmap is hereby approved as a vital instrument to provide direction to the concerned stakeholders towards a sustainable and globally competitive mango industry, that will likewise contribute to attaining food security and poverty alleviation.

Approved by:

EMMANUEL F. PIÑOL
Secretary
Department of Agriculture

December 18, 2019

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EXECUTIVE SUMMARY

Where are we? At present, the mango industry comprises of few large farms (over 20 ha.), a few hundreds of medium sized farms (2 to 5 ha.), and at least 1.9M of very small farms with an average of 10 to 12 trees for a total equivalent area of 146,841 ha planted to Carabao mango. Under this situation, only the larger or corporate farms can afford to operate their orchards and produce fruits themselves. Majority of the small growers have to engage service contractors (contract-sprayers) to spray and manage the fruiting of their trees, at terms unprofitable to both parties in most localities.

The Philippines, which had earned a reputation for innovation in the mango world, has now lagged behind in the world market and still wallowing in self-delusion as having the best mango variety. The local yield of 4.1 mt/ha is way below the world average of 7.65 mt/ha and is not even half that of Thailand with almost 8.20 mt/ha. Obviously, there is a lot of work to do in order to catch up with other leading mango producers. Yield must be sustainably increased and the quality of both fresh and processed products must be improved in order to be competitive in the international markets.

Where do we want to go? The ideas, targets and proposed strategies gathered through the regional cluster consultations were sorted out and organized in logical manner to address various systemic constrains or specific commodity situation. For the Philippines to catch up with Mexico and Thailand, the country must launch and sustain an aggressive breeding program to develop dwarf varieties resistant to insect pests and diseases and with improved export quality fruits. As a long-term investment strategy, the country should immediately launch a sustainably well-funded and aggressive national mango development program that will address the short-term and long-term research and development needs of the mango industry. Mango farmers must immediately adopt the best technology available (e.g. Integrated Crop Management (ICM) and Postharvest Quality Management (PQM) to reverse the declining productivity by investing in strategic rehabilitation of unproductive mango trees and in improving post-harvest handling system to increase the production of export quality and safe mangoes.

How do we get there? The mango program is basically a private sector undertaking. The industry has a major program on rehabilitation of unproductive mango trees where the private sector would do most of the work and put up the necessary cost. What is urgently needed is support from the government in the form of inputs such as fertilizers and crop protection chemicals. With the expected increase in production, the industry also expects government support for post-harvest and processing facilities. The other requirements such as breeding or development of improved varieties, management of insect pests especially cecid fly (kurikong) and diseases, and product utilization of seasonal surplus are long-term and systemic in nature, for which the government is expected to provide sustained funding support.

I. INTRODUCTION

Rationale

The Department of Agriculture (DA) is complying with the guidance and has initiated road mapping activities among its agencies. The Agriculture Sector Roadmap will be anchored on Agriculture and Fisheries Modernization Act (AFMA) and the Philippine Development Plan (PDP).

This Mango Industry Roadmap is part of the High Value Crops (HVC) Subsector Roadmap which outlines how the Philippines can address three major challenges, to wit:

a) at the national level, achieving self - sufficiency while lifting farmers from poverty;
b) at the regional level, preparing for the advent of ASEAN Economic Community (AEC); and
c) at the global level, adapting to climate change.

As the industry is on the decline, there was a felt urgency to reverse the trend and revitalize the industry. There was also a clamor to develop long term strategy for export competitiveness.

Objectives

The general objective was to update/prepare the Mango roadmap aiming at survival of mango producers and increase resiliency to climate change; providing safe nutritious, affordable and accessible products to consumers throughout the year; providing opportunities for all segments in the value chain to modernize and be globally competitive and strengthening foothold in export markets where Philippines has competitive advantage.

The specific objectives were to:

- Provide a profile, prospects and trends of the mango industry including current situation and environment, global and domestic and relevant benchmarks on production technology and costs, competitive measures and other trends;
- Analyze the mango supply/value chain;
- Set goals and objectives which will operationally flesh out the shared vision, quantify targets along a timeline with indicators of production, resource and cost efficiency and competitiveness; the rationale and directions of the proposed strategies and programs; and
- Recommend strategies, programs, budgetary and other resource requirements to achieve the set goals, objectives, and targets.

II. PHILIPPINE MANGO INDUSTRY

Source: Photo taken by Geffrey Ian V. Galvez, Iloilo lifestyle blogspot by Kathy Purr

Today, mango is the third most important fruit crop in the Philippines next to banana and pineapple. Its importance does not only come from the export side. Mango is the Philippine national fruit, loved by the Filipino people eaten as fresh, processed as flavorings to ice creams and pastries and other delicacies.

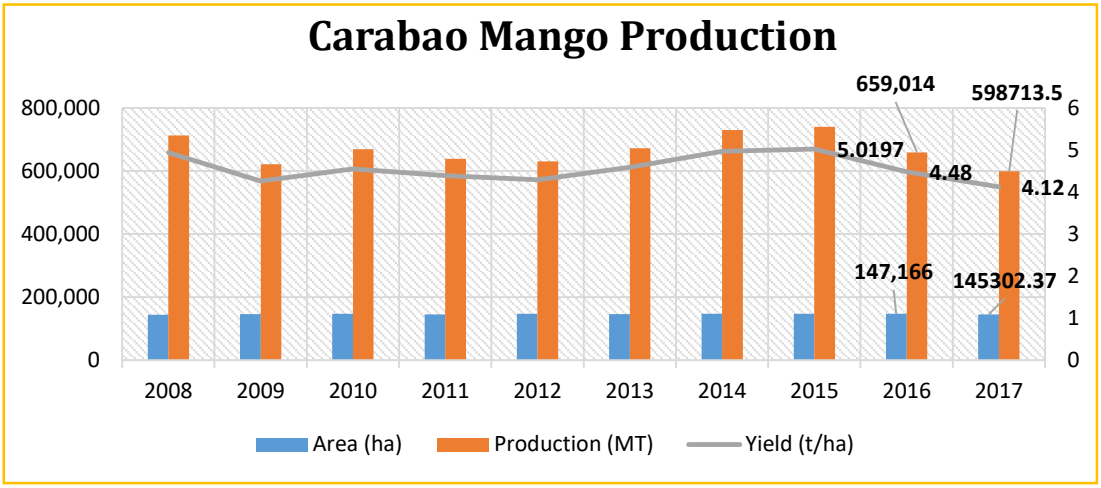
There are three well known variety of mango in the Philippines and these are Carabao mango, Pico and Katchamita (also known as Indian Mango). However, Carabao is the dominant variety that is widely grown throughout the country and is the sole exported variety.

Philippines is blessed to have lands and climate that favor the cultivation of one of the best mango variety in the world which is the "Philippine Carabao Mango" and other indigenous and introduced varieties, strains and selections. During the last several years, however, the volume of production and yield of mango have significantly deteriorated. Furthermore, the volume of export-quality fresh mangoes remains very low at less than 5 percent. This alarming situation, coupled with increasing cost of production prompted many growers to abandon their mango orchards or planted them to other crops or uses. There are many factors that contribute to this trend. Among them are typhoon, rainfall, insect pests, diseases and inadequate orchard management. Another single most important reason is the lack of strategic and long-term research and development efforts leading to the development of innovative technology that can enhance competitiveness of the mango industry in local and export markets.

a. Performance

Production, Area and Yield

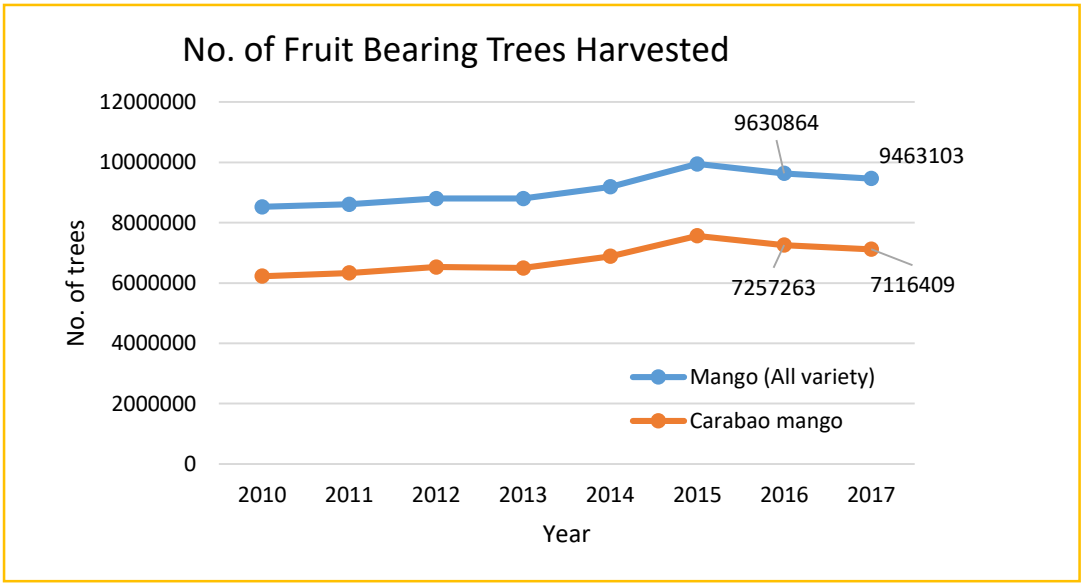
Figure 1. Production, Area planted and Yield of Carabao mango from 2008-2017



The total area harvested, production volume and yield of Carabao mango from 2008 to 2017 are shown in Figure 1. During this period, there are no distinguished expansion in area planted as it goes stagnant with just minimum increase from 144,293.3 hectares in 2008 to 145,302hectares in 2017.

Production trend increases from 2012 to 2015 but decreases in 2016 and 2017. Peak production along this period happened in 2015 where it reaches to 740,239 metric tons and an average yield of 5.02 metric tons per hectare. Carabao mango production remarkably decline in 2017 resulting to 598,713.5 metric tons, a reduction of roughly 141,526 metric tons or drop off of 19%. This trend is very alarming for the entire mango industry and must be addressed immediately. Effective measures must be done to reverse the trend and bring back the productivity to at least the 1990's level (e.g. 8 mt/ha).

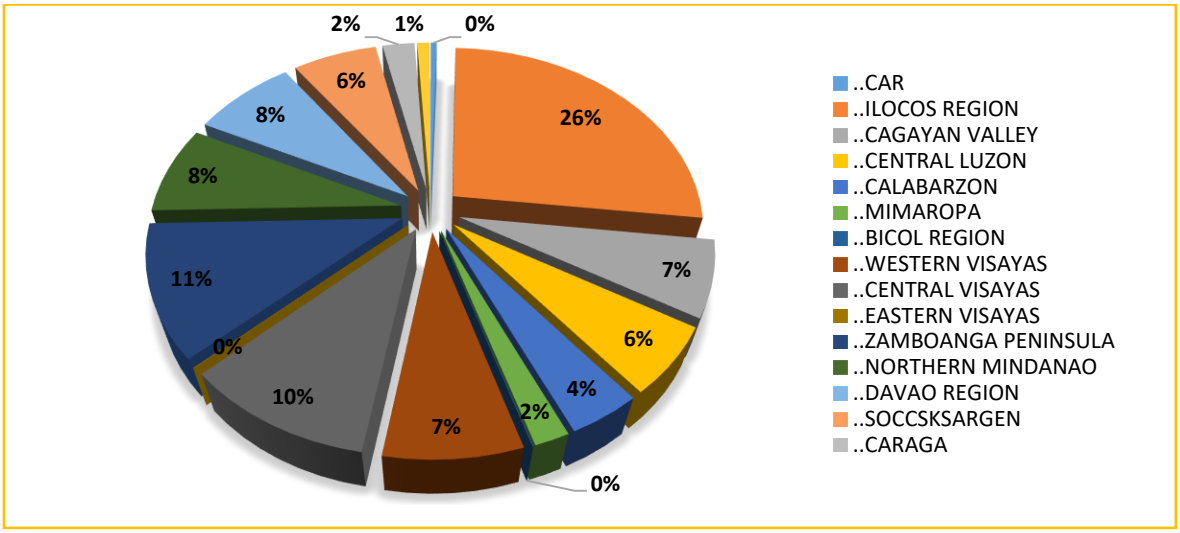
Figure 2. Mango bearing trees harvested from 2010-2017



According to PSA, the total number of carabao mango bearing trees harvested in 2017 reached a total of 7,116,409. An increase in number of trees was observed from 5,880,136 trees in 2008 to 7,563,066 in 2015. A decrease of 446,657 mango trees harvested can be observed from 2015-2017. This can be attributed to a number

of factors such as increasing proportion of young trees, damage of insect pests and diseases and the ill practice of excessive flower induction of older trees and failure to adopt appropriate cultural practices like fertilization, pruning and fruit bagging. Some farm owners also opt to cut down their century old trees due to difficulty in harvest, low yield and price fluctuation.

Figure 3. Percentage distribution of Carabao Mango Producing Region,2017



The percentage of production of each region to the total production in the Philippines can be observed in Figure 3. Highest carabao mango producing province in 2017 is Ilocos Region with 26% followed by Zamboanga Peninsula contributing to 11% of total production of the Philippines. At present, the mango industry comprises of few large farms (over 20 ha.), a few hundreds of medium sized farms (2 to 5 ha.) and at least 1.9M of very small farms with an average of 10 to 12 trees for a total equivalent area of 146,841 has. planted to Carabao mango with a production of 630,530 mt in 2012 (BAS-PSA, 2013).

Under this situation, only the larger or corporate farms can afford to operate their orchards and produce fruits themselves. Majority of the small growers have to engage service contractors (contract-sprayers) to spray and manage the fruiting of their trees, at terms unprofitable to both parties in most localities. In the early days, three spraying cycles throughout the fruiting period including flower induction were enough. Now, at least six spraying is the norm. The contract-sprayers have now become important players in the mango industry.

A few years back, some companies offered long-term service contracts to medium size growers, but for some reasons they stopped this practice. Some farms that are far from water sources and cannot be serviced by contract-sprayers so they just rely on natural fruiting but are usually left with fewer or no harvest at all. Industry players estimate that at least 90 percent of the mangoes sold to distant markets are produced by contract-sprayers. At the current 80:20 sharing, the tree owner is just breakeven on the cost of fertilization and pruning from his 20 percent share. Likewise, the contract sprayer could not make money even at 80 percent share if he needs to spray six times or more and/or hauls water from afar. They have to invest in foliar fertilization to induce more fruits and in the process detrimental to the trees resulting in die-back and loss of crop in the following season.

No. of accredited nurseries

Up to date, there are already 16 accredited nurseries according to the data from Bureau of Plant Industry-National Seed Quality Control Service. These nurseries can be found in Regions II, IV-A, IV-B, XI and XII.

NSIC approved mango varieties

As of 2017, there are already 14 approved strains of carabao mango varieties based on National Seed Industry Council. These are GES 73, GES 77, GES 84, GES 85, MMSU Gold, Sweet Elena, Fresco, Talaban, Guimaras Super (Galila), Efondo, Lamao #1, Tanaleon, JTA Sweet and P1 King Rodolfo. There is also one NSIC Pico Variety named "BPI Golden Pico" and two NSIC approved red mango varieties: Prima and Corsino.

Among these varieties, Guimaras Super (Galila) has the highest total soluble solids recorded (22.3° Brix). Total soluble solid is the measurement used to determine the sweetness of fruits by determining the solid concentration of a sucrose containing solution.

b. Farm Practices

As industry on the decline with all large commercial farms subdivided or converted into resorts or other uses, most of the residual farms are now operated by contract sprayers, and most trees are overexploited or abused. For all intent and purposes, the existing mango trees are typically managed. In certain regions, there are program interventions to demonstrate how mango groves can be made more productive. The comparison of typical practices with the recommended interventions is summarized in Annex A-Table 1.

Fruiting

Flower inducer was discovered by the award winning scientist Dr. Ramon Barba in 1970. Flower induction technique involves the use of potassium nitrate, calcium nitrate or sodium nitrate. Prior to application of flower inducer, paclobutrazol (a growth inhibitor) is also used. This discovery transforms the cultivation of mango from natural and season bearing to more precise production technology that makes the mango available year round. It revolutionized mango culture which was dependent on heavy chemical inputs.

Fruit Bagging

Bagging of fruits is practiced in the Philippines using recycled paper and pages of telephone directories while others used specially designed bags.

Increasing market demand of natural and organically grown mangoes which are free from toxic chemical residues which makes the farmers rethink of their farming system to meet market demands.

In some areas, mangoes were planted for expansion but a lot of trees were cut down for being unproductive due to wrong planting distance, use of chemicals which damaged the good microorganisms and biodiversity of the soil. Because of this, many mango farmers start to adopt natural, organic and biological farming systems. (Rivera, MINMANGO Council, n.d)

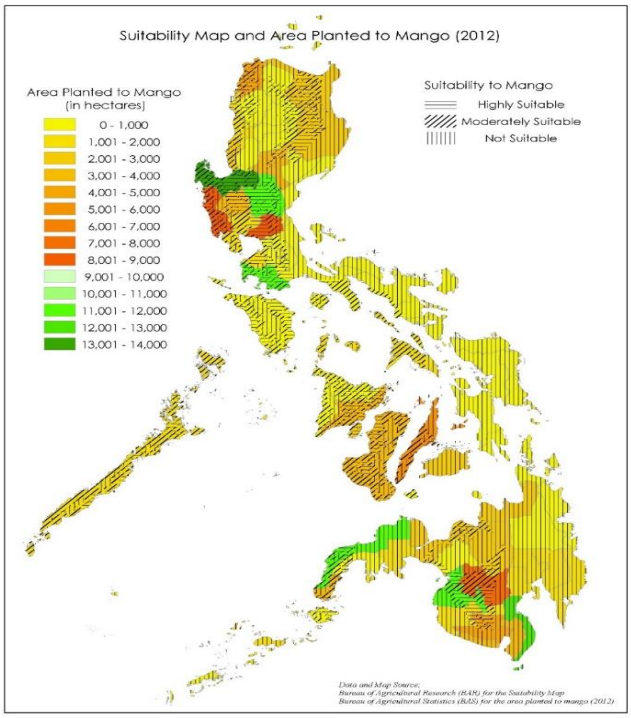
c. Crop suitability

Table 1.Top Carabao Mango Producing Provinces, 2017

Rank	Province	Production (MT)
1	Pangasinan	121,142
2	Zamboanga del Norte	47,489.02
3	Cebu	39,850.00
4	Davao del Sur	38,974.00
5	Misamis Occidental	23,210.00
6	Iloilo	23,125.00
7	Ilocos Norte	20,992.50
8	Batangas	18,636.00
9	Nueva Vizcaya	18,572.30
10	Isabela	17,381.10

Source: PSA,2018

Figure 4. Mango: Regional Production in Relation to Crop Suitability, BAR 2012



Crop suitability map and area planted with mango in 2012 was illustrated in Figure 4. Top mango producing provinces such as Pangasinan, Zamboanga del Norte and Davao del Sur and Cebu climate were well-suited for cultivation of Mango.

d. Mango Pests and Diseases

There is a very high potential for export of fresh or processed carabao mangoes. But the industry faces declining yield and quality attributed to pests and diseases, high post-harvest losses and other factors that limit the performance of Philippine mango in the international market.

Currently, the major problem of mango growers is Cecid fly infestation, Mango Pulp Weevil (only in Palawan) and Anthracnose. With the occurrence of destructive pests and diseases in mango like the cecid fly, the Department of Agriculture coordinated with SUC's and experts regarding the conduct of a research study on the management and control of major mango pests and diseases. For common pests and diseases on mango, please refer to Annex A –Table 2.

CECID FLY

Cecid fly also known as "kurikong or nora nora" is a very small and delicate fly with long legs and antennae, and hairy transparent wings. Two types of Cecid fly is present in mango: one attacks the fruits (*Procontarinia frugivora Gagne*) and the other on leaves (*Procontarinia pustulata*). Cecid fly on newly infested fruits are hard to recognize because the damage appears as pin pricks with slight discoloration and/or moderate galling and become more distinct and darker as the fruit grows and matures. Infestation starts as early as at 32 DAFI and could recur up to 75 DAFI.

Management: Prune crowded branches and infested leaves, particularly flushes. Remove weeds, underbrush shrubs and small trees under the mango canopy. Collect and dispose the infested fruits properly. Monitor damage as early as 32 DAFI and spray insecticide when necessary. Practice Insecticide Resistance Management (IRM) by alternating insecticides with different modes of action (MOA). Dispose fallen fruits by burning or digging into a minimum of 50 cm. deep.

Prevention: Bag fruits at 40 days after flower induction or at marble size or spray registered insecticides up to 55 days after flower induction. Bag fruits one to three days after insecticide application.

MANGO PULP WEEVIL IN PALAWAN

The mango pulp weevil (*Sternochetus frigicus*) is a hard-bodied weevil, usually 6 mm long and brownish black in color. Due to its color and habit, it cannot easily be seen in the tree. In the Philippines, this insect is only found in Southern Palawan but because of its destructive nature, it has placed the whole Palawan island under quarantine through BPI Special Quarantine Administrative Order No. 20 Series of 1987 which prohibits movement, transfer or carrying of mango tree or any part of it that is capable of harboring MPW. Transfer of mango tree or any part is allowed for experimental purposes only and limited quantity. The Island of Guimaras, on the other hand, was declared as "Special Quarantine Zone" by President Ramos on December,1993 to support mango production due to its high potential for exoport. The island is free from infestation of pulp and seed weevil.

The damage created by the weevil is not visible externally. But inside the fruit, tunnels and discolored pulp are formed due to larval feeding. An adult weevil does not leave the fruit until it falls to the ground and rots.

Management: Prune the tree, preferably open-center pruning, to allow the sunlight to penetrate the tree canopy. Sunlight kills weevils. Keep the orchard clean. Remove all weeds, twigs, fallen leaves and other debris under the tree canopy. Dispose infected fruits properly by burying the fruits two feet below the ground. Bag the fruits at 55 to 60 DAFI.

ANTHRACNOSE

Anthracnose is a major post-harvest problem of mango fruits and is the most serious fungal disease of mangoes in the Philippines. causes irregular brown spots on young leaves while mature leaves get distorted with "shotholes" in various shapes and sizes. It also blackens and withers the flowers and produces "blossom blight" while causing brown to black sunken spots on the fruits. Other damage caused by anthracnose: reduced tree vigor; unproductive terminal branches; withering of flowers; failure to set and retain fruits; rotting of fruits and total crop failure

Field Management – Maintain good light penetration and air circulation in each mango tree. Collect and burn trash to reduce sources of disease. Bag fruits using appropriate bagging materials to reduce further field infestation. Fertilize and irrigate trees to improve tree vigor. When flushing occurs on rainy days, protect emerging flushes from leaf spots by spraying registered contact fungicides. Apply protectants/ systemic fungicides to protect inflorescence against blossom blight and fruit rot infection on developing fruits.

Post-harvest Management- Subject newly harvested fruits in hot water treatment.

DOST-PCAARRD initiatives to address concerns on pests and diseases are dissemination of IEC materials for integrated pest management (IPM) which are developed by UPLB, RMTU and other SUCs. IPB-UPLB has been conducting studies on plant breeding of putative mango hybrids with traits such as red blush and thick skin and resistance to pests and diseases.

e. Post-harvest handling techniques

Carabao mango is the third fruit exported of the Philippines but due to its fast rate of ripening, markets are limited to the nearby countries such as Japan, Hong Kong and South Korea while transports to distant markets make it very expensive and affects the price competitiveness of the Philippine mango to the world market.

HOT WATER TREATMENT

One of the important methods to maintain and enhance the quality of mango is to subject it to hot water treatment (HWT) especially for exported produce. Mangoes are placed into HWT at 52-55°C for 10-15 minutes to minimize the incidence of anthracnose disease. For mangoes exported to China, extended hot water treatment was done by dipping it in 48°C water until pulp reaches 46°C for 10 minutes.
Source: DOST-PCAARRD Crops Research Division

VAPOR HEAT TREATMENT (VHT)

This type of treatment is used in mangoes exported to Japan, Australia, Korea, and also in United States. During the vapor heat treatment, mango pulp temperatures reach 46°C for 10 minutes and performed in the presence of inspectors from importing countries. (Lualhati and Rodeo, 2013)

IRRADIATION

Some importing countries require disinfestation protocols such as United States. Philippine Mangoes exported to the US are irradiated at 150 Gy and 350 Gy for fruit flies and seed weevil quality control, respectively by using cesium-137.

MODIFIED ATMOSPHERE PACKAGING (MAP)

This technology is widely used in the country as it requires only simple and cost effective technique. Fresh mangoes sealed inside a film or plastic bag results to modification of the surrounding atmosphere containing carbon dioxide (CO_2) and oxygen (O_2). The modified atmosphere decreases the rate of deterioration, ripening and loss of moisture of the commodity. The plastic film contains diffusion holes to prevent aerobic respiration and high CO_2 level. The number of these holes and its sizes depends on the volume, maturity and type of commodity to be packed.

Studies have conducted for Philippine mangoes whereas it turns from green to half ripen when stored for one month in a control atmosphere chamber. This technology allows Philippine mango exporters to bring their products to far countries. Philippine Nuclear Research Institute is the only irradiation facility in the country.

INDIVIDUAL QUICK FREEZE (IQF)

A new production and postharvest technology for supply and marketing sustainability, Instant Quick Freeze (IQF) is an emerging technology that is useful in postharvest operations for fruits and vegetables. This technology allows each piece of fruit to be frozen separately avoiding large chunks of frozen product and can last up to 24 months. This form of mango is later used in smoothies, salads and confectionaries (OctoFrost,2016). It is a technology that is now widely used in Vietnam to preserve the nutrients and freshness of farmers' harvests.

f. Farmers Issues and Concern

Table 2. Summarized issues and concern of farmers from Mango stakeholders' forum

Congress	No. of Attendees	Major Issues and Concern	Actions taken/to be taken
Mindanao Mango Stakeholders Forum, Davao City (August 2,2017)	606	1. Direct buyers for mango growers/farmers 2. Limited technology on mango production & other means of technology (rehab, production practices &flower induction) 3. Lack of working capital/high cost of inputs, logistics 4. Mango tree rehabilitation intervention 5. Cecid fly infetstation 6. Farm to market road 7. Fund for study to control Cecid fly 8. Communication on DA's assistance programs	1. Conduct mango forum to organize business matching for buyers 2. Conduct a provincial wide training to mango growers/farmers 3. Loan program thru ACEF 4. ACPC loan without interest, Php 600/tree for rehabilitation protocol 5. Nationwide revalidation of farms 6. DA- PRDP, validate the road with the geotagging and satellite mapping. 7. Craft a proposal care of Dr. Medina, fund for conduct of TOT in proper control of Cecid fly in all mango producing regions. 8. Create a website care of DA
Luzon Mango Stakeholders' Forum, Pangasinan (August 11,2017)	750		
Central & Eastern Visayas Mango Stakeholders' Forum, Cebu City (August 18,2017)	355		
Western Visayas Mango Stakeholders Forum, Guimaras (August 23,2017)	156		
Zamboanga Peninsula Mango Stakeholder's Forum, Dipolog City	185		
Bohol Mango Summit, Tubigan, Bohol (September 30,2017)			
Palawan Stakeholders Forum, Palawan (September 30,2017)			
19th National Mango Congress, Cagayan de Oro (November 27-29,2017)			

Note: See Annex B for Issues and Concern gathered from each forum

g. SWOT ANALYSIS

Table 3. Mango: SWOT Analysis

Strengths	Weaknesses	Opportunities	Threats
'Carabao' mango is one of the best varieties in the world in terms of aroma and eating quality. It is also responsive to flower induction with the use of potassium nitrate and calcium nitrate	Thin skinned that easily bruises; poor handling and transport characters. It is also susceptible to major insect pests and diseases, including Cecid fly which has no recommended control measures	The substantial surplus that is not currently used can be developed into marketable value-added products	Adverse effect of climate and weather change
Year-round production technologies are available	High perishability and inadequate postharvest, and processing facilities	Increasing domestic and export demands for fresh and processed products	Stiff competition from other mango-exporting countries (e.g. Mexico, Thailand)
Improved production, postharvest, and processing technologies are available	Low adoption of improved technologies resulting to decreasing productivity	Possible adoption of controlled atmosphere storage for distant markets	Emerging insect pests and diseases Unscrupulous exporters using prohibited chemicals
Grown in most parts of the country	Predominance of small farms, hence inconsistent supply of high quality fruits	Strategic geographical proximity to Asian markets	Increasing costs of labor and production inputs
Priority fruit crop supported by DA, DOST and DTI	Many mango trees are old and unproductive contributing to low productivity	Availability of additional suitable areas for further expansion	Unabated cutting of mango trees for crop conversion
	'Carabao' mango tree is highly vigorous and grows into huge trees. Existing trees are extremely difficult and too risky to manage	R and D on canopy management for pest, disease and other culture technology application	Weather/climate change. Mango trees are at risks of toppling down/breaking of branches during strong typhoon because of its tall and spreading canopy

h. Supply Chain and Players

The supply chain of the mango industry existing today is composed of input suppliers (planting materilas, agricultural inputs and post-harvest supply), producers (growers, spray contractor, spotters), consolidator/traders, processors, exporters and retailers. What is unique for mango is the entry and pivotal role of the contract sprayers who actually do the production of mango from flower induction, crop protection, harvesting and marketing.

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Key Industry Players

As a major and relatively old industry, the mango subsector is more organized and has producers or trade associations all over the country. For the mango industry, list of member cooperatives (active and up-coming) were listed in Annex A-Table 3. It is estimated that about 60 percent of those who produce mango for the market are members of one form of farmer's association or another as they also grow other crops.

Processors are doing well in utilizing surplus seasonal production and exporting them as high value products. However, as there are only few expensive plants they are situated mainly in Metro Manila and Cebu, fairly far from the producing areas and are fully utilized during the harvest season. The mango processors are listed in Annex A-Table 4. We need smaller but versatile processing plants that are located near production areas and capable of processing not only mangoes but also other fruits and vegetables, especially those with different peak harvest seasons.

i. Consumption and Utilization

The per capita supply of mango in the Philippines is decreasing, closely following the decreasing trend in production which can be seen in Figure 5 and 6. A near equilibrium was attained in 2011 when 29 percent of total local productions were exported so that the residual supply of Carabao mango is about the same volume as the total consumption. That leaves the production of other mango varieties (about 20 percent of the total) as surplus or unutilized. With the decline in production, only 17 percent went to export in 2012. Of the available mango supply, per capita consumption ranged from 1.39 (Region VIII) to 4.80 kg (CARAGA) with a national average of 3.49 kg, indicating that the Philippines had indeed surplus of mangoes which therefore justifies exporting them in fresh and processed forms.

Figure 5. Mango: Supply (Net of Export and Processing) Per Capita, 2003-2012

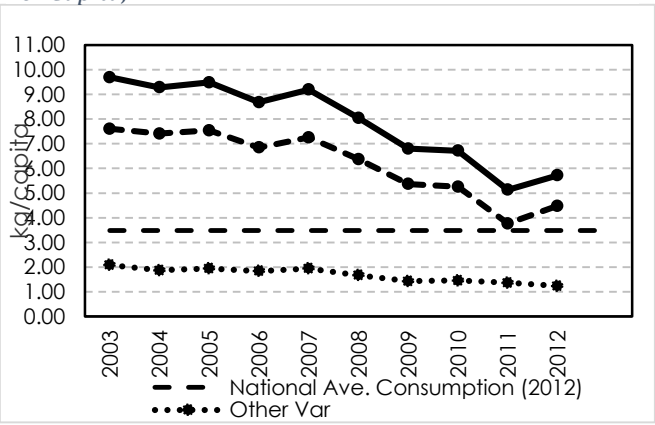
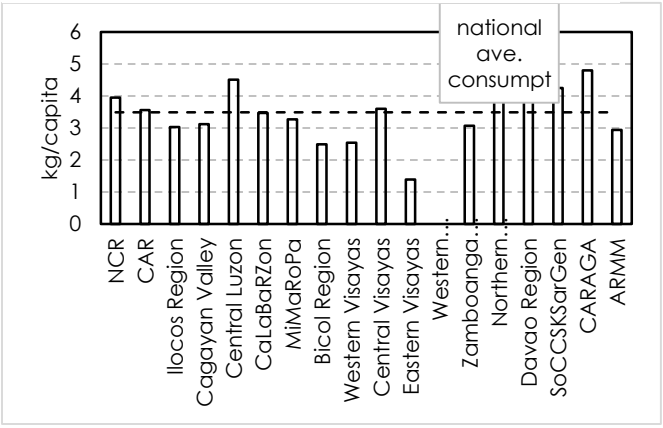


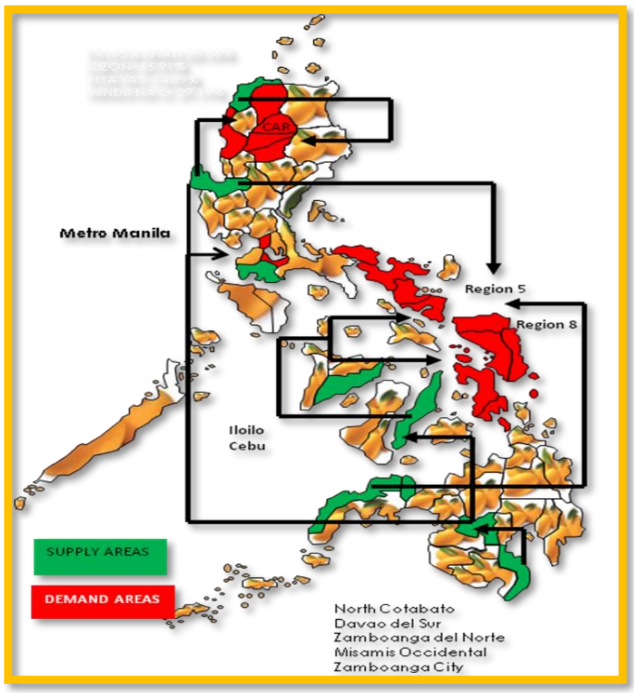
Figure 6. Ripe Mango: Regional Consumption, 2012



Source: BAS-PSA; Consultatant's calculations & Consumption of Selected Agricultural Commodities in the Philippines (National and Regional Levels) Volume 1 (BAS-PSA, 2012).

Supply of mango fruits comes mainly through these provinces and other supply areas and transported to their respective market destinations. The general product flow is shown in Figure 7.

Figure 7. Mango: Major Demand and Supply Centers

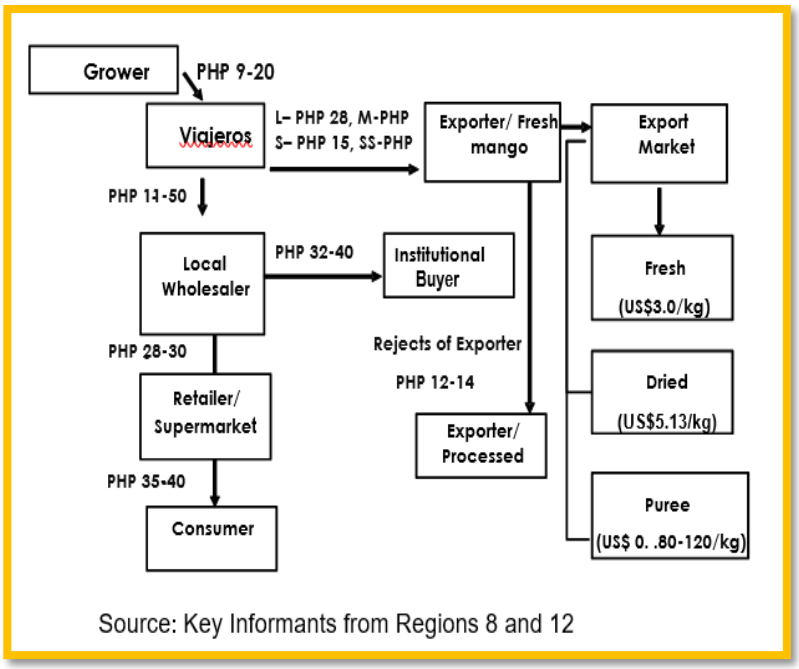


Supply Areas	Destinations
Pangasinan	Ilocos Sur, Baguio City, Laguna, Bicol, Metro Manila, Zambales
Davao City	Bukidnon, Surigao Sur, Gen. Santos City, Manila, Cebu
Batangas	Bicol, Metro Manila
Cebu	Samar, Metro Manila
Iloilo	Metro Manila, Aklan, Capjiz, Negros Occidental, Cebu, Hongkong, Japan, USA

j. Domestic prices

Prices mangoes fluctuated depending on season and farm gate price in particular, increased by an average annual growth rate of 4.6 percent from 2003-2012 compared to retail price that increased at a lower average annual growth rate of 3.9 percent. Retailers/wholesalers rather than the farmers got much of the benefit from off-season production of mangoes or can afford higher cost of transport if they can pass the produce on to consumers. The price movement of mango from East Visayas and Mindanao through the marketing channel is reflected in Figure 8.

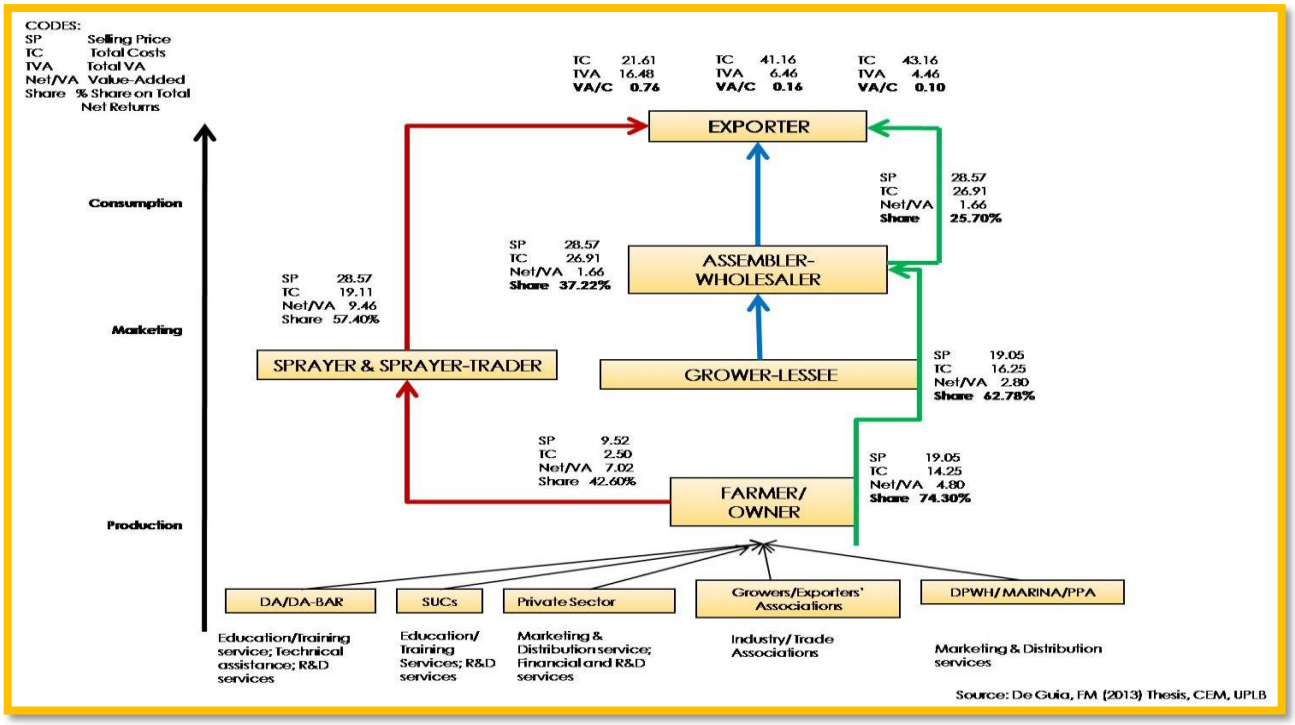
Figure 8. Mango: Marketing Channels (Price Tracking) 2013



Cost Build Up for Typical and Benchmark Farms

De Guia (2013) conducted a study on value chain analysis for mango exporters (Figure 9). The study shows that the mango farmer who manages his mango orchard gets higher share (74 percent) of the total net return than the farmer who enter into contract agreement with sprayer-trader and gets only 42.6 percent. In the latter case, the sprayer-trader gets 57.4 percent share of the profit which is just fair since he is the one who finance and manage the entire cropping

Figure 9. Mango: Value Chain Map for Exporters, 2013



Source: De Guia (2013), Thesis, CEM, UPLB

operation. While the data presented on per kilo basis are interesting, they have to be viewed from the enterprise level. Very few corporate farms can manage their orchard. For the small mango farms, though the data would appear profitable on paper in terms of ratios, this is not so in absolute or total amount per farm.

The study, however, showed how mango spray contracting has earned an indispensable role in the mango industry during the last 3 decades. Recently, however, the number of contract sprayers is dwindling due to the increasing cost of production brought about by spiraling cost of inputs, particularly flower inducer, insecticides, fungicides and fertilizers. In addition, the present practice of farmers that relies heavily on calendar-based chemical sprays to control various pests and diseases further results to high pesticide residues, emergence of new pests and contributes to more pollution of the ecosystems.

Based on a study made by Philippine Rural Development Plan – Department of Agriculture (PRDP-DA) on the Mango (Fresh Carabao) Value Chain Analysis of Luzon A Cluster (Region I, II and III), particularly on the cost calculation of value added in fresh Carabao mango sold for export and local markets, it showed that for export quality fresh Carabao mangoes buying price was higher at PHP 45.00 per kilo while those that were sold in the local market buying price was only PHP 38.00 per kilo. Costs associated with inputs only accounted to 7.58% for export grade mangoes and 8.97% for local grade. On the production side it was interesting to note that costs associated with production was only 16.27% for export grade Carabao mangoes and 19.26% for local grade. The reduction on percentage share on cost associated with production for export grade Carabao mangoes was a result of higher buying price as compared to local market.

k. Cost and Return Analysis

For mango production in Eastern Visayas or Southern Mindanao, the profitability picture is much better. According to key informants in Mindanao, the small farmer who manages his mango trees up to harvest will invest PHP 30,750 and make a sale of PHP 69,000 at PHP 23/kg farm gate price or a 124 percent return to cost. If he engages a contract sprayer at a sharing of 70:30, he spends only for fertilization at PHP 6,70 and gets PHP 20,700 or a 306 percent return to cost. The contract sprayer will invest PHP 24,000 and sells his share at PHP 48,300 and gets a margin of PHP24,300 or 101 percent return to cost. To sell to exporters in Manila or Cebu, he would incur an additional cost of PHP 20,706 and make a sales of PHP 69,825 at PHP 35/kg. On the whole he will just get a margin of PHP 25,115 or 56 percent return to cost.

In both cases, the contract sprayers do not make much money selling to exporters if they can sell to local traders or wholesalers who are not meticulous of quality and usually pay higher prices. Apparently, the contract sprayers sell only to exporters of institutional buyers if they have plenty of fruits that they cannot move through the wholesalers in the local markets.

Table 4. Updated average production costs and returns by commodity (2014-2016)

ITEM	2014	2015	2016
CASH COSTS (PhP)	**43,257**	**43,813**	**43,545**
Fertilizer	14981	14606	13806
Pesticides	7269	7220	7252
Hired Labor	11763	12635	12696
Land Tax	815	823	831
Rentals	1940	2026	2233
Water/Electric Bills	307	280	280
Fuel and Oil	1923	1753	1750
Interest Payment on Crop Loan	1508	1659	1825
Food Expense	1313	1347	1380
Repairs	1438	1464	1492
NON-CASH COSTS	**4,829**	**4,924**	**5,819**
Hired Labor Paid in Kind	739	794	798
Rentals Paid in Kind	138	148	149
Landlord's Share Paid in Kind	3215	3228	4022
Harvester's Share	737	754	850
IMPUTED COSTS (family labor, depreciation, land rental value, operating capital interest)	**24236**	**26143**	**28282**
ALL COSTS	**72,322**	**74,880**	**77,646**
Yield Per Hectare in Kilograms	4,705	4,791	4,334
Cost of Production Per Kilogram (Php)	15.37	15.63	17.92
Farmgate Price per kilogram (Php)	27.1	27.21	33.9
GROSS RETURNS (Php)	127,506	130,363	146,923
NET RETURNS (Php)	**55,184**	**55,483**	**69,277**
NET PROFIT- COST RATIO	**0.76**	**0.74**	**0.89**

Source: Countrystat-PSA, 2018.

III. MANGO IN THE WORLD MARKET

Mangoes are cultivated in warm tropical and subtropical climates mostly in Asia, Latin America and Africa. Leading countries like India (42%), China (10%), Thailand (7%), Indonesia (5%), and Mexico (4%) have dominated the export market (FAO, 2016). This fruit is the fifth most cultivated fruit in the world and for the past 10 years and the trade in mango products has tripled; in 2005 the total exports were just US$696 million, while in 2015 it had increased to almost US$2.1 billion (UNComtrade, 2016). Demand rapidly increases due to expanding consumption in US, China and other countries. With increased availability, mango prices in the global market have generally declined, though prices fluctuate mainly depending on variety, size, origin and season (USAID, 2013). Fresh and processed form such as dried, frozen, puree and juice have been sold in the market worldwide.

Figure 10. Countries with highest mango production.

Source: www.mapsofworld.com,2017

The key characteristic of mango global value chain according to D TI's The Philippine in the Mango Global Mango Chain (2017) include:

- Increasing global demand for mango.
- Few countries have been able to penetrate the global market.
- Trade in fresh mangos is more regional in scope, while dried mango trade is more globally oriented.
- The global mango sector operates as a buyer-driven value chain
- Mango producers and processors face a complex system of standards.

a. Production, Area and Yield of World Top Producers

Worldwide, mango production continues to increase from the past years mainly due to increase in areas harvested rather than increase in productivity. The five leading producers of mango were India, China, Thailand, Indonesia and Pakistan that respectively contributed 39 percent, 11 percent, 5 percent,7 percent and 7 percent to global mango production in 2011 (Table 5). In terms of volume of production and area harvested, India holds the top spot in year 2011 but in terms of yield, Brazil has the highest garnering an average yield of 16.36 metric tons/ hectare. Philippines contributed roughly only 2 percent to world production output. From previous years, top producing countries experienced periodic dip but the occurrences vary among countries probably influenced by local weather.

Table 5. Mango: Production, Area and Yield of Top 10 Producing Countries, 2010-2011

Country	Production (MT)		Area harvested (ha)		Yield (MT/ha)	
	2010	2011	2010	2011	2010	2011
WORLD	**37,149,496**	**38,953,166**	**4,956,754**	**5,088,80**	**7.49**	**7.65**
India	**15,026,700**	**15,188,000**	**2,312,300**	**2,297,000**	6.50	6.61
China, mainland	4,000,000	4,350,000	450,000	450,000	8.89	9.67
Thailand	2,550,595	`	311,048	317,000	8.20	8.20
Indonesia	1,287,287	2,131,139	131,674	208,280	9.78	10.23
Pakistan	1,845,528	1,888,449	173,731	172,008	10.62	10.98
Mexico	1,632,649	1,827,314	174,970	196,930	9.33	9.28
Brazil	1,189,651	1,249,521	75,179	76,383	**15.82**	**16.36**
Bangladesh	1,047,849	889,176	129,000	111,100	8.12	8.0
Nigeria	850,000	850,000	130,000	130,000	6.54	6.54
Philippines	843,508	800,551	197,816	195,401	4.26	4.10

Source: FAOStat

Further comparison clearly showed that the Philippines is very far behind the leading mango producers in terms of productivity or yield per hectare (Table 4). The local yield of 4.1 mt/ha is way below the world average of 7.65 mt/ha and is not even half that of Thailand with almost 8.20 mt/ha. Obviously, there is a lot of work to do in order to catch up with other leading mango producers. Yield must be sustainably increased and the quality of both fresh and processed products must be improved in order to be competitive in the international markets.

b. Trade: Import and Export

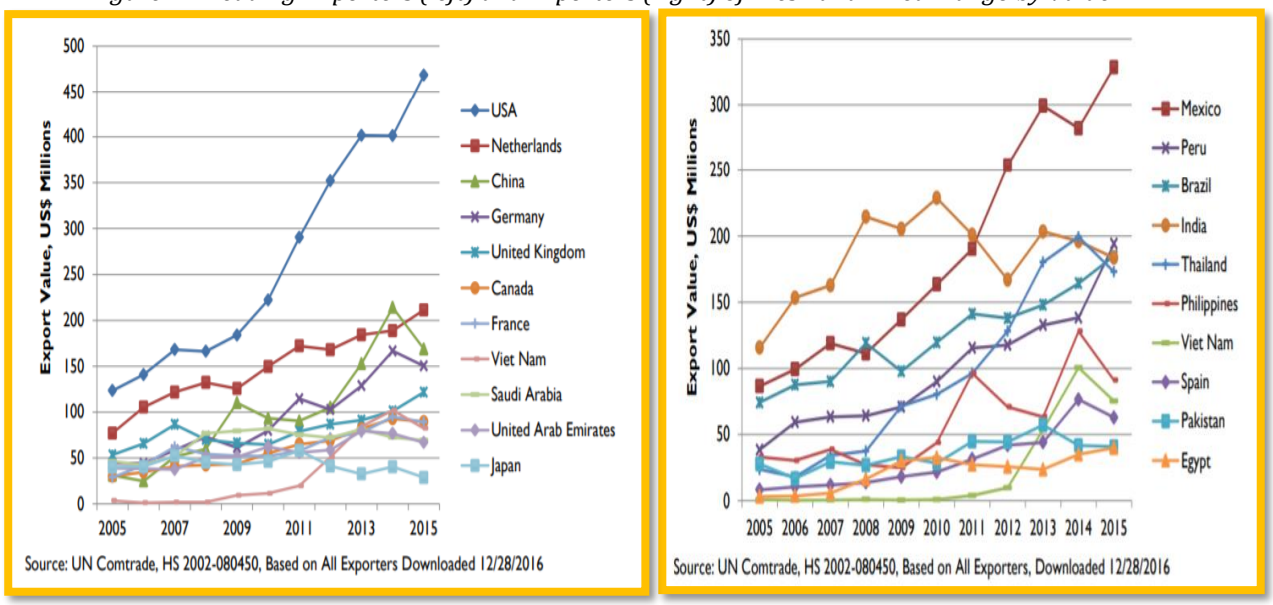
Mango is considered as the 5th most consumed fruit after citrus, banana, grapes and apple and is produced in more than 100 countries. Most mangoes are consumed fresh due to its special characteristic such as distinct flavor and nutritional content. Trading of mangoes occur at all levels, either local, domestic and international but it's international trade is relatively marginal compared to other fruit. In 2011, the total world mango output reached 37,149,496 metric tons. Although there is

an increase in demand, some barriers on trade have been faced by some exporting countries. One relevant trade issue is the sanitary and phytosanitary (SPS) requirement imposed by importing countries to protect them from possible pests and diseases coming from outside.

Mango Importers

Most of the mango importers are developed countries as seen in figure 11 such as USA, Netherlands, Germany and United Kingdom. USA has been the leading importer over the past decade, reaching US$468 million in 2015 with a 23% share in world market. China's import, on the other hand, have increased importation from US$ 31Million in 2005 to US$ 169 Million in 2015 and this is due to their growing demand for non-traditional fruits (EUSME Centre,2015).

Figure 11. Leading Importers (left) and Exporters (right) of Fresh and Dried Mango by Value



Source: The Philippines in Mango Global Value Chain, DTI (2017)

Mango Exporters

Due to the short shelf-life of mangoes and it's high shipping cost, the trade of mangoes was limited to neighboring countries. For example, fresh mangoes imported to United States came from Latin America while Japan sourced out its mangoes from Thailand, Taiwan and the Philippines. It must be taken into account that Japan has a very strict Sanitary and Phyto-sanitary requirement established in 2011, making it hard for few regions to meet. Philippine exports to Japan showed a very huge decline due to the tight SPS standards especially the maximum residue limit (MRL). Mexico have the highest export value followed by Peru, Brazil, India and Thailand.

Other Countries Mango Production Practices

Recently, the Development Academy of the Philippines (DAP, 2014) conducted an international benchmarking studies on mango. The countries covered were Philippines, Thailand, Vietnam, Mexico and India. Salient features of the different cultural management practices in these countries can be seen in Annex A-Table 8.

c. PHILIPPINES IN THE GLOBAL MARKET

Philippines has been an important player in the mango global market since 1980 with exports taking off in 1990's. The country ranked 7th in exports of fresh and dried mango in 2015 with US $91 million in exports and 4% share in global market.

Figure 12. Philippine Mangoes in Japan which cost US $63/kilo

Major export destination of the country's fresh mangoes in terms of volume from 2015-2017 can be seen in Table 6. These destinations are Hong Kong, Korea, Japan, Malaysia and Canada which are mostly neighboring countries. Volume of export going to Korea and Malaysia decline drastically. Highest export went to Hong Kong with a volume of 8,015.11 metric tons.

Table 6. Top Five Country Destination for Fresh Mango Export in metric tons

COUNTRY	2015	2016	2017
HONGKONG	7,867.24	5,534.47	8,015.11
KOREA	4,805.00	3,702.27	3,486.27
JAPAN	466.06	585.04	562.122
MALAYSIA	788.72	480.05	206.59
CANADA	144.79	242.72	133.837

Commercial varieties

Basically only Carabao is grown commercially for both local and export market. Relying on only one genetically-uniform variety is risky; if some catastrophic events (serious pests, natural calamity) happened on this variety, then the entire mango industry will suffer greatly. On the other hand, the three (3) other countries included in the study rely on diverse genetic materials on at least seven (7) commercial varieties.

Competitiveness of the Philippine Carabao mango in the world market is mostly influenced by its quality as it is considered as the one of the finest and sweetest mangoes in the world. The Philippine mango however, has not been able to sustain the position in terms of export due to limited R&D, technologies such as cold chain management, packaging and inability to meet the standards of the key markets. Japan, for instance, required exporting countries to have their mangoes to undergo vapor heat treatment. USA bans mango imports from some countries to control entering of pests such as fruit flies from entering its territory. (FAO,2014 as cited by Requena, 2014)

Government Policies

The DAP benchmarking report provides detailed discussion on government policies in support of agricultural development of the five (5) countries. Summary of the benchmarking for mango can be seen in Annex A, Table 8. Briefly, the policies of Thailand, Vietnam, India and Mexico had been successful and had greatly contributed to improved agricultural productivity and efficiency as well as improved farmer's income. In contrast, the Philippines' AFMA of 1997 has not been fully implemented primarily due to lack of fund its mandates. Furthermore, there are packages of incentives and subsidies for farmers in other countries that are practically lacking in the Philippines. Moreover, Thailand, Vietnam and Mexico has invested on continued research and development which include breeding and selection of new varieties suitable to their growing conditions and appropriate to high-density production system that are more efficient and more productive than the traditional production system.

With an effective extension delivery system in Thailand, Vietnam and Mexico, newly developed technologies are immediately disseminated to the farmers. In the Philippines, agricultural research and development are managed by DA and DOST but the delivery of R and D outcome is basically delegated to LGUs which may have priorities other than agriculture. Policy review on protection of mango, trade barriers and leverage with the mango importing countries and conduct of trade fairs should be look upon to increase competitiveness of the Philippine Mango in the world market.

Price Competitiveness Analysis

For export of fresh mangoes, our market is the East Asian region which prefers the less fibrous no-turpentine flavor mangoes. This is in contrast to the preference of those from South Asia and Africa who prefer mangoes with distinct turpentine flavor. For the East Asian market, our current competitor is Thailand, and Vietnam would soon be exporting to the same market. For price competitive analyses, our benchmark should be Thailand because there is yet no comparable data from Vietnam. For us to compete with Thailand in Japan and Korea, our competitive export price should be US$ 633/mt as shown in Table 7. At this border price, the corresponding wholesale price ex-warehouse of exporter should be PHP 27/kg. At the average assemblers cost and margins, the competitive farm gate price should be PHP 18/kg.

Table 7. Mango: Price Comparison of Philippines and Thailand

Parameters	Unit	Export Mango
Reference Country		Thailand
Competitive Border Price	US$/mt	633
Exchange Rate	PHP/US$	44
Competitive Wholesale Price	PHP/kg	27.85
Regulatory Fees	3%	0.84
Wholesalers/Exporters'		27.02
▪ Marketing Cost	PHP/kg	7.86
▪ Margin at 6%	PHP/kg	1.15
Competitive Farmgate Prices	PHP/kg	18.01
Production Cost (Mango)		
▪ Grafted, OO Region 1	PHP/kg	7.38
▪ Seedling, OO Region 1	PHP/kg	6.42
▪ Contract Sprayer Central Luzon	PHP/kg	17.14
▪ Contract Sprayer, EV or SM	PHP/kg	11.43

From earlier analyses as reported in Tables 7 and 8, growers in Ilocos Region who manage their crop and sell to assembler-wholesalers for exporters would still be

competitive. The contract sprayers in Luzon will have difficulty selling to exporters while those in Eastern Visayas and Mindanao may have a fighting chance. For other areas especially those who engage contract sprayers in which cost of production is from PHP 11-12/kg, the producers are better off selling to the local market.

While the Philippines can compete its price, the country is way behind in quality. The Philippine carabao mango may have excellent eating qualities but it has very poor handling and distribution resiliency. The carabao mango has very thin skin that easily bruises, and prone to pest and disease damages. We have not invested enough in long term research to identify and develop appropriate varieties for export the way Mexico, Thailand and Vietnam has done and continue to do. Thus, in the near term, it is not practical for the country to be ambitious in the export of fresh fruits. The capability for long-term research

Figure 13. Export process in the Philippines

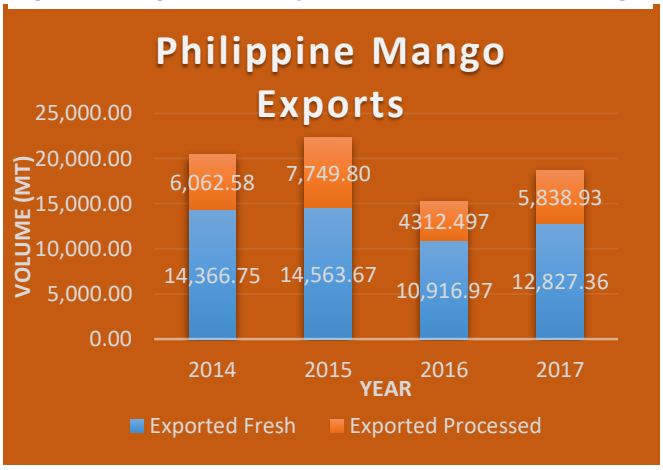
to develop appropriate varieties for export should first be put in place.

In the meantime, the country should build on the successful efforts of processors in developing product and penetrating new markets. All surplus production should be utilized by processing them into exportable products. Figure 13 shows the step by step process in exporting mangoes to other countries.

Market Trend and Prospect

Mango, the country's national fruit is considered as one of the finest fruit in the world. It has an established domestic market and has bright opportunities for the international market both in fresh or processed forms.

Figure 14. Export Volume for Fresh and Processed Mango



The mango-processing sector produces various product forms of mango such as mango puree, mango juice, dried mangoes, mango concentrates, frozen mangoes, mango glaze, edible parts, and mango in brine and mango preserves. Export in 2015 reaches the highest peak for both fresh and processed product as seen on the figure 13 and then decline in 2016 and increased again in 2017.

IV. ROADMAP AND ACTION PLAN

Philippines need to develop new and innovative products, develop a cost-effective control measures against Cecid fly ("kurikong") and be better prepared for the changing climate and keep in pace with the ASEAN Economic Community. Mango farmers must immediately adopt the best technology available (e.g. Integrated Crop Management or ICM) and Postharvest Quality Management (PQM) to reverse the declining productivity by investing in strategic rehabilitation of unproductive mango trees and in improving post-harvest handling system to increase the production of export quality and safe mangoes.

As a long-term investment strategy, the country should immediately launch a sustainably well-funded and aggressive national mango development program that will address the short-term and long-term research and development needs of the mango industry. The postharvest handling and processing as well as marketing of perennial fruit crops and plantation crops could be handled by other mandated agencies, in which their capacity development is also part of the HVC roadmap.

To recap, the mango industry is now at the cross road. It must make the right decision if it were to prosper; otherwise it would wither in slow decline. Foremost, the Philippines must immediately put in placed a long-term strategic intervention.

a. Vision, Mission and Objectives

Vision

Regaining position in innovation on production technology, post-harvest, product development, and export marketing in order to supply consistently safe and high-quality products.

Mission

Enhancing global competitive levels in production, processing and marketing by integrating industry efforts and providing stakeholders with safe environment and opportunities.

Goals/Objectives

The Philippine mango industry roadmap aims:

1. To increase production by at least 3% per year;
2. To increase per capita consumption by at least **3%/year**
3. To increase export volume of mango processed products and export value of fresh mango;
4. To reduce production cost by **25-30%;**
5. To reduce postharvest losses from **40%** down to **14%**;
6. To increase GAP accredited mango farms (**10 farms/year**)
7. To increase income of mango farmers; &
8. To generate more job opportunities in mango growing communities.

b. Mango* Targets (2018-2022)

Table 8. Production target based on estimated population (2018-2022)

Item	2018	2019	2020	2021	2022
***Population ('000)**	**106,598**	**108,274**	**109,479**	**111,192**	**112,764**
Per Capita Consumption (Kg)	9.80	10.29	10.81	11.35	11.91
Local Demand (MT) at 8.5 kg/capita	906,083	920,329	930,572	945,132	958,494
Local Demand (MT) at increasing per capita consumption	1131582	1208136	1289441	1375800	1467523
Export , Fresh (MT)	23761	24474	25208	25965	26743
Export Dried (MT)	7592	7820	8055	8296	8545
Export Total (MT)	35623	36692	37792	38926	40094
Export total in fresh equivalent (MT)	86,530	89,126	91,800	94,554	97,391
Total Export Value (USD M)	116.49	119.98	123.58	127.29	131.11
Export share to total production (%)	8.77	8.77	8.77	8.77	8.77
Production (MT)	986448	1016041	1046522	1077918	1110256
Yield (T/ha)	4.98	5.08	5.18	5.28	5.5
Present area (ha)	194,132	196,073	198,034	200,014	202,014
Increase in area (ha)	4,416	4,420	4,425	4,429	4,434
Planting materials at 100 seedlings/ha	441,600	442,000	442,500	442,900	443,400
Net available for local market (MT)	899,917	926,915	954,722	983,364	1,012,865
Per Capita availability (kg/year)	7.79	7.90	8.00	8.11	8.22
Per Capita availability (kg/year) re: PSA BAS Popn	8.40	8.50	8.60	8.71	8.82

Source: PSA for 2018-2020, forecasted population for 2021-2022
*For all mango varieties

Table 9. Physical Targets for Mango Planting and Rehabilitation, 2018-2022

TARGETS	2018	2019	2020	2021	2022
Yield (mt/ha)*	5.1	5.2	5.3	5.4	**5.5**
Expansion area (ha)*	**4,416**	**4,420**	**4,425**	**4,429**	**4,434**
Target total area (baseline: 145,302.37 has.)	149,718	154,138	158,563	162,992	**167,426**
No. of trees for expansion (12x12m planting distance)	**309,120**	**309,400**	**309,750**	**310,030**	**310,380**
Estimate no. of trees (based on 2017 no. of trees data: 7,116,409)	7,425,529	7,734,929	8,044,679	8,354,709	**8,665,089**
Target total production (metric tons)	**763,563.68**	**801,519.52**	**840,385.86**	**880,158.79**	**920,845.03**

Source: *PDP 2017-2022

Target yield and expansion area was based on the Philippine Development Plan 2017-2022. Yield must increase from 4.32 mt/ha in 2016 to 5.50 mt/ ha by 2022. Increase in expansion area will also be done for the succeeding years to achieve the production of 920, 845 metric tons in 2022. Priority for expansion areas are MIMAROPA, Zamboanga Peninsula (Region IX), Northern Mindanao (Region X), Davao Region (Region XI) and SOCCSKSARGEN (Region XII).

Strategies and programs of the concerned government agencies and private sector to be implemented from 2018-2022 can be seen in Table 10.

c. Strategic Direction

Table 10. Program, Strategies and Action Plan

OBJECTIVES	LEAD AGENCY	TIMELINE
1. Increase production		
• Establishment, rehabilitation and maintenance of production facilities focusing on new varieties (Nursery, Foundation Scion Grove, etc.) Developed or identified suitable varieties for propagation should be produced in massive scale. This will involve capacitating plant nurseries and helping them produce quality and disease free planting materials	BPI	2018-2022
• Regulation for nursery accreditation and plant material certification	BPI-NSCQSD	2018-2022
• Provision of production inputs and farm machineries /equipment (quality planting materials, power sprayers, flower inducers, BCA, etc.)	DA-RFO	2018-2022
• Establishment of Techno demo farms for rehabilitation, GAP and trainings	DA-RFO, ATI	2020-2022
• Pests and diseases monitoring and surveillance Systemic strengthening of the capabilities of BPI to coordinate and undertake effective pest and disease forecasting and quick response in the event of infestation	BPI-CPMD,RCPC	2018-2022
• Information Dissemination (IPM, Quality enhancement, GAP, traceability, etc) through IEC (such as SOA). Conduct training for farmers and contractors. Inform farmers as well as contractors proper tree and farm management.	ATI	2018-2022
• R and D on variety development, BCA and other organic inputs, product development The support R and D would also be operationalized by the Establishment of the Fruit and Tree Crops Development Institute. Other research and development agencies will be coopted to support the industry efforts. The initial programs may include: a) Variety Development; b) Genetic Resources Conservation; c) Production Technology Development; d) Agri Packaging Development; e) Bioprocess Engineering; and f) Processed Product Development • For recent studies funded by DA-BAR, please refer to Annex A-Table 7.	BAR	2018-2022
• Mango Rehabilitation With the established rehabilitation protocol, a loaning program of Php 600/tree can be availed which aims to increase yield of old mango trees (10 year old and up).	ACPC,DA	2018-2020

This program aims to motivate mango farmers in the key production regions to rehabilitate, restore to health and sustainable productivity of trees that have been adversely affected by induced flowering. It would involve pruning of dead, weak and internal branches, proper sealing of stumps and fertilization. The owners will supply the labor while the HVCDP will provide support for training, fertilizer and pesticides.		
• Fruit Production Insurance Program Ex. Requested reduction of the number of DAFI from 55 to 40.	PCIC	2018
• Strengthen organization Consolidate mango growers, strengthen and capacitate cooperatives	Private industry	2018-2022
2. **Increasing export with new and better products**		
• Product promotion thru conduct of trade fairs, exhibits, trade missions	AMAS	2018-2022
• Benchmarking and market reconnaissance	AMAS	2018-2022
• Provision of Postharvest/Processing Equipment and Machineries	PhilMech	2018-2022
• Community-Based Processing/Postharvest Facilities In strategic key production areas, common post-harvest facilities such as packinghouse and HWT that would minimize product damages and deterioration in the distribution system. The facilities as public good will be investment of the government but may be operated by the private sector under mutually acceptable arrangements.	PhilMech, DA	2018-2022
• Product processing and Market Support In strategic key production areas, common primary processing facilities will be established to provide industry players options for adding value to their produce before distributing to urban centers or exporting. Other intervention could be in the form of community-based processing center, agro-processing complex, marketing studies, etc. The facilities as public good will be investment of the government but may be operated by the private sector under mutually acceptable arrangements. This would be complemented by capacitating nearby State Universities and Colleges (SUCs) to serve a partners in training the technical human resources of the mango processing enterprise.	DTI,DOST, SUCs	2018-2022
• Support for GAP certification of mango farms	BPI-PPSSD	2018-2022
• Product Development	Private sector	2018-2022
3. Increase mango consumption for better health		
Promotion of mango as healthy produce in coordination with DOH	AFID	2018
Promotion of other varieties of mango as green and processed product	AFID	2018-2022

Mango Rehabilitation (2018-2022)

Rehabilitation of mango trees by pruning and fertilization has been one of the priority interventions that must be made to increase productivity and yield of mango trees. The number of mango trees as shown in Table 11 were targeted based from the total number of mango trees and gradual rehabilitation every year. For 2018, 10% of the total number of trees which is 861,165 trees should be rehabilitated, 25% for 2019 and 2020 and 20% for 2021 and 2022. For the span of 5 years a total of 8,804,928 trees should undergo rehabilitation. This process requires pruning, chipping or rotavating, composting and fertilization which costs from Php 570-820 per tree based on calculations. The Department of Agriculture approved a budget of Php 600.00 per tree as a support for the rehabilitation program which can be availed thru loan from the Agricultural Credit and Policy Council.

Table 11. Budgetary Requirement for Mango Rehabilitation (2018-2022)

Year	2018	2019	2020	2021	2022	TOTAL
No. of trees	861,165	2,172,544	2,194,268	1,772,964	1,803,987	8,804,928
Budget Required Php (600/tree)	P0.517B	P1.304 B	P 1.317 B	P 1.064 B	P 1.082	P 5.284 B

Source: Philippine Mango Industry Foundation, Inc.

Mango Learning Site (2020-2022)

Latest technologies on Mango farming will be demonstrated on the proposed Mango Learning site/school to be established in the top mango producing provinces. Pilot areas for establishment of 10 mango learning site are **Davao del Sur, Zamboanga, Cebu, Guimaras, Pangasinan, Zambales, Palawan, Nueva Ecija, Batangas** and **Isabela** which are the top producing areas and strategically positioned for easy access.

The learning sites will be placed in areas with existing mango orchard of about 1 hectare and serve as a site for demo-school on production technology and mango cultural management and practices, equipped with air conditioned/non air conditioned training facilities, dormitory, mini basic laboratory, mango nursery, mango implements, harvest implements, post-harvest (sorting/grading, packing facilities) and with trained support staff.

These sites will be handled by Agricultural Training Institute in coordination with Department of Agriculture High Value Crops Development Program Regional Offices. Forty mango learning site is proposed to be completed by the end of 2022 requiring as estimate budget of 1.060 Billion pesos.

Table 12. Budgetary Requirement for Establishment of Mango Learning Site (2018-2022)

YEAR	2019	2020	2021	2022	Total
No. of Learning Site	**(Planning)**	**10**	**20**	**20**	**50**
***Budgetary Requirement**	**-**	**265 M**	**530 M**	**530 M**	1.325 B

*As per estimates made by ATI, one learning site costs Php 26,500,000.00.

d. Required Investments and Support

The mango program is basically a private sector undertaking. The industry has a major program on rehabilitation of unproductive mango trees where the private sector would do most of the work and put up the necessary cost. What is urgently needed is support from the government in the form of inputs such as fertilizers and crop protection chemicals. With the expected increase in production, the industry also expects government support for post-harvest and processing facilities.

The other requirements such as breeding or development of improved varieties, management of insect pests especially cecid fly (kurikong) and diseases, and product utilization of seasonal surplus are long-term and systemic in nature, for which the government is expected to provide sustained funding support.

Considering the situation of the industry, the intervention on the production and processing aspects can only be identified and planned up to 2016, and this would revolve around rehabilitating unproductive trees in highly suitable regions for mango productions and providing post-harvest and processing support in existing producing areas. Interventions after 2016 would depend on the performance in the next three years. However, systemic interventions of long-term nature such as breeding work and disease and pest prevention and control, which benefit the whole HVC subsector, have to be supported up to 2028. Thus, the estimated required budget for the mango industry roadmap is PHP 25,686B, 43.3 percent of which will be coming from the private investors and 56.7 percent or PHP 14,567B from the government. The private sector investment shall be devoted for capacity expansion particularly on rehabilitation (97.1percent) and export products processing development (2.9 percent). Bulk of the government budget will be for HVC Development Programs which is about 59.7 percent of the total government programs. The estimated program cost for mango is shown as Table 11.

Table 11. Estimated Mango Program Cost, 2014-2028

Cost Item	2014-2016	2017-2022	2023-2028		Total Program Cost	
	Cost PHP M					% Share
PRIVATE SECTOR INVESTMENT	**11,120**				**11,120**	**43.3**
Capacity Expansion	10,800				10,800	
Export Products Processing Development	320				320	
GOVERNMENT PROGRAMS	**10,684**	**2,289**	**1,593**		**14,567**	**56.7**
HVC Development Programs	*8,201*	*325*	*170*		*8,697*	
Market and Product Development Support	*4,048*	*125*			*4,173*	
Marketing Studies	20				20	
Comparative Study Visit (in country and overseas)	35	70			105	
Support for Practical Fruit and Vegetable Processing	3,600				3,600	
Support for SUCs in R and D and Training	392	56			448	
Fruit Crops Program	*4,153*	*200*	*170*		*4,524*	
Production Support						
Planting Materials Development	109	170	170		450	

Cost Item	2014-2016	2017-2022	2023-2028		Total Program Cost	
			Cost PHP M			% Share
Production Support Services	3,600				3,600	
Post-harvest Facilities	144				144	
Processing Support	300	30			330	
Institutional Strengthening and Support Services Development	2,483	1,964	1,423		5,870	
Strengthening of Regulatory and Enforcement Laboratories	27	43	43		113	
Pest and Disease Forecasting and Quick Response Teams	455	493	492		1,440	
Tree Crop Development Institute	1,794	1,428	888		4,110	
Strengthening Extension Services Delivery	207				207	
Total Program Cost	**21,804**	**2,289**	**1,593**		**25,686**	**100**

Note: The provisions for institutional strengthening and support services are only estimates BAS-PSA on relative magnitude and distribution of beneficiaries in relation to other HVC commodity programs.

IV. IMPLEMENTATION AND MONITORING

The implementation of the Mango Industry Roadmap shall be guided by the National Mango Action Team Technical Working Group (NMAT-TWG).

The NMAT-TWG shall have the following primary roles and responsibilities:

- Assist the High Value Crops Development Program (HVCDP) implement the Mango Industry Roadmap.
- Validate and consolidate national, regional and provincial plans on mango.
- Monitor the developments and implementation the Mango Industry Strategic Plan.
- Update from time to time the Mango Industry Roadmap based on national and international developments.
- Liaison with the national policy makers, Bureaus, and other stakeholders of the mango industry.

The TWG Secretariat (PCAF) shall:

- Provide administrative and technical support to the NMAT-TWG.
- Arrange and coordinate regular and special meetings as scheduled by the TWGs.
- Liaising with the TWG Chair to prepare meeting agendas.
- Document the proceedings of the meeting .
- Prepare the minutes of committee meetings, including action points arising from meetings and details of actions to be undertaken by management.
- Prepare and transmit minutes/reports based upon information received from TWGs, as well as upon information derived from meetings.
- Coordinating the preparation and circulation of committee papers within agreed timeframes.
- Ensure the necessary coordination of the NMAT-TWG and RMAT-TWG.

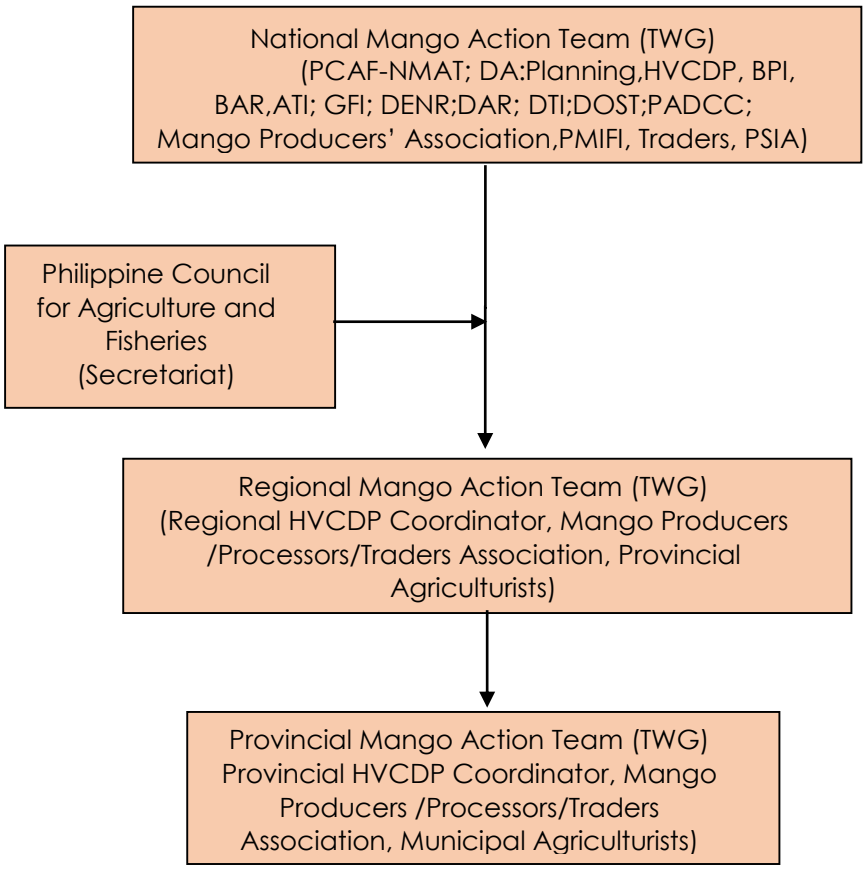
The Regional Mango Action Team TWG (RMAT-TWG) shall:

- Develop the regional mango action plans to include municipal and provincial targets and programs.
- Implement the regional plans developed from the national plan through the provincial and municipal counterparts of the Regional HVCDP.
- Conduct regional mango congresses and field days in coordination with the regional/provincial stakeholders and relevant agencies.
- Promote GAP in mango production.
- Ensure reliability of data and information access on production, prices, consumption and trade.
- Report and represent the region in the NMAT-TWG.

The Provincial Mango Actio Team TWG (PMAT-TWG) shall:

- Coordinate with RM-TWG to implement targets and programs;
- Work with Regional HVCDP to implement the regional plans developed from the national plan;
- Assist in the regional mango congresses and field days;
- Promote GAP in mango production; and
- Coordinate with the municipalities/cities and barangays .

Figure 18. Proposed Mango Roadmap Implementation Structure



To be able to fully implement the proposed mango industry roadmap, the contributions from the private sectors and the government must be put in place. It is through this collaboration that the Philippine mango industry would take off and become competitive in the world markets.

The Technical Working Group (TWG) for each level shall meet regularly as agreed upon. It shall deal mostly with programs and issues at the specific level. The TWG shall be funded by the HVCDP (re: meetings, travel expenses). The members will be pro bono (no honorarium or compensation except for the travel expenses).

Regional Mango Action Teams (RMATs) shall report important updates during the quartely meeting of National Mango Action Team. The creation or activation of RMATs and PMATs on top mango producing regions and prvinces shall be the responsibility of NMAT as the overseeing body.

PHILIPPINE MANGO INDUSTRY FOUNDATION, INC. (PMIFI)

- A national umbrella association with 61 mango growers association and cooperatives. It has more than 30 individual/corporate farms, 15 processors, 2 exporters, 8 input suppliers, 11 consolidators, 1 airline, 1 worldwide cargo forwarder/logistics provider, 6 traders/wholesalers members.

- The Philippine Mango Industry Foundation (PMIFI) was organized when the first Phil. Mango Ind. Dev. Council failed to actively address the needs of the development of the mango industry. PMIFI which initially was organized by mango growers with regional representatives, became the national umbrella organization of the mango industry including all other mango stake holders.

- This was followed by the creation of the National Mango Action Team (NMAT) a joint government agencies and private sector to address more on the RD&E of the industry.

- PMIFI Initiatives:
  1. Land Bank mango financing (LBP January, 2008 Memorandum Cicular signed by VP Teresita Cheng.
     P1,800 per tree for 10 years old & below trees;
     P2,250 per tree for more than 10 yrs-20 years old trees;
     P3,500 per tree for more than 20 years old trees.
  2. Mango Fruit Production Crop Insurance Coverage, Maximum of P5,000 per tree;
  3. Marketing Assistance & Mango Buying from/Selling to Members;
  4. Annual Mango Congresses
  5. Organizing / reorganizing or reactivating mango producers associations;
  6. Made representation with PNP, FPA, House of Representatives and Senate for the relaxed regulation or exemption of member-suppliers of calcium nitrate as flower inducers.

ANNEX A. Supplemental tables to the roadmap

ANNEX B. Summary of Issues and Concerns During the Series of Mango Stakeholders' Forum

Table 1. Mango: Summary Comparison of Traditional versus Recommended Technologies

Parameters/ Aspects	Typical/Traditional	Recommended Intervention
Planting Materials		
Sources and Quality	Seedlings or grafted purchased from any source	Certified grafted seedlings from BPI-accredited nursery
Cultural Management		
Land Preparation	Land clearing, staking and holing	Land Clearing, staking and digging of bigger holes
Planting Distance	10 m apart	12x12 m (based on GAP recommendation)
Type	Intercropping	Mono-cropping
Fertilization	No fertilization or undetermined amount of animal manure applied directly at the base of the trees.	a. Organic Fertilizer/ Processed animal manure; b. Inorganic Fertilizer: Urea, Triple 14 and Foliar fertilizer
Insect pests and disease control	Pests management relies heavily on the use of synthetic pesticides	Pests management relies heavily on the use of synthetic pesticides
Bagging of fruits	Not a common practice among mango growers	Should be done in order to reduce the frequency of pesticide sprays
Harvesting		
Fruit maturity	Mangoes should be picked only when they reached full maturity. 120 to 130 days from flower induction (during early induction months of Oct, Nov. and Dec); 105 to 115 days during late induction months of January, February and March.	
Fruit sampling and testing	No analysis for pesticides and heavy metals is made.	Mango fruits intended for exports should be tested for pesticide and heavy metal residues prior to actual picking.
Time and Method	Harvesting time is not considered critical; Picking of mangoes is done by hand and/or with the use of picking pole. With tall trees, harvesters have to climb the tree and use rope to lower down the basket filled with fruits.	Harvesting of mango should be done between 9 am and 3 pm to minimize latex staining and latex burns which are major causes of rejection. Picking of mangoes is done by hand and/or with the use of picking pole. With tall trees, harvesters have to climb the tree and use rope to lower down the basket filled with fruits.
Estimated Yield	Varies with age and health of trees; 4,213 kg/ha.*	
Post-harvest		
Sorting and Grading	Fruit sorting is usually done in the field without following the Philippine National Standards (PNS) for mango.	In the packinghouse, fruits are sorting on tables padded with foam based on marketable quality (no defects) and non-marketable (with defects) and classified according to sizes (small, medium and large) following the PNS for mango.

Parameters/ Aspects	Typical/Traditional	Recommended Intervention
Ripening	Calcium carbide is placed inside the container together with the fruits to accelerate ripening of fruits.	If accelerated ripening is desired, simply subject the fruits to hot water treatment (HWT) without hydrocooling. Place liners, such as newsprint, inside the container to help conserve some of the heat and trap ethylene which can accelerate ripening.
Hot Water Treatment	Generally not practiced by typical mango growers	To minimize problems with anthracnose and stem-end rot, mangoes should be subjected to HWT. This consists of dipping newly harvested fruits in water at 52° to 55° C for ten minutes, followed by hydro cooling with tap water, then air drying.
Packaging	Bamboo basket ("Kaing"), is commonly used	Plastic crates are used; Fiber board cartons are used for fruits intended for export.
Marketing:		
Practices	The supply chain of the mango industry has been characterized by production-marketing arrangements between growers and contract sprayers who also act as traders. These growers and traders sell to wholesale markets and exporters.	
Credit:		
Financing	Self-financed	Special lending programs from the government

Table 2. Common Pests and Diseases on Mango

Part of Mango Plant	Pests	Disease
Flowers	Mango leafhopper Mango tip/twig borer Mealy bugs Scale insect Mango thrips	Anthracnose Sooty mold
Fruits	Fruits flies Mango seed borer Mango Pulp weevil Mango thrips Mealy bugs Scale insect Capsid bug Cecid fly Ants	Anthracnose Scab Sooty mold Diplodia stem-end rot

Source: PNS BAFPS 2045-2009

Table 3. Mango: List of Member Cooperatives, 2014

ACTIVE	UPCOMING
LUZON	
▪ Aani Mango IndustryAssociation, Inc. ▪ Federation of Mango Growers and Handlers Association of Pangasinan, Inc. ▪ Masbate Provincial Mango Growers Association ▪ Samahan ng Magmamanga ng Zambales, Inc. ▪ Mango Growers Association of Region 1/ Ilocos Norte Mango Growers, Inc. ▪ Ilocos Sur Mango Growers Association ▪ Pangasinan Tropical Fruit Cooperative ▪ La Union Mango Growers Association	
VISAYAS	
▪ Visayas Chamber of Mango Industry MPC (to be renamed Cebu Mango Growers and Stakeholders MPC - papers in process) ▪ Iloilo Mango Growers MPC ▪ Bohol Mango MPC	▪ Isabel/Leyte Mango Growers Association ▪ Negros Or. Mango Growers Association ▪ Siquijor Mango Growers Association ▪ Guimaras Mango Growers Association ▪ Negros Occ. Mango Growers Association
MINDANAO	
▪ Southern Mindanao Mango Industry ▪ Development Council, Inc. ▪ Northern Mindanao Mango Industry ▪ Development Council/ Cagayan de Oro ▪ Malaybalay-Bukidnon Mango Growers Association ▪ Gen. Santos Fruit Growers Association ▪ Zamboanga City Mango Growers Coop. ▪ Caraga Federation of Mango Producers, Inc. ▪ Mango Growers Association of Iligan City ▪ Federation of Mango Growers of Davod del Sur Cooperative ▪ Saranggani Federation of Fruit Assns, Inc. ▪ Zambo Sur-Pagadian City Mango Growers Association ▪ Talayan Agro Industrial Marketing Association	▪ Midsayap Mango Growers Association

Source: Phil. Mango Industry Foundation Inc. (PMIFI), 2014

Table 4. Mango: List of Processors per Region

Company	Products
National Capital Region (NCR)	
FruitGems Agricultural Corporation	Dried Mango
Tem Ngun Food Corporation	Dried Mango
Kian Sun International, Corporation	Dried Mangoes In Cubes, Strips and Chips
Agrinurture, Inc. (Formerly Mabuhay 2000 Enterprises, Inc.)	Fresh Mango, Dried Mango, Mango Jams
Cebu Legacy Marketing Corporation	Fresh Mango, Dried Mango, Frozen Mango Puree, Mango Nectar, Mango Puree
A and P Foods Corporation	Mango Fruit Bar, Mango Puree
Harman Foods, Inc.	Mango Juices
Ramed Food Manufacturing, Inc.	Mango Puree
Soyuz Foods International Inc.	Mango Puree
Xtc, Incorporated	Mango Puree
Hi-Las Marketing Corp.	Mango Puree, Fresh Mango, Frozen Mango, Frozen Mango Dice, Frozen Mango Halves
Region 3, Central Luzon	

Bulacan-Batangas Food Specialties	Mango Juices
Agri-Fruit Freezing Corp.	Mango Puree
Drupe Int'l. Inc.	Mango Puree
Region 4-A, CALABARZON	
Amira International Trading	Mango Puree
Klt Fruits Inc. Mango Puree	Mango Puree
Don Roberto's Winery Corporation	Yellow and Green Mango Wine
Region 6, Western Visayas	
Guimaras Fruits Processing Plant (GFPP)	Dried Mango
Mc Nester Food Products	Mango Atchara, Mango Drink Concentrates, Mango Jams, Mango Ketchup
Region 7, Central Visayas	
Divent Corporation	Canned Mango Halves, Frozen Mango
Jojo's Food Products	Dried Mango
Profoods International Corporation	Dried Mango, Mango Drink Concentrates, Mango Puree In Hot pack
R and M Preserves	Dried Mango, Mango Chips, Mango Drink Concentrates, Mango Nectar, Mango Puree
7d Food International, Inc. (Cebu)	Dried Mango, Mango Nectar, Mango Puree, Margorine
Cebu Legacy Marketing Corp. (Cebu)	Fresh Mango, Dried Mango
Region 9, Zamboanga Peninsula	
Polyfruits, Inc.	Dried Mango, Pickled Green Mango, Sweetened Mango Concentrate
Region 10, Northern Mindanao	
Motherland Food Products	Frozen Mango Dice, Frozen Mango Puree
Autonomous Region in Muslim Mindanao (ARMM)	
Kiwalan's Food Products	Mango Puree

Source: Philippine Exporters Association (PHILEXPORT) Website

Table 5. Mango: Cost and Return of Production and Marketing Participants in Central Luzon and Mindanao, 2012

Actor/Item	Self-spraying		Contract Spraying	
	Value/kg (PHP)	%	Value/kg (PHP)	%
Central Luzon			80:20 sharing	
Farmer				
Selling Price	19.05	100	3.81	100
Total Cost	14.25	74.8%	2.25	60
Profit	4.80	25.2%	1.56	40
Return to Cost		33.7%		69
Assembler-wholesaler			Sprayer and Sprayer Trader	
Selling Price	28.57	100.0%	28.57	100.0
Procurement Cost	19.05	66.7%	12.00	42
Marketing Cost	7.86	27.5%	7.86	27.5
Profit	1.66	5.8%	8.71	30.5
Return to Cost		6.2%		42%
Exporter				
Buying Price	28.57		28.57	
Mindanao			70:30 sharing	
Farmer				
Selling Price	23.00	100	6.90	100
Total Cost	10.25	65%	2.25	33

Actor/Item	Self-spraying		Contract Spraying	
	Value/kg (PHP)	%	Value/kg (PHP)	%
Profit	12.75	35%	4.65	67
Return to Cost		124%		205%
Assembler-wholesaler			Sprayer and Sprayer Trader	
Selling Price	35.00	100.0%	35.00	100.0
Procurement Cost	23.00	66.7%	8.00	23
Marketing Cost	9.86	27.5%	9.86	28
Profit	2.12	5.8%	17.14	49
Return to Cost		6.2%		96%
Exporter				
Buying Price	35.00		35.00	

Source: For Central Luzon, Calculated together with Pangasinan Contract-Sprayers operating in Tarlac; For Mindanao from Key Informants in Mindanao

Table 6. Supply Chain Key Players

Key Players	Description
Input Suppliers	
• Planting materials	These include accredited nurseries which supply certified grafted seedlings of NSIC-registered varieties
• Agri-inputs	These include manufacturers and/or traders of tools, equipment, fertilizers, paper bags, pesticides and others
• Post-harvest supply	This includes manufacturers and traders of plastic crates, bamboo baskets, and etc.
Producers	
• Growers	These are the farmers or orchard owners who plant and take care of the mango trees
• Spray Contractor	These are people who enter into a contract agreement with the mango growers based on agreed sharing scheme. Contract sprayers may themselves "buy" the share of orchard owners.
• Spotters	Usually under the employ of spray contractors, the spotters are responsible for identifying potential mango farms for spray contracting. They look for bearing-age trees that are ready for flower induction and fruiting.
Consolidator/ Wholesalers/Traders	These are multi-commodity traders who source mango fruits from several farms, spray contractors and fellow traders and sell the fruits to big bulk buyers like processors and exporters. They may also be engaged in trading of other commodities like vegetables and other fruits.
Processors	These are food manufacturers which process the mango fruits into purees, dried mangoes, candies, preserves and other products both for local and the export markets.
Exporters	These are traders or companies who buy exportable-quality fresh mangoes that meet the requirements and comply with the quality standards of importing markets in Japan, Hong Kong, USA and other countries.
Retailers	These include supermarket, fruit vendors, public markets, and chained retailers.

Table 7. Bureau of Agricultural Research funded projects for mango

Problems	Project Title Conducted	Technology
Limited supply of quality planting materials	Enhancing Productivity of Mango Thru Integrated Crop Management (ICM), Integrated Pest Management (IPM), Post Harvest Quality Management (PQM), and Double Rootstock Propagation (*on-going)*	Production of quality planting materials of exotic superior varieties of mango from Thailand thru mass production of the Choanantand Nandokmai mango varieties; also a two (2) hectare existing scion grove were enriched and serve as a continuous source of scion materials needed in producing propagated seedlings of superior varieties
High incidence of pests and diseases	Development of Pest Control Strategy Against Cecid Fly in Mango (*completed*)	Generated bio-ecological information and control strategy against cecid fly
	Development of Non-Chemical Based Management Strategies Against Insect Pests of Mango with emphasis on Mango Twig Borer (*Niphonoclea spp.*) (*completed*)	Developed non-chemical based pest management strategies effective against insect pests of mango with emphasis on mango twig borer
	Biological Control of Fruit Flies Using *Beauveria bassiana* through Autodissemination (*completed*)	1.) Identification of the effective trap design for autodissemination 2.) Determination of the pathogen dispersal in the field 3.) Determination of the effectiveness of the fungus, *Beauveria bassiana* using field trap in reducing fruit fly population and incidence of fruit infestation 4.) Development of POT and IEC materials on bilogical control of fruit flies using *Beauveria bassiana* through auto-dissemination developed
	Field Studies on Using the Yellow Netted Lady Beetle, *Heteroneda billardieri* (Crotch) as Biological Control Agent of the Mango Leafhopper, *Idioscopus clypealis* (Lethierry) (Hemiptera: Cicadellidae) (*completed*)	1.) Biocon-based IPM for Mango 2.) Guide for the use of Yellow Netted Lady Beetle 3.) Economic analysis of mass production system for Netted Lady Beetle
	Development of Alternative Strategies in Controlling Mango Pulp Weevil, *Sternochetus frigidus Fabr*. (Coleoptera: Curculionidae) to Enhance Establishment of "Pest Free Zones" (*completed*)	1.) Updated chemical control recommendation for mango pulp weevil (MPW) and other pests 2.) Methodology to produce sterile insects 3.) Postharvest treatment protocol for MPW 4.) Improved criteria to evaluate the x-rays as screening device for quarantine purpose
	Development of Organic Mango-based Farming System in Ramon Magsaysay Technological University (*on-going*)	1. Alternative organic flower inducers developed 2. Biopesticides formulated 3. Organic foliar fertilizers formulated 4. Vermi-compost and tea produced

Problems	Project Title Conducted	Technology
High incidence of pests and diseases	Development of Chemical and Cultural Control of Cecid Fly in Mango (Dipteria: Cecidomyiidae) (*on-going*)	1. Insecticide Resistance Management 2. Mulching - application of appropriate mulching material to reduce survival of pupa and/or prevent pupation of cecid fly 3. Cecid Fly Traps - to determine start of infestation and success of control
	Development of Pest Management Strategies for Mango Cecid Fly (*Procontorina frugivora Gagne*) in Region 1 (*on-going*)	Pest control strategies technology against mango cecid fly in Region 1
	Enhancing Productivity of Mango Thru Integrated Crop Management (ICM), Integrated Pest Management (IPM), Post Harvest Quality Management (PQM), and Double Rootsock Propagation (*on-going*)	Integrated Pest Management for Carabao Mango and Package of technologies (POT) for mango production
Low Productivity	Technology Utilization and Rehabilitation of Mango Production in Quezon Province (*completed*)	Promoted the utilization and improved the recommended package of technologies for rehabilitation and increased mango production in Quezon Province
High Post-Harvest Losses	Yeast as biocontrol agent of postharvest disease of high value vegetables (eggplant and pepper) and fruit (mango and banana) crops (*on-going*)	1. Culture collection of yeasts and pathogens associated with economically important postharvest diseases of high-value vegetables and fruit crops. 2. Screened antagonistic yeast isolates from diseased fruits and existing BIOTECH isolates on in-vitro and in-vivo conditions. 3. Established the mode of action of the yeast as biocontrol agent. 4. Screened and characterized putative isolates as biocon of postharvest disease of high-value vegetables and fruit crops. 5. Tested yeast biocon agent under pilot scale. 6. Reduction of chemical pesticides and fungicides use in postharvest diseases of high-value vegetables and fruit crops
Limited value added products	Utilization of Optimized Osmotically Dehydrated Mango (*Mangifera indica*) to Different Food Processing Technologies (*on-going*)	1. Optimum operating conditions for osmotic dehydration of different varieties of mango as pre-treatment for further processing 2. Optimum operating conditions for vacuum frying, air drying and sterilization by water retort of optimized osmotically dehydrated mango slices 3. Quality manual for technology transfer

Problems	Project title conducted	Technology
Limited value added	Development and Commercialization of Processed Mango Products in the Province of Quezon	Mango processing of developed new mango products and by-products
	Development of Mangifera Liqueur Towards Commercialization	Mango-Infused Cordial processing, Shelf-life and storage conditions; Nutrient content and Physio-chemical
Lack of processing and handling tools, facilities, equipment and infrastructure	Development of Commercial-Scale Belt-Type Dryer with Combination Far-Infrared and Convection Heating for Rapid Drying of Mango Slices (*on-going*)	Far-infrared and convection heating (FIRCH) for rapid drying of mango slices
Low compliance to food safety and quality standards	Development of Immunoassay Methods for Analysis of Pesticide Residues from Mango (Chlorpyrifos and Cypermethrin) and Okra (Fluazifop and Methamidophos) (*completed*)	1.) Antibodies (polyclonal/monoclonal) highly specific and sensitive to the selected residues. 2.) Test protocols that are suited to users and their resources
	Method Development and Analysis of Some Residues of Priority Pesticides on Mango, Rice and Other Fruits and Vegetables in Support for the Establishment of Maximum Residue Limits(MRLs) Required in International Trade	1. Improved test kits for pesticide residue detection 2. Well developed and validated methods for pesticide residue analysis(both rapid tests and sophisticated method) used in various agricultural commodities 3. Database of pesticide residues of rice, mango and other fruits and vegetables in the Philippines
Limited by-product utilization	Production of Polyphenols and Specialty Flours from Wastes of the Mango (Peel and Seed Kernel) Processing Industry (*on-going*)	1.Technology for production of phenolics from mango peel and kernel 2. Technology for production of flour from mango peel and kernel 3.Fully characterized products 4. Economic feasibility for each product

Table 8. Benchmarking: Cultural Management Practices in other countries.

ITEM	PHILIPPINES	THAILAND	INDIA	VIETNAM	MEXICO
Planting Density	Planting density –100 trees per hectare; PhilGAP- 51 trees to 70 trees per hectare	Upland spacing -4 m by 6 m (416 trees per hectare); Lowland spacing-6 to 8 meters wide and water ditches 1.0-1.5 m	Planting density – 100 trees per hectare	high-density planting-5 meters by 8 meters (250 trees per hectare)	Planting density –100 trees per hectare; experimental planting density-higher densities of 1,000 to 2,200 trees per hectare
Harvest Season	Luzon-February to April; Visayas and Mindanao- May to September; off-season-November-January and June.	Normal season- May to July; little production-April; late harvest- August. But Thailand is also capable of producing mangoes during the off-season from September to March.	Whole country-January to August; the State of Andhra Pradesh- April to July	Hoa Loc mangoes-harvest once a year; Production-starts November, peak months- March and April. off-season- June to October (there still production during off-season)	Normal period of availability-February to September (September-peak period) ; There is year-round availability of mangoes depending on the variety and the location.
Soil testing and analysis	Uncertain done at all or frequently done	frequently done	uncertain done at all or frequently done	frequently done	frequently done
Fertilization	Typical commercial fertilizers: urea and complete fertilizers; Organic and manure fertilizers/manual fertilization through basal and foliar application	manual fertilization through basal and foliar application	Not widespread in the mango farms of India but practiced as demonstration in the Fruit Research Station (FRS) in the State of Andhra Pradesh.	manual fertilization through basal and foliar application	fertilizer application through irrigation (fertigation)
Irrigation	Irrigation(manual watering)	Novel irrigation systems, using water from the river systems, by building ditches and canals proximate to the mango orchards, this cuts cost on labor associated with manual irrigation.	Irrigation (manual watering); though the country offers subsidy for the installation of drip or sprinkler irrigation, encouraging growers by offering Rs 50,000 (PhP 36,030.00) systems with 10% equity.	novel irrigation systems, using water from the river systems, by building ditches and canals proximate to the mango orchards, this cuts cost on labor associated with manual irrigation.	Drip irrigation system

ITEM	PHILIPPINES	THAILAND	INDIA	VIETNAM	MEXICO
Pruning	Pruning is too late to apply since the country has existing orchards with fruit-bearing trees. Pruning is done mainly for canopy management, allowing sunlight to cover as much area as possible and to get rid of diseased and dead branches.	Pruning and fruit thinning. All the farms visited in Thailand deliberately implement scheduled pruning of trees to limit branches and height of trees. Grafting is likewise universally practiced by the farmers. With proper pruning, the number of fruits per tree is limited but of better size and weight giving better marketability especially for exports.	Pruning is too late to apply since the country has existing orchards with fruit-bearing trees. Pruning is done mainly for canopy management, allowing sunlight to cover as much area as possible and to get rid of diseased and dead branches.	Pruning may also be practiced as well, because the country has stock replacement plans and high-density planting too.	Systematic or geometric progression (1 main branching into 4 branches) pruning, even during the early stages (young trees) of orchard establishment, to manage tree height, branching and canopy spread so that in later years, less pruning will be done. This means that the growers manage plant growth in a similar way that growers manage "bonsai" plants. Apart from the suitability of cultivars, this is one of the most important factors in high-density planting.; mechanical pruning is used in some orchards or plantations.
Pest and Diseases Control Management	Intensive use of agro-chemicals especially during flowering, fruit set, and fruit growth. This explains the dominant role of sprayer-contractors during harvesting especially engaged by most backyard and small holders, who cannot afford the cost of agro-chemicals or who find the cost prohibitive. Commercial growers can well afford to have their own spraying operations. Oftentimes, they double up as sprayer-contractors.	In an effort to make mangoes more acceptable to its export markets which is increasing because of FTAs, Thailand regulates the use of agro-chemicals. Agro-chemical application is undertaken by the growers themselves and not outsourced to sprayer contractors. This may be explained by their access to cheaper agro-chemicals. Other practices include eradication of fruit fly, the use of integrated controlling technique based on ecological data of the fruit fly, coupling with the use of poison bait and repellant.	India has intensive use of agro-chemicals. The FRS in the State of Andhra Pradesh (SAP) reported no occurrence of cecid fly (it would seem the fly can only be found in the Philippines). However, the FRS is conducting research on Integrated Pest Management (IPM) and Integrated Nutrient Management (INM) to reduce agro-chemical application.	The VietGAP requires regulated use of agro-chemicals to meet the chemical residue level standards of importing countries. Cecid fly has not been reported to thrive in Vietnam especially in the Hoa Loc mango areas.	The country has the strictest policy on fruit flies *(Anastrephaludens).* It imposes a "zero fruit fly policy" prohibiting mango inter-state trade if fruit fly appearance is suspect. It also requires the establishment of "buffer zones" near mango plantations and orchards to fence off fruit fly incidence.

ITEM	PHILIPPINES	THAILAND	INDIA	VIETNAM	MEXICO
Flower Inducement	Majority of mango growers and contract sprayers use potassium nitrate, no matter if it costs higher. However, there is a slow shift to calcium nitrate because of its availability and cheaper price. Off-season production is not as prevalent as it is in Vietnam and Thailand as previously mentioned, so the use of flower inducer may be in the regular season to increase the number of flowers per panicle and the probability of generating more yield per tree.	The tandem use of paclobutrazol and flower inducer (unknown whether potassium or calcium nitrate) enables the country to produce off-season fruits. This mastery, coupled with favorable climate and regularity of seasons in some provinces, means that it can respond to market demands.	Most of the mango growers, backyard and small holders, follow the phenology and normal flowering. They do not induce flowers, at least according to the materials on cultural management practices; the use of paclobutrazol for off-season production is even more discouraged.	Potassium nitrate is used as flower inducer. Like Thailand, Vietnam can also produce off-season fruits using paclobutrazol in tandem with potassium nitrate.	Calcium nitrate is used instead of potassium nitrate primarily because of the price difference. Calcium nitrate is much cheaper. Off-season production is also possible in Mexico.
Fruit (Pea Stage Selection) and Bagging	Fruit drops are not controlled and the natural course is followed. The remaining pea-sized fruits in a panicle (the number does not matter; the more fruits, the better; yield per tree is important) are then bagged using old telephone directories to control fruit flies.	Few (2-3 fruits) selected pea-sized fruits or buds are selected per panicle or bunch to get quality fruits which are then bagged using specially-designed or custom-made pouches. The custom-made paper (even if imported from Taiwan) for bagging is used to prevent fruit flies and achieve the required skin color consistency. There are two types of bags available. One is called "carbon" bag and the other is "white" bag. The "carbon" bag does not allow the light to penetrate to the fruit. This provides suitable environment for perfect skin color appearance of the ripe fruit. The cost of the specially-designed wrapper from Taiwan is about PHP 3.00.	Mango growers follow the natural course. Bagging is not practiced (at least in Andhra Pradesh) because it is laborious and most of the produce goes into local consumption, not exports.	The Hoa Loc practice is similar to Thailand's but the growers are content with caring for even one fruit per panicle to ensure quality. This fruit bud is then bagged with specially-designed pouch which insects and even rain cannot penetrate. Again, the area productivity concept is given more important.	There is no deliberate fruit selection. The natural course of fruiting and fruit drops is allowed to take its course. No bagging is necessary and "zero fruit fly policy" is in effect.

ITEM	PHILIPPINES	THAILAND	INDIA	VIETNAM	MEXICO
Harvesting	Use ladders and harvesting poles. Extra workers are hired during the harvest operation to help in the picking, sorting, packing and loading of fruits. Sorting is already done at the farm right after harvest based on size and quality. Both commercial farms in Luzon place their harvested fruits in plastic trays to avoid damage during transport to the buyer's facility. Commercial farm operators have their own trucks for delivery of their harvest to the buyer's facility and bear all the cost of freight.	Thai mango farmers are aware of the importance of harvesting procedures in producing and maintaining high quality fruits. Inherent in their farm planning is the inclusion of harvesting schedule even at the time of planting. They predict beforehand the best time that they will harvest their produce to maximize freshness and longer shelf life. The farmers also synchronize their harvesting activities with the schedule and requirements of their buyers. In the case of the two farmer-interviewees, they keep in constant contact with their buyers and determine ahead of time who among their buyers they will deal with even before they actually harvest the produce. Though price is an important consideration, other terms are also taken into consideration.	Harvesting time varies with the distance to the market and local consumption. Nevertheless, the factors such as market price, market glut, etc., should also be considered while harvesting mangoes.7 Postharvest losses in mangoes, which impact on productivity, have been estimated in the range of 25-40% from harvesting to consumption stage. Fruits such as mangoes, banana, papaya citrus and pineapples in the Philippines are estimated to incur post-harvest losses from 15% to 35%.8 .; There is widespread use of chemical such as calcium carbide in ripening because of the unavailability of fruit ripening chambers especially in the semi or peri-urban areas. The SAP is encouraging the setting up of more chambers to discourage the use of ripening chemicals.9.	Manual harvesting through the use of bamboo pole with a net basket at the end and ensuring that no scarring occurs. Maturity is determined by visual means and observance of calendar for harvest. Growers do not practice water flotation to determine maturity. Produce for sale are assembled, sorted and graded at the packing house. Washing is done through the use of purified water and drained in tables with specially made holes for mangoes. No vapor heat treatment or hot water treatment is being done because of the thin skin.; Produce intended for Ha Noi are harvested three days earlier than those intended for Ho Chi Minh or other local markets. Hoa Loc mangoes have typically seven days shelf-life. No ethylene is used for ripening as this is not allowed under VietGAP. The natural course of ripening is preferred. The cold storage is used for a short time while waiting for buyers usually contacted in advance. As much as possible, the use of cold storage is avoided because of its high operating cost.	Mango growers consider harvesting as one of the most important decisions a grower faces in order to provide superior-quality fruits. Due to the seasonal nature of harvest, Mexico requires special focus on yearly retraining of harvest crews. Training includes harvest maturity indicators, latex removal procedures, good sanitation practices, and workers' safety. Mango growers in Mexico follow the most popular and effective harvest practices as contained in the "Mango Postharvest Best Management Practices Manual" based on the collective experience of the mango industry.

Source: International Benchmarking Study on Selected Agricultural Commodities. DAP, May 2015

Table 1.		LUZON MANGO STAKEHOLDERS FORUM (AUGUST 11,2017)	
NAME	**AGENCY**	**ISSUES & CONCERNS**	**ACTIONS TAKEN**
1. Mr. Charlie Meridores 2. Mr. Rolando Tolentino	• Pres., AP+LB Agrotech Development, Inc. • Pres., Federation of Mango Growers Association	• Confirmed Sec.'s immediate action and seriousness in helping the mango industry. • Status of mango industry in this administration. Last administration, DA remove mango in the priority product. Bring back mango as a priority industry. For 5 years it was neglected. Beneficiary of ACEF, during Aquino administration, fund was not released.	• Sec. Piñol thanked Mr. Meridores. • Sec. Piñol responded that the reason why we are here is for you to tell us what you need in order to help the mango industry be back on its feet. After that, we will craft the 5-year roadmap for mango development. Next week, we will finish the IRR for the new ACEF, you can start applying for a loan • Sec. Piñol said Mr. Yonder of the national mango development and research center of Guimaras will talk later. Guimaras mangoes are outstanding and they have coding. P 30/seedling of Guimaras mango. • The reason we invited speakers is because we cannot just rely on insurance. We have to address Cecid fly infestation. • DA is doing nationwide revalidation list of farms. • Problem is not price of mango but the supply of mango. • You have to organize yourselves so that in your level, you can process your mangoes. We cannot just rely on the buyers of mango. • In the Davao forum, it was agreed that in every province, we will establish pilot farm that will become a learning center of all mango growers in that province. In Abra, if you have mango farm there - 1 hectare, DA
3. Ms. Clara Lapus	• Mama Sita's Foundation	• BPI – rootstocks of mango to be grafted with scions of delicious mango, take a picture in order to know where the mango came from.	
4. Mr. Bienvenido Cruz	• Bulacan	• Cecid fly is destroying mangoes. Why don't we include mango in the insurance so that mangoes destroyed by Cecid fly, the farmers can recoup their capital. • Some farmers do not harvest their mango because of low prices. • Lack of knowledge on how to take care of mangoes/training	

5. Mr. Chu	• Representative, mango growers of Abra	• FMR	will finance. It will serve as a model farm that mango growers can go to. • We have program – regular FMR 6B for 2018. PRDP – needs 10% equity from LGU. We will validate your road. Coordinate with Dir. Caranguian and PRDP. Identify the road and we will have geotagging. Satellite mapping. • Since we are setting up pilot farms and model farms across the country, you might as well work with us. • In the Davao forum, it was agreed for DA to have a loaning program through ACPC. For farmers who want to rehabilitate their farms. P600/tree. • Identify an area which we could convert into a brand new farm in your province which will be financed by DA. If the farmer is willing to turn his farm into a school, we will convert it. We will put structures, water and audio visual facilities and we will conduct demo there. • 9M trees x P600 = 5.4B P600/tree – rehab Concerted effort to address Cecid fly problem. Everybody should adhere to the protocol. Make a decision and do costing. All of you to agree that once and for all, we will address Cecid fly. Assigned a TWG that will make a recommendation. I will find other sources of funding.
6. Mr. Jun Catan	• MAPECON	• Mapecon insect growth regulator and activated carbon.	
7. Mr. Randy	• Region 4A, San Pascual Batangas	• Fund • 10 years ago mango production in San Pascual was good but now not so good (at a loss). • Technical knowhow for rehabilitation of mango.	
8. Virgie dela Fuente	• Pres., PMIFI	• Emphasized the seriousness of the problem of Cecid fly infestation esp. in Pangasinan. Menace to the mango industry. Bigger fund for study – Dr. Medina to submit proposal. Luzon, 200T hectares affected.	

Table 2.	EASTERN AND CENTRAL VISAYAS MANGO STAKEHOLDERS FORUM (AUGUST 18,2018)		
NAME	**AGENCY**	**ISSUES & CONCERNS**	**ACTIONS TAKEN**
9. Atty. Martin Nunez, Jr. 0917-897-4758	• Bohol Mango Industry Org. Inc.	• What is the research division in the department doing to eradicate *piti-piti* and *cecid fly*.	• Sec. Piñol responded that the resource speakers will address the issue. • He also mentioned that this should be added to the 5 year road map for all the concerns and issues.
10. Mr. Emil Rosal (032) 344-1085	• Farmer from Mandaue	• Is there something we could do for lots that do not allow road right of way especially for lots that are untitled?	• Sec. Piñol responded that there are no prohibitions of passing through untitled lots. • He further responded that he can get clarification from the LGU in charge. • He further added that there are two programs provided by the department: 1.Regular farm to market roads program and 2.PRDP program for farm to market roads where the municipality will shoulder the 10% equity for the construction of these roads
11. Cecilio Tulabing, Jr. 0975-890-5394	• Vice Pres. ORGANIC MANGO GROWERS ASSOCIATION, NEGROS ORIENTAL	• Can we be given an allocation of your budget so that the farmers can try the product for flower induction/ promotion that our association is producing?	• Sec. Piñol replied that his request is possible, but the product (formula) should be presented with the Fertilizer License Authority for validation. • He was directed to talk with Usec. Laviña and Dir. Culaste.

12. Manuel Monzon 0917-628-8388	• NURSERY COOPERATIVE CEBU ***CENVIPNUMCO***	• Who determines and control the pricing of mango fruits?	• Sec. Piñol responded until such time the farmers are dependent on the middle men and traders then they will never be able to set the price. • He further added that in order to be independent on the pricing we need to implement technology, financing and marketing. Marketing will be empowering the farmers to market their products. • He also said this issue is needed to be considered in crafting the 5 year plan.
13. Hardy Leopando 0917-551-2755	• Bohol	• Do we have programs that handles monitoring on the diseases and infestation of the produce (livestock and crops)?	• Sec. Piñol replied that the solution would be establishing Regional Laboratories like the one in Tuguegarao and one being built in Davao for animal diseases, livestock, fruits and vegetables diseases as well as soil and water analysis.

Table 3. WESTERN VISAYAS MANGO STAKEHOLDERS FORUM (AUGUST 23,2017)			
NAME	**AGENCY**	**ISSUES & CONCERNS**	**ACTIONS TAKEN**
14. Rosario Grieser 0917-326-1142	• Chairperson, Guimaras Mango Growers	• If DA extends loan to rice farmers with 6% interest/ annum, can we mango growers also avail of it? Our coop cannot loan from Landbank because we do not have 3 years track record for us to avail of loan. During peak season, our mangoes are bought for only P 30/kilo. What subsidy can DA extend to us?	• Sec. Piñol responded to put that in the roadmap. He will look at the roadmap that you have crafted. If mango growers say this is what we need in order to be able to improve our mango farms, then we will program that. • Sec. Piñol said that DA cannot subsidize. Subsidies are actually unsustainable. Let's come up with a program that is sustainable, a program that will liberate us from political interest. After the forum, from every region, we will get a representative for TWG to pore over your every input and we will come up with a national roadmap for mango development that will reflect the dreams, aspirations and the needs of the Filipino mango growers.
15. Mr. Julius Alejo 0910-480-5200	• Cooperatiba Sang Alimodian (AKBC) - Iloilo	• do not know assistance from DA. If we do not ask, we will not know. Can coops be given communication for us to avail of assistance from DA? We have 6 ha. farm with mangoes, bananas, coffee, and vegetables. With the assistance of DA, we want to make our farm a pilot project with assistance of DA so neighboring farmers will see what is intercropping, what crops they should plant, etc. RA 9520 – Cooperative Code of 2008 Coops will be given priority projects of government especially from the DA.	• Sec. Piñol replied that in every province there should be a model farm so farmers will have a lot to learn from. Coordinate with Usec. Laviña. Let's make use of modern information technology. We will make a website where you can see our notices, etc. Linking all coops.
16. Dr. Ernesto Hofileña 0917-300-0866	• Mango farmer	• Help us with the middlemen in the sugar industry.	• Sec. Piñol replied that we will have to reform the sugar industry.

17. Lorelei G. Repalabia 0912-425-8909	• Technician, Nova Valencia Igang Irrigators Association of Guimaras	• Dam was destroyed, they have nothing to get from for repair. They emailed Sir Bong.	• Sec. Piñol told his staff to call her father, who is the Deputy Administrator of NIA in charge of operations. Sec. Piñol said that we will check on it.
18. Mr. Rogelio Artajo 0917-300-7750	• Pres., Guimaras State College (GSC)	• Tried color coded map for 2 barangays: Concordia and Oracon but no result. • GSC has a college of agriculture. Interested and committed to be part of your program for sustainable agricultural development in the country.	• Sec. Piñol told them to make a proposal for fund support for organic farming. • Sec. Piñol said that if farmers will ask, no problem. But wants to make sure that it is the farmers who need it and not to be used for business. For validation.
19. Mr. Premio Cabalonso	• Pres., Buenavista Mango Grower		
20. Johnel Dinero 0908-742-8962	• VP, Capiz Swisa Federation Chairman, Brgy. Sublangon Kabalaka F.A. Inc.	• Has inactive members Needs: - power sprayer - hose • Drilling machine requested from Capiz (follow-up)	• Sec. Piñol said that RD Recoter has already conducted bidding for drilling machine but there was failure of bidding.

Table 4. ZAMBOANGA PENINSULA MANGO STAKEHOLDERS' FORUM (*SEPTEMBER 11, 2017)*			
NAME	**AGENCY**	**ISSUES & CONCERNS**	**ACTIONS TAKEN**
21. Diosdado N. Palacat 0920-924-7754	Office of the City Agriculture, Zamboanga City	• The 20 MT harvest on 70 trees, is that the highest harvest or there is lower than that? Every harvest is that 20 tons?	• Dr. Evelyn Saldivar said May 2017's harvest was 21T while previous year's harvest was 10T in same area. It shoots up after application of protocol. In another area, previous harvest was 7T but after application of protocol, harvest was 65T. Invited 20 persons to see new areas with high harvest this Sept. because of the rehabilitation that they did.
		• How about the price of mango, what can we expect and where can we sell our fresh mango product?	• Ms. Virginia de la Fuente responded that processed grade is PhP 55. Price for mango export ranges from PhP 90 per kilo for small size and PhP 95 for medium size and up.
		• Can you conduct a Field Demo so we can promote in Zamboanga City?	• Mr. Bialen answered that tomorrow's field tour will be a practical application of the said technology for forty (40) trees at Alano's Farm at Katipunan, Zamboanga del Norte.
22. Ludwig Adaza Jose Dalman, ZDN 0920-225-0857	President, Mango Growers' Assn.	• Willing to offer his farm as demonstration area. • No age limit regarding killing of the farm working animals.	• We have intervention in every province - 1 hectare. We need training for spraying • Usec. Laviña responded to submit his name (must be association) and his area will be validated; will check with Bureau of Animal Industry regarding the practice of killing young working animals
23. Ched R. Caperida 0977-121-8796	Jose Rizal Memorial State University (JRMSU-K)	• Our school is a recipient of Genebank Project funded by CHED last CY 2014 at Sanao, Katipunan, Zamboanga del Norte. Superior tropical fruits in ASIA were selected and introduced in the area that includes different varieties of mango.	• Open to public for field visit and as a training ground.

24. Bebot Belandres 0935-752-4750	Zamboanga del Norte Mango Growers Assn. of Sindangan	• Latest update of 60-man delegation to tour for four (4) countries in Europe as discussed last year during the National Mango Congress held in Laoag, Ilocos Norte. Did the trip push through?	• Ms. Virginia De La Fuente answered that the trip to Europe did push through, but she suggested to invite also some members of ZAMPEN mango stakeholders to join their next trip to meet foreign investors for mango in helping the development and crafting of the 5-year Roadmap for Philippine mango project of Secretary Emmanuel Piñol.
25. Rolando Cimafranca	Pagadian City	• Schedule for the data inventory of mango trees and inventory of potential areas for mango production, farm size per family and productivity	• DTI Region IX answered that data can be provided by Sir Rey Quisumbing but since they are waiting for the schedule of the meeting that will be headed by the private sector, MAFC in collaboration with the DA, these data are not yet given.
26. Bonifacio Laborada	Zamboanga City	• Still waiting for the schedule of the meeting.	• Mr. Rey Campomanes procured already for recipient for validation and further inspection.
27. Ludwig Adaza	President, Mango Growers' Assn.	• Intervention of Dept. of Agri regarding power sprayers for the mango growers? When will they receive it?	• Still validating for the final listing of recipients.
28. Virginia dela Fuente	President, PMIFI	• Clarification on insurance of mango. Problem is insurance should be from the time of inducing to the time of wrapping the fruit because it might be attacked by buti-buti. • Will give Mr. Hamoy credit bulletin dated Jan. 7, 2008 in lieu of project proposal wherein the marketing agreement and the ages of the trees have a corresponding loan value.	• Indemnity limit for total loss – 1-14 days from flower induction – 42% will be received. Mango tree insurance was used and not fruit insurance. • Ms. Dela Fuente said that as to when to start the insurance, for PCIC they have no basis although they have costing. Plan to have a meeting to talk about it on Nat'l Mango Congress on November. • Mr. Hamoy said that the head office has no commodity module about mango.

Table 5. MINDANAO MANGO STAKEHOLDERS' FORUM (*AUGUST 2, 2017)*			
NAME	**AGENCY**	**ISSUES & CONCERNS**	**ACTIONS TAKEN**
29. PAQUITO ROLIO 30. BONG TOMBIS 31. LINDA LAGO 32. MS. AMY 33. MAY MANA-AY 34. RICKSON OLIMPUS	• REGION XII PRES. MANGO INDUSTRY • OZAMIS CITY • DAVAO CITY • SULTAN KUDARAT MANGO GROWERS ASSOCIATION • TULUNAN NORTH COTABATO	• FARM INPUTS • MANGO PROCESSING • 20M PROJECT PROPOSAL C/O PRDP (PROCESSING EQUIPMENT FOR) MANGO, HAULING TRACK) • EHANCED MANGO PROCESSING PACKAGING FOR EXPORT • DIRECT BUYERS FOR MANGO GROWERS / FARMERS • SMALL MANGO GROWERS ARE LIMITED WITH TECHNOLOGY REGARDING MANGO PRODUCTION AND OTHER MEANS OF TECHNOLOGY (MANGO REHAB, PRODUCTION PRACTICES AND FLOWER INDUCTION) • START UP CAPITAL FOR MANGO GROWERS • STATUS OF THE HB 3538 (REGARDING THE 5M DEVELOPMENT FUND FOR MANGO) • THE ASSOCIATION REQUESTED THAT THEY WANT TO HAVE THEIR ASSOCIATION BE EQUIPPED WITH VAPOR HEAT TREATMENT FACILITY SINCE VHT IS ONE OF THE REQUIREMENTS FOR MANGO TO BE EXPORTED TO OTHER COUNTRY.	• PRDP- UPDATED THAT THE SUBMISSION OF PROJECT PROPOSAL WERE BEING PRIORTIZED IN THEIR BUDGET ALLOCATION • DA RFO 12 PROVIDED PROVISION OF FERTILIZER FOR THE ASSOCIATION • SEC. INSTRUCTED PRDP TO PROVIDE COMREHENSIVE REPORT RELATIVE TO THE DELAY OF THE PROJECT PROPOSAL FROM THE ASSOCIATION SINCE THE PROJECT PROPOSAL WAS SUBMITTED LAST NOVEMBER 2016. • SEC. DIRECTED THAT THE FORUM WILL ORGANIZED BUSINESS MATCHING FOR BUYERS. TRADERS, AND COSOLIDATORS TO PROVIDE AVENUE FOR MANGO FARMERS WHO ATTENDED THE MANGO FORUM. • SEC. PINOL INSTRUCTED USEC EVELYN G. LAVINA TO DRAFT MEMORANDUM ORDER TO CONDUCT PROVINCIAL-WIDE TRAININGS TO MANGO GROWERS/ FARMERS ALL OVER THE COUNTRY TO IMPROVED PRODUCTION PRACTICES. • SEC. PINOL SAID THAT LOAN PROGRAM FOR AGRI CROPS WERE BIENG IMPLEMENTED THROUGH ACEF WHICH GRANT GROUP AND INDIVIDUAL FARMERS WITH LOWER INTEREST RATE. • SEC. PINOL ALSO IMPHASIZED THAT FINANCING SHOULD BE PACKAGED WITH TECHNOLOGY AND MARKETING. • SEC. PINOL RESPONDED THAT MANGO FORUM WILL BE PERFECT AVENUE TO PROVIDE CRAFTING

35. MARISSA S. ABELLA	• DAVAO CITY COUNCILOR	• THEY ALSO REQUESTED IF THEY COULD BE ASSISTED IN THE PACKAGING MATRIALS FOR THEIR MANGO PRODUCED	OF ROADMAP TO ALLOCATE FUNDS FOR MANGO INDUSTRY.
36. EMMANUEL BARTOCILLO	• PRES REGION 12 MANGO GROWERS ASSOCIATION	• SHE ASKED SEC. PINOL IF THEY WOULD CONSIDER SAMAL ISLAND AS ANOTHER GUIMARRAS FOR MANGO SINCE SAMAL IS ALSO KNOWN AS ONE OF THE LARGEST MANGO PRODUCER IN REGION XI	• (FOR RESPONSE DUE TO LIMITED TIME DURING THE OPEN FORUM) • SEC. PINOL RESPONDED THAT IT IS POSSIBLE AND SAID THAT HE WANT MORE GUIMARRAS TO BE REPLICATED IN THE COUNTRY FOR MANGO
37. CRESENCIO NATIVIDAD	• BLGU ZAMBOANGA	• CONCERN ON PEST INFESTATION (CECID FLIES)	• SEC. RESPONDED THEY SHOULD INCREASE FIRST THEIR PRODUCED TO ENHANCED GREATER PRODUCTIVITY. • MANGO REHABILITATION FOR OLD TREES WILL BE GIVEN COSIDERATION TO INCREASE FARM PRODUCTIVITY
38. EDSEL MUYUELA	• TACURONG CITY	• CONCERN ON THE FLOOR PRICE • HOW TO AVAIL POWER SPRAYER FOR MANGO GROWERS • PROPOSED MECHANIZED MANGO PACKAGING/ SEALER TO MINIMIZED POST HARVEST LOSSES	
39. DAVE CATOM	• MANGO GROWER MAGUINDANAO / CONTRACTOR	• LOW PRODUCTION • CUTTING OF TREES DUE TO UNSTABLE MARKET PRICES • LOW PRODUCTIVITY	• *(FOR RESPONSE DUE TO LIMITED TIME DURING THE OPEN FORUM)* • *(FOR RESPONSE DUE TO LIMITED TIME DURING THE OPEN FORUM)* • *(FOR RESPONSE DUE TO LIMITED TIME DURING THE OPEN FORUM)*
40. LOUDUS SISON	BUTUAN CITY	• CONCERN ON MASSIVE BANNING OF SOME CHEMICALS FOR MANGO WITH CAUSES TO HARDEN TO PREVENT PEST INFESTATION FOR CICID FLIES RESULTED TO LOW PRODUCTIVITY OF QUALITY MANGO	• *(FOR RESPONSE DUE TO LIMITED TIME DURING THE OPEN FORUM)*

Table 6.	PALAWAN MANGO STAKEHOLDERS' FORUM (*AUGUST 2, 2017)*
ISSUES & CONCERNS	**SOLUTION/ACTIONS TAKEN**
41. X-ray machines are too far away from mango plantations and not enough for the total requirement. One machine available but not being used since there is no counterpart with municipality of Roxas. 42. Identification and detection of infected fruits is being done but none of these are adequate to totally eradicate the infestation. 43. Only handful of farmers practice GAP, when its strict practice can already drastically reduce and even eliminate, as shown by some farmers in some areas. 44. RSBSA is necessary to open gates for credit 45. Suggestion for the Quarantine personnel to operate the x-ray machine 46. Request from farmers for good markets for their produce. 47. Stakeholders are not asking for the lifting of the ban to bring Palawan mango out of Palawan, but just to have adequate and proper testing and detection. 48. Mr. Macasaet confirmed that with GAP practice he showed that 0% infestation is possible. 49. There is urgent need to put x-ray machines everywhere to help detect and irradicate the infestation. Consider deploying mobile scanning machines. 50. Release of ACEF loan of P100M was stopped to prevent wasting the money, according to Mitra 51. Suggestion to extend DOST Irradiation facilities and conduct massive spraying to cover all areas.	• Mr. Mira suggested to place it in the city for easy access to all. • Urgent need to gather data on extent and specific location of infestation • Widen and deepen GAP training, Implementation, and Monitoring; • Determine what technological intervention can really detect and irradicate the infestation.; • Study the widespread adaptation of off-season mango production; • Consider seriously the supply and demand situation within Palawan itself, mindful of the rise in tourism; • Make representation to Secretary Pinol on extending coverage by PCIC to mango farmers; • Look into existing DA (government) credit facilities such as PLEA and SURE, AGFP, especially in the light of rethinking the stringent requirements; • Need to change the mind-set from receiving grants to qualifying for loans; • Consider loan facility from Landbank, which can increase amounts to P300,000 provided farmers are RSBSA registered; • Revisit the existing Mango Roadmap and revise according to current situation, discoveries, insights through the various Fora, and emerging requirements; • Be careful with chemical use in solving the infestation problem because it might create yet another problem which is long term. Everyone should instead use and adhere to GAP very strictly; • Consider value-adding schemes since export of mango to some countries which • still accept clean Palawan mangos, is still possible and a viable bridging strategy • to provide continuous income to Palawan farmers; • 12. Organize all municipal and city mayors to meet and discuss simultaneous • spraying of all mango planted areas which are infected; • 13. Before any discussion on the lifting of the ban the local mango industry in • Palawan, growers and staekholders must prove first that it is already MWP-free • as can be certified by the Quarantine office.; • 14. Improve marketing information system to better-manage the price fluctuation • within the country of mango, which eventually affects the stability of the industry.

Annex C. Export Destination and Volume of Fresh Mangoes (2010-2017)

Destination	2010	2011	2012	2013	2014	2015	2016	2017
Australia		0.8050		5.7700		*0.0400		
Austria	0.0220	0.0050	0.0180	1.1280	1.8650	2.1500	0.7550	0.0032
Bahrain	2.5000	4.9350	1.6000	4.0650	4.2400	5.1750	3.5900	5.0095
Canada	2.2890	4.4720	4.6877	6.8710	57.5570	144.7930	242.7150	133.8371
China	104.8620	16.6710	6.0300	16.6200	12.1200	4.5940	21.4180	49.6575
Dubai	1.8580				3.6600	3.8970		
France		0.0113	0.0440	0.0200	0.0350	0.0250	0.0250	10.0360
Germany	0.0580	0.0500	0.0930	0.1200	1.7921	0.1580	0.5420	9.4798
Greece	2.5560	3.8770	2.6170	1.3650	0.3490			
Hongkong	7,819.6970	11,136.0406	9,155.6637	8,983.6050	7,251.9848	7,867.2380	5,534.4740	8,015.1090
Italy	0.0120	0.2410	0.0648	0.7601	0.0150	0.3561	0.0200	7.5200
Japan	2,634.8352	2,200.4816	2,126.9336	1,929.6140	1,267.7970	466.0646	585.0360	562.1217
Jebel Ali	7.6400				10.6500	9.0790		
Korea	289.8930	540.0395	1,046.1620	2,970.9096	4,781.4503	4,804.9950	3,702.2690	3,486.2650
KSA	8.2039	22.4789	30.6799	30.7243	24.2533	17.3938	20.1840	16.9661
Kuwait		6.4340	5.8130	10.4220	8.5170	5.1910	5.9940	3.8030
Luxembourg								
Malaysia	206.9750	689.7060	2,621.3970	1,322.8130	559.2600	788.7242	480.0500	206.5900
Malta								
Netherlands	0.0150	1.3000	3.5000	3.3600	1.0040	8.2650	9.1150	15.8200
New Zealand			17.9850	7.8500	12.5000			0.0050
Oman				0.2500			0.1580	
Qatar		3.6770	13.0793	16.8240	28.9270	10.6440	19.6050	17.5370
Russia				0.0010	9.0000			0.1621
Singapore	137.8600	167.7380	201.8566	669.8186	282.6989	397.8105	232.8780	105.7105
Switzerland	1.4710	1.9435	10.1110	0.1549	0.0950	0.1110	0.9180	78.5470
Thailand	0.0050		0.0140	0.0150				
UAE	2.5895	15.4290	27.1783	24.9498	24.7361	11.2058	39.8730	84.4663
UK	0.0230	2.2100	40.8423	16.3990	0.0862		2.8360	0.0600
USA								
Brunei	0.0100	0.0600		0.1372	0.1000		0.6500	
Denmark	0.1900							
England	0.0200				0.0160			
Ireland	0.0100							
Kuala Lumpur	0.3630							
Spain	0.2770		0.0450	0.0500	0.1530	0.0753	0.0530	6.4000
Sweden	0.1000	0.0100				0.0150	0.0050	0.2500
Jordan		0.0400	0.0250					
Belgium			0.2620	1.3820	21.8460	11.5030	10.5400	11.3350
Hungary			0.0050					0.1000
Iran			0.0093					
Indonesia				0.0040			0.2600	
Amsterdam					0.0200	1.5675	2.6000	
Georgia					0.0001			
Norway					0.0100	0.0100		
Poland					0.0100			
Rome					0.0050	0.0050		
Lebanon						2.2200		
Palau						0.3750		
Cambodia						0.0250		
Laos							0.3900	
Turkey							0.0130	
Macau								0.5500
London								0.0100
South Africa								0.0080
Tunisia								0.0040
GRAND TOTAL	11,224.3346	14,818.6554	15,316.7164	16,026.0025	14,366.7526	14,563.6656	10,916.9660	12,827.3626

*Note: Volume of Mango on Year 2015 (0.0400)-For research purposes

Source: NPQSD

* Based on Issuances of Phytosanitary Certificate as required by country of destination

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