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SURVEY ON ISSUE ANALYSIS OF FOOD VALUE CHAIN IN THE PHILIPPINES

FINAL REPORT

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List of abbreviations

ACPC	Agricultural Credit Policy Council
ADB	Asian Development Bank
AHFF	Agriculture, Hunting, Forestry, and Fishing
ASEAN	Association of Southeast Asian Nations
BAFE	Bureau of Agricultural and Fisheries Engineering
BAFPS	Bureau of Agriculture and Fisheries Product Standards
BAPTC	Benguet Agri-Pinoy Trading Post
BEP	Break-even Price
BEV	Break-even Volume
BSU	Benguet State University
CALABARZON	Region IV-A (Cavite, Laguna, Batangas, Rizal, Quezon)
CAR	Cordillera Autonomous Region
DA	Department of Agriculture
DAR	Department of Agrarian Reform
DOST	Department of Science and Technology
DOST-PCAARD	DOST - Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development
DOST-PCIEERD	DOST - Philippine Council for Industry, Energy, and Emerging Technology Research and Development
DSWD	Department of Social Welfare and Development
DTI	Department of Trade and Industry
FAO	Food and Agriculture Organization of the United Nations
FEP	Farmer Entrepreneurship Program
FGD	Focus Group Discussion
FMR	Farm-to-Market Roads
FTI	Food Terminal Inc.
GAP	Good Agricultural Practices
GDP	Gross Domestic Product
GPHP	Good Postharvest Practices
HVVC	Highland vegetable value chain
IT	Information Technology
JAEC	Japan Agricultural Exchange Council
JGF	Jollibee Group Foundation
JICA	Japan International Cooperation Agency
KII	Key Informant Interview
KOICA	Korea International Cooperation Agency
LGU	Local Government Unit
LTVTP	La Trinidad Vegetable Trading Post
LVVC	Lowland vegetable value chain
MIS	Management Information System
MSME	Micro, Small, and Medium Enterprises
NCR	National Capital Region
NIS	National Irrigation System
NVAT	Nueva Vizcaya Agricultural Terminal, Inc.

PCIC	Philippine Crop Insurance Corporation
PhilMech	Philippine Center for Postharvest Development and Mechanization
PSA	Philippine Statistics Authority
RDE	Research, development, and extension
R&D	Research and Development
RA	Republic Act
SME	Small and Medium Enterprises
UPLB	University of the Philippines - Los Baños
WBG	World Bank Group
WHO	World Health Organization

List of pictures

Terraced hillsides, major highland vegetable production site in Benguet

La Trinidad Vegetable Trading Center, one of the largest trading posts in Benguet

Wet market in Baguio

Hangar market in Benguet

Sorting and packaging of cabbage with newspapers and plastic bags in BAPTC

Trimming outer leaves of cabbage in BAPTC

Washing of carrots in the privately-owned facilities near LTVTP

Removing outer leaves of wombok, Chinese cabbage

Tomato placed in plastic crates in a trading post in Nueva Vizcaya

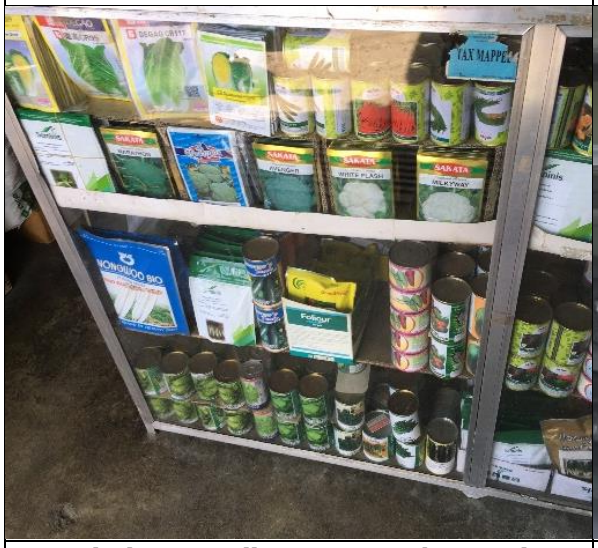
Cold storage to preserve onion in Nueva Ecija

Potato for sale in La Trinidad, sorted according to size

Manually loading vegetables packed in plastic bags into a truck in Urdaneta

Piled up vegetables in a wing van truck, transporting from BAPTC to major consumer sites

Refrigerated van owned by the Tublay municipal government office



A roadside store selling inputs such as seeds and pesticides in La Trinidad

Processing machine for tomato products in Aritao, Nueva Vizcaya

Focus group discussion in Kayapa, Nueva Vizcaya

Tomato wrapped in plastic at a supermarket in Batangas

	
Focus group discussion in Dupax Del Sur, Nueva Vizcaya	Focus Group Discussion in Buguias, Benguet
	
Focus group discussion in Atok, Benguet	Key informative interview with LTVTP traders
	
Site visit in PhilMech, which support the development of agricultural mechanization in the Philippines	One day workshop for the study gathering different stakeholders including public and private institutions

Executive Summary

Objectives of the study

The primary objective of this study include characterizing the current situation of target vegetable value chains, identifying major value chain constraints, and proposing solutions to address the challenges identified. These are done primarily through focus group discussions with relevant farmers, key informant interviews with major value chain stakeholders, and analyses of all the primary and secondary data gathered from key value chain players.

Overview of the vegetable value chain

The vegetable value chains for both the highland and the lowland areas display similar marketing channels, with the key difference lying in the proximity of farmers to the market. Major production areas in the highlands are far from the consolidation centers and have poor farm-to-market infrastructure. This increases the reliance on disposers which drives the incremental costs and losses as the produce pass from one trader to another. Highland farmers also have relatively smaller farm sizes with lower adoption of productivity enhancing technology and equipment. Although there are some who are more progressive and able to contract with buyers, most highland farmers are still considered marginalized. On the other hand, lowland farmers have more organized farmer associations and better access to market due to their proximity to trading centers. As they have larger farm areas and better associations, these farmers are able to implement more advanced farm technologies (e.g. irrigation systems, mechanical land preparation), and contract more supply agreements with target buyers.

Highlights from the vegetable value chain analyses

For the highland, the heavy reliance on intermediaries coupled with the lack of market information put the farmers at a disadvantage. This renders most of them as price-takers. Due to this, retailers and wholesalers have the highest share of the profit at 30.6 to 34.4 percent for carrot, and 21.1 to 25.5 percent for potato. This is in contrast with the lowland vegetable value chain where farmers have the highest margin. This ranges from 33.1 percent for eggplant, 35.9 percent for tomato, and 50 percent for red creole onion. Access to different markets allow lowland farmers to have a relatively higher bargaining power in setting their prices with the produce going through fewer intermediaries.

The analysis of the breakeven price and volume of both the highland and the lowland show that given the average production cost and volume of farmers[1], farmers have the potential of generating income. In fact, sensitivity analyses highlight that from low to high prices, the gross income of farmers remain positive. However, various factors affect the prices of vegetables, foremost of which are the market supply and demand situation and the seasonality of crops. The instability of production partnered with the lack of a stable market fuel the price variability of vegetables. In these, key interventions include improving harvest quality and quantity of farmers and effectively establishing direct market contact to stabilize prices and supply production.

Major constraints in the value chain

Incorporating the data and analyses show major constraints in each node of the value chain. Starting from input procurement, farmers face increasing production costs with lack of access to quality inputs and low support from the government and the private sector in enhancing agricultural inputs. This is amplified by the issues in production. Farmers do not implement value-adding farm management due to financial constraints and lack of knowledge, while farmer organizations display organizational and management failures. On the processing node, vegetable processing is not integrated in the value chain as there is a lack of processing technology and research prioritization. On the marketing aspect, the lack of direct market access and market information hinder farmers from offering and bargaining for a competitive price. Additional constraints in the logistics from farm-to-market and transport to other markets increase postharvest losses and costs due to poor infrastructure and improper handling and transport practices. On the consumer side, there is a lack of government programs in promoting

[1] Production cost, volume, and yield data from the Provincial Agriculture Office and FGDs

awareness and higher consumption of vegetables. Also, there is a need for stricter implementation of guidelines for vegetable qualities to promote information transparency along the value chain.

Lastly, issues from external players providing support services to the value chain were identified. In the government side, there is inadequate support in terms of budget allocation and assistance. In research and development, projects are not integrated and there is a lack of support and prioritization. For financing and insurance, farmers lack access to relevant information and the stringent requirements hinder them from availing these. In terms of industry associations and logistics services, there is a lack of partnership with related parties to increase farmer access to advanced technology and needed transport services.

Proposed countermeasures

Practical solutions can be implemented per value chain node. The research and development of production inputs can be strengthened and local input production can be developed through partnership with related agribusiness companies. Concurrently, key interventions for farmers include comprehensive training programs, enhancement of farmer organizations, establishment of contract supply agreements with target buyers, and provision of the necessary materials and tools needed. As a support to production, processing interventions comprise of comprehensive processing plans through the development of a vegetable processing center and partnership with processing corporations. Following the production is the need for effective marketing. This can utilize online platforms to increase direct market access and enhance market information transparency. As for the logistics, there is a need to promote and monitor proper handling and transport with the provision of the needed facilities to farmers. On the other hand, educational programs can greatly help in promoting awareness on the benefits of vegetable consumption.

On the support system, the following solutions can be applied. The government can implement farmer profiling and geo-tagging to support crop programming. Also, provision of technology and expertise for research and development integration will greatly help in accelerating productivity improvement. Lastly, strengthening partnerships with industry associations and logistics services are strategic moves to promote the development of the agriculture industry.

Vertical integration of the vegetable value chain

In order to comprehensively address the constraints per node, the best solution is to vertically integrate the farmers, effectively connect them to the target market, and provide the needed support for the efficient delivery to consumers. Key activities start from developing the farmers and farmer organizations through intensive agribusiness trainings and provision of quality input and facilities. Establishment of contract supply agreements connecting these farmers to the target buyers ensures a market, volume, and price for the produce. Concurrently, logistics support can be given through the establishment of consolidation centers near the production areas and development of distribution centers near the consumers. To facilitate the efficient coordination along the value chain, a management information system will connect buyers and other players such as producers and logistics providers. In addition, direct access to customers can be increased through the utilization of innovative platforms such as mobile applications for online marketing and direct delivery services.

Chapter 1. Background and context

1.1. Background of the study

The agricultural productivity of the Philippines continues to lag behind other countries in the Association of Southeast Asian Nations (ASEAN) region. For the period of 2012 to 2014, the corn and coconut yields of the country are at the lowest among the five ASEAN countries. As for rice, the country has better yields than Thailand, approximates that of Malaysia, but is below Indonesia and Vietnam. In terms of the long term total factor productivity in the sector, the Philippines remains the lowest in the region. This reinforces the need for agricultural development in the country, particularly in diversifying and strengthening other crops such as fruits and vegetables.

Table 1.1.1 ASEAN farm yields of major crops, 2012-2014 average

Crops In MT/ha	Indonesia	Malaysia	Philippines	Thailand	Vietnam
Rice (paddy)	5.1	3.8	3.9	3.1	5.7
Corn	4.9	8.0	2.9	4.3	4.4
Coconut	6.2	6.7	4.3	4.9	9.7

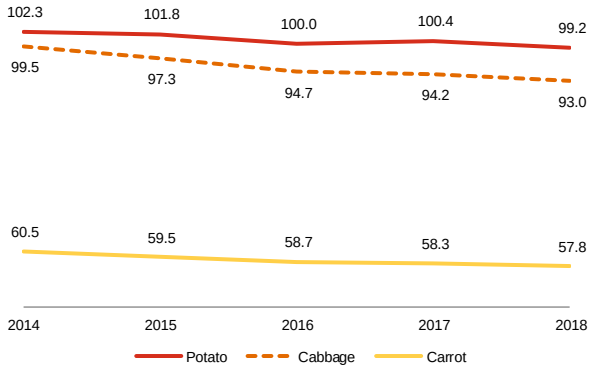
Source: FAO and UAP analytics as cited in DY (2017) and as taken from Brown et. al. (2018)

Table 1.1.2 Long-term total factor productivity in agriculture, average annual percent growth

Country In percentage	1980s	1990s	2001-2013
Malaysia	3.0	1.9	2.9
Indonesia	0.4	0.7	2.7
Vietnam	1.2	2.3	2.5
Thailand	0.1	2.4	2.2
Philippines	0.2	0.5	1.9

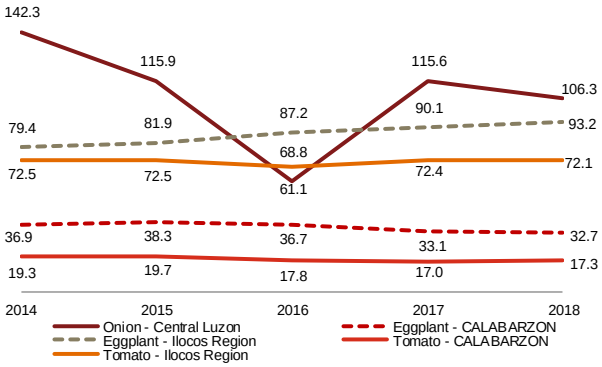
Source: FAO and UAP analytics as cited in DY (2017) and as taken from Brown et. al. (2018)

In the Philippines, the agricultural sector as a whole is experiencing a decline in production and competitiveness. On the production node, productivity yield and quality has been on a flat downward trend. This low productivity can be attributed to the inefficiencies in the agricultural value chain and the weaknesses of its support system.



Source: Philippine Statistics Authority

Figure 1.1.1 Production volume of target highland vegetable in CAR in thousand metric tons



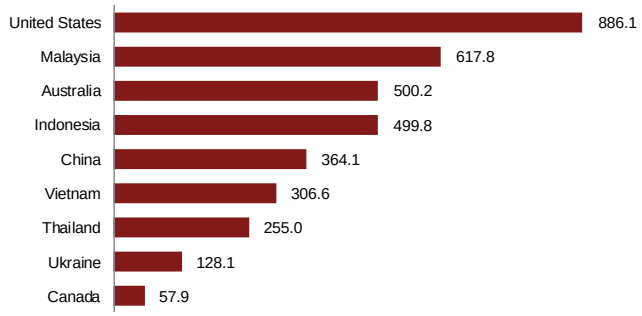
Source: Philippine Statistics Authority

Figure 1.1.2 Production volume of target lowland vegetable in survey areas in thousand metric tons

A study conducted by the Philippine Council for Agriculture, Aquatic, and Natural Resources Research and Development (PCAARRD) showed that the relatively weak performance of the agriculture sector can be traced to its narrow diversity and low productivity[2]. Traditional crops such as rice, corn, and coconut comprise more than 50 percent of the total harvestable areas. The government interventions focused mainly on these three crops, particularly on rice. Yet, the country has not achieved competitiveness in any of these crops and even relies on importation for rice.

[2] Brown, Ernesto O., Ebora, Reynaldo V. and Fezoil Luz C. Decena. PCAARRD. The Current State, Challenges and Plans for Philippine Agriculture. Food and Fertilizer Technology Center (FFTC). November 21, 2018.

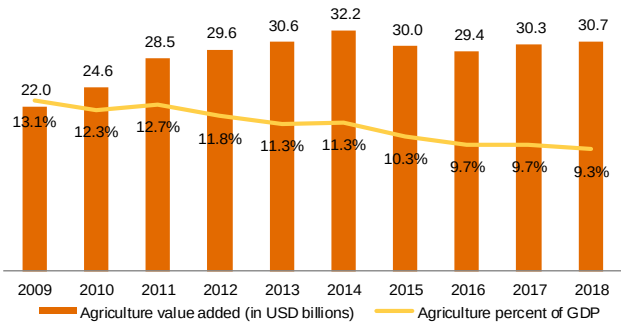
Locally, the current agricultural sector has much to improve to fully supply and provide the quality demanded for vegetables. In fact, according to World Bank data, the Philippines imported USD886.1 million from the United States during 2017. Other partner countries from which the country imported vegetables in the ASEAN region include Malaysia, Indonesia, Vietnam, and Thailand. These countries have seen agricultural improvement over the past years. In Malaysia, the use of advanced farming technology aided in driving agricultural growth. In Indonesia, the government established agricultural programs and policies that successfully boosted production and productivity. In Vietnam, the application of improved and organic technologies has increased the value of crop production. In Thailand, the use of precision agriculture has increased quality and yield of harvest.



Source: World Bank – World Integrated Solution

Figure 1.1.3 Top countries from which the Philippines import vegetables during 2017 in USD millions

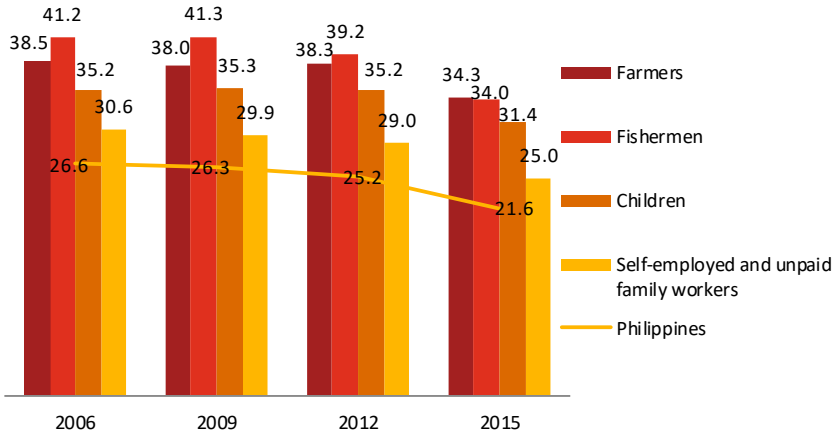
On the contrary, the agricultural development in the Philippines has been slow and constrained. This is highlighted by the declining contribution of agriculture to the national gross domestic product (GDP). From 1998 to 2009, it accounted for 13 to 14 percent of total GDP. This steadily declined to 9.3 percent in 2018. The different industry sectors of services, industry, and agriculture, hunting, fishery and forestry (AHFF) accounted for 57.8 percent, 34.1 percent and 8.1 percent of the total GDP, respectively (PSA, 2018). This declining contribution is due to structural transformation in the economy as the industry and service sectors grew faster than the agriculture sector. On the other hand, gross value added to agriculture in constant prices has been growing albeit minimally. This means that the size of agriculture is not getting smaller in absolute size. Although the agriculture sector is contributing only about 10 percent to the economy, it employs about 26 percent of the total labor force with 10.9 million people in 2018. This implies that the productivity in this sector is lower.



Source: World Bank – World Development Indicators

Figure 1.1.4 Agriculture sector performance of the Philippines

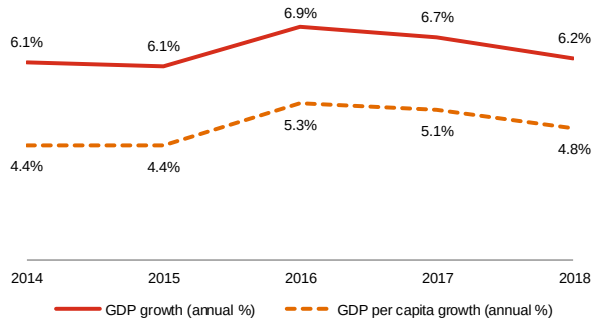
Aside from its economic importance, agriculture is also an important factor in the poverty alleviation program of government. According to the Poverty Statistics data of Philippine Statistics Authority (PSA), farmer poverty has ranked consistently highest in the agricultural sector. Despite the large food demand and the potential earning capacity of farming, the farmers remain as one of the poorest sectors of the population. The 2015 Census of Population conducted by PSA showed that the high poverty incidence in the rural areas is one of the key factors that drive the migration of rural residents to urban areas. In 2010, the level of urbanization was at 45.3 percent which increased to 51.2 percent in 2015. This means that rural population decreased from 54.7 percent to 48.8 percent over the same period. Improving the agriculture sector is a key solution to alleviating the poverty incidence in the rural areas.



Source: Philippine Statistics Authority

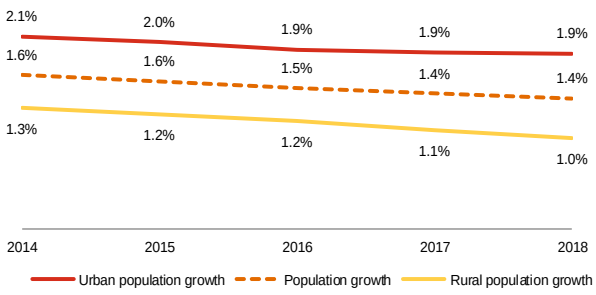
Figure 1.1.5 Philippine basic sectors with the highest poverty incidence in percentage

On the consumer side, factors that positively affect vegetable demand are the population and economic growth of the country. From 2014 to 2018, the population of the Philippines increased from 100.5 million to 106.7 million in 2018. The average growth rate was at 1.5 percent. In comparing the rural and the urban, the urban population grew at an average of 1.9 percent while the rural was only at 1.1 percent. On the other hand, the GDP growth rate of the country averaged 6.4 percent during the same period. This is in parallel with the GDP per capita growth which averaged 4.8 percent. Consequently, the population and economic growth drive the increase in demand for agricultural products, particularly fruits and vegetables. This is shown in the increase in fast food chains, supermarkets, hotels, resorts, and institutional buyers.



Source: World Bank – World Development Indicators

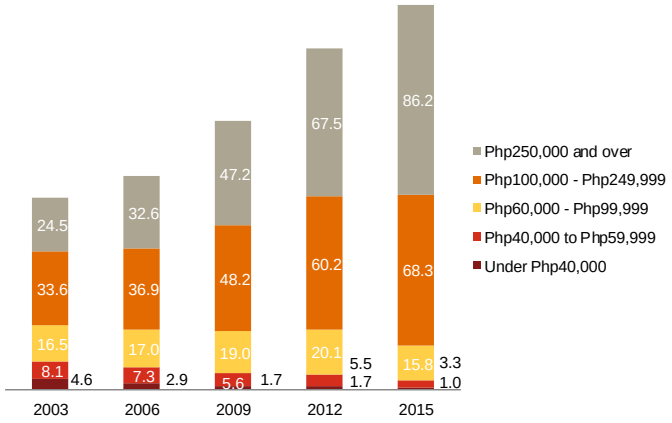
Figure 1.1.6 Annual GDP growth rate and GDP per capita growth rate of the Philippines



Source: World Bank – World Development Indicators

Figure 1.1.7 Annual population growth rates of the Philippines

In the Philippines, the Family Income and Expenditure Surveys of the PSA reveal that family disbursements on fruits and vegetables display an increasing trend with a compounded annual growth rate of 5.9 percent. From Php87.3 billion in 2003, the total disbursements doubled in amount to Php174.8 billion in 2015. By income class, families with annual income of Php100,000 and above exhibit an increasing trend. This is in contrast to the lower income classes who spent lesser amounts on fruits and vegetables annually. The trend in expenditures reveal that there is a growing demand for fruits and vegetables, particularly since the urban population has been increasing.



Source: PSA – Family Income and Expenditure Surveys

Figure 1.1.8 Philippine family expenditures on fruits and vegetables by income class in billion pesos

Recognizing the declining performance of the agricultural sector, the government has invested more resources and programs to increase its growth rate. However, the target growth rates were not reached due to weather disturbances (typhoons and drought), pest and disease outbreaks, and slow adoption of improved varieties. Concurrently, the agricultural value chain is constrained by the low adoption of production technology and machinery, limited post-harvest facilities, poor infrastructure, inadequate management information system (MIS) and inefficient intermediaries between production and consumption. Addressing these would cater to the national concern for food security, rural poverty, consumer nutrition, and economic improvement of all stakeholders.

Government intervention alone is not sufficient to create the desired improved performance of the sector. There is a need to leverage private sector investments along the chain and to partner with development grant organizations to effect a greater impact on agricultural performance. This will contribute to the strengthening and sustained growth of the Philippine agriculture.

1.2. Goal and objectives of the study

The goal of this study is to identify specific areas where Japan International Cooperation Agency (JICA) and the Department of Agriculture (DA) can cooperate to improve the vegetable value chain such that income of farmers is improved and competitively priced and quality vegetables are delivered efficiently to consumers.

Specifically, the study aims to:

1. Understand the selected vegetable value chains as sub-chains in the food value chain of the Philippines and characterize the current situation of each node.
2. Identify major issues and constraints in the food value chain with a focus on the vegetable value chain in Luzon.
3. Propose countermeasures that will address the major issues and constraints in the vegetable value chain.

1.3. Methodology

At the start of the study, a vegetable value chain selection process was implemented through analysis of demand growth trend, profitability, production data, and alignment with government priorities and plans to determine priority crops and target areas.

In selecting the target crops, a scoring method was implemented using the following parameters: volume of production, value of crop, number of farmers growing the crop, profitability, increasing demand, suitability for crop rotation, and import potential of the crops.

Initially, the identified crops were cabbage, potato, and cauliflower for the highland, and eggplant, bittergourd, and onion for the lowland.

Table 1.3.1 Criteria scoring table for selection of target highland crops

Highland vegetables

	Criteria	Weights	Cabbage		Potato		Carrots		Cauliflower		Brocolli		Leeks	
			Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score
1	High Volume of production	4	85%	3.4	100%	4.0	80%	3.2	70%	2.8	70%	2.8	65%	2.6
2	High Value	3	80%	2.4	60%	1.8	80%	2.4	95%	2.9	90%	2.7	85%	2.6
3	Large number of farmers growing	5	90%	4.5	100%	5.0	75%	3.8	70%	3.5	70%	3.5	65%	3.3
4	Profitability	5	90%	4.5	80%	4.0	85%	4.3	85%	4.3	85%	4.3	80%	4.0
5	Increasing demand growth trend	4	85%	3.4	80%	3.2	75%	3.0	80%	3.2	80%	3.2	75%	3.0
6	Suitable for crop rotation	3	95%	2.9	60%	1.8	90%	2.7	90%	2.7	90%	2.7	90%	2.7
7	High potential for import substitut	3	85%	2.6	100%	3.0	40%	1.2	95%	2.9	95%	2.9	95%	2.9
		Total		**23.6**		**22.8**		20.5		**22.2**		22.0		21.0

Source: Analysis by PwC Marketing expert

Table 1.3.2 Criteria scoring table for selection of target lowland crops

Lowland vegetable

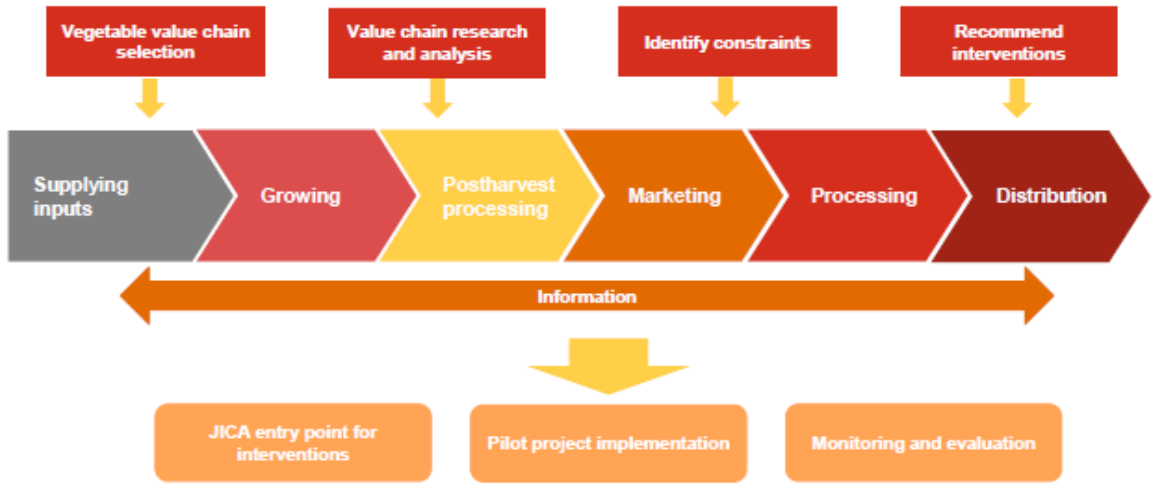
	Criteria	Weights	Eggplant		Bittergourd		Onion		Tomatoes		Okra		Squash	
			Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score
1	High Volume of production	4	95%	3.8	80%	3.2	100%	4.0	90%	3.6	70%	2.8	90%	3.6
2	High Value	3	80%	2.4	85%	2.6	90%	2.7	70%	2.1	80%	2.4	70%	2.1
3	Large number of farmers growing	5	90%	4.5	80%	4.0	100%	5.0	80%	4.0	70%	3.5	85%	4.3
4	Profitability	5	90%	4.5	90%	4.5	90%	4.5	75%	3.8	80%	4.0	70%	3.5
5	Increasing demand growth trend	4	85%	3.4	80%	3.2	90%	3.6	80%	3.2	75%	3.0	75%	3.0
6	Suitable for crop rotation	3	95%	2.9	90%	2.7	95%	2.9	90%	2.7	90%	2.7	90%	2.7
		Total		**21.5**		**20.2**		**22.7**		**19.4**		18.4		19.2

Source: Analysis by PwC Marketing expert

Upon consultation with DA, the priority vegetables were finalized, namely **cabbage, carrot, potato, eggplant, tomato,** and **onion**.

Consequently, baseline information gathering was conducted primarily through focus group discussions (FGD) with farmers and key informant interviews (KII) with major value chain players. Supporting data were obtained from agriculture offices, government agencies, desktop research, and relevant studies, among others. After obtaining the relevant data, value chain analyses were conducted to identify major constraints per node. Through this, key interventions were proposed to address major constraints, cater to stakeholder needs, and establish concrete initiatives for the vegetable value chain development.

On 17 May 2019, a one-day workshop was held with relevant government agencies and related private sector entities. The purpose of the workshop was to solicit feedback from vegetable value chain stakeholders and refine the recommended interventions and value chain development direction. Incorporating all the data and feedback gathered, concept notes and an information matrix suggesting key interventions for the highland and lowland vegetable value chains were submitted.



Source: PwC analysis

Figure 1.3.1 Flow of activities for the vegetable value chain study

This final report summarizes the vegetable value chain insights, major constraints, and key interventions being proposed.

1.4. Overview of the vegetable sub-sector in the Philippines

The vegetable subsector has two classifications based on location of production, namely, the highland and lowland vegetables. Highland vegetables are generally grown in high elevation areas of Benguet Province – Cordillera Autonomous Region (CAR), Bukidnon province of Region X, Dalaguete of Cebu, and Budha of Davao City. Lowland vegetables are grown in relatively flat and low-lying areas with major production occurring in Batangas, Laguna, and Quezon provinces of Region IV-A (CALABARZON), Pangasinan, and La Union of Region I (Ilocos Region), and Bulacan, Pampanga, and Bataan of Region III (Central Luzon).

1.4.1. Importance of vegetable production in Luzon

In the Philippines, majority of the production is concentrated in the Luzon Island. For highland vegetables, most of the production is in Luzon, particularly CAR. For cabbage, out of the 120.7 thousand metric tons produced in the country, 81.4 percent is from the regions in Luzon with CAR production amounting to 93.0 thousand metric tons during 2018. The same is true for carrots, with Luzon garnering 90.0 percent and CAR with the most production at 57.8 thousand metric tons. In the case of potato, 99.2 thousand metric tons is concentrated in CAR, which represents 84.5 percent of the total Philippine production.

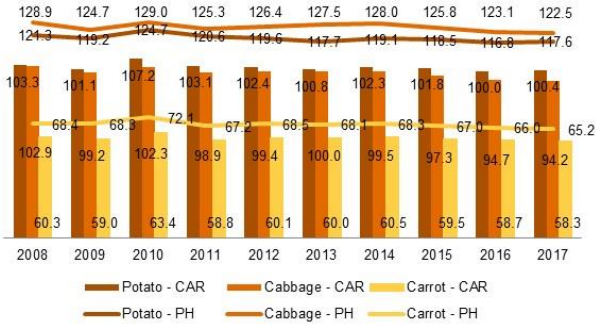
For lowland vegetables, the production is more widely dispersed. For eggplant, the Ilocos Region contributed the largest production at 93.2 thousand metric tons out of the 244.8 thousand metric tons total production during 2018. This is followed by Central Luzon and CALABARZON with production volumes of 27.0 thousand metric tons and 32.7 thousand metric tons, respectively. The tomato production is also concentrated in the Ilocos Region at 72.1 thousand metric tons. The Luzon Island registered 62.7 percent of the total tomato production at 131.7 thousand metric tons during 2018. Onion, on the other hand, is mostly grown in Central Luzon at 106.3 thousand metric tons for the same year. This amounts to 61.5 percent of the total production in the country. The tables of production enumerating the production volume of the target crops per province can be found in Appendix *1: Production data*. This shows that majority of the production is concentrated in the Luzon island.

1.4.2. Highland vegetable production

The main production in the highland is located in CAR with Benguet as the leading province producing vegetables. According to the PSA data, the total production volume of cabbage, carrot and potato amounted to 305,331 metric tons in 2017. Out of these, 252,975 metric tons were produced in CAR

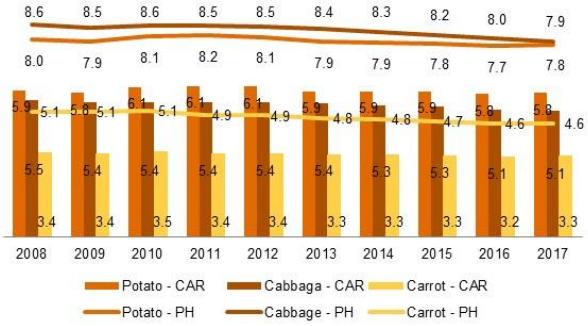
alone, with 88.9 percent coming from Benguet. The province's production of potato amounted to 89,893 metric tons, followed by cabbage and carrot at 80,634 and 54,387 metric tons, respectively.

There are nineteen vegetable types being produced in Benguet, six (i.e., cabbage, white potato, chayote, carrot, Chinese cabbage and cauliflower) of them contributed to about 91 percent of the total production. Cabbage and white potato contributed approximately 29 percent and 25 percent of the production, respectively.



Source: Philippine Statistics Authority

Figure 1.4.1 Comparison of annual production volume of target highland crops in thousand metric tons



Source: Philippine Statistics Authority

Figure 1.4.2 Comparison of annual production area of target highland crops in thousand hectares

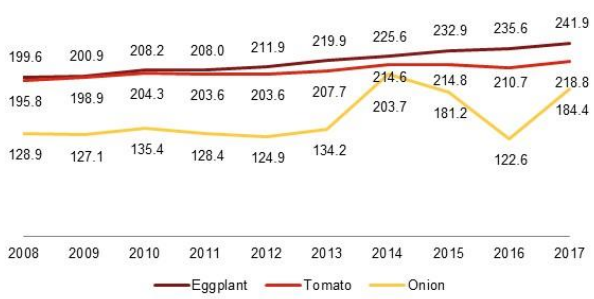
Potato Over the decade of 2008 to 2017, potato production volume and area has decreased at an average annual rate of 0.32 and 0.27 percent, respectively. This was arrested in 2017. Potato produced was 117,637 metric tons, an increase of 0.73 percent from the previous year's volume of 116,783 metric tons. This increase in production from 2016 to 2017 is driven by the 0.64 percent increase in production area from 7,744 to 7,793 hectares in the same period.

Cabbage The production of cabbage has decreased at an annual average rate of 0.54 percent from 128,865 metric tons in 2008 to 122,474 metric tons in 2017. In the same period, the production area for cabbage also declined from 8,596 hectares to 7,912 hectares. In 2017, cabbage production decreased by 0.49 percent from 123,080 metric tons in the previous year. This can be attributed to the 1.3 percent decrease in land area from 8,018 hectares in 2016.

Carrot In the period of 2008 to 2017, production volume and area for carrot displayed a decrease of 0.47 and 1.06 percent, respectively. Carrot production was at 65,219 metric tons for 2017, which decreased by 1.16 percent from the prior year's volume of 65,987 metric tons. The same pattern is seen in the production area of carrot which went down by 0.01 percent over the same period.

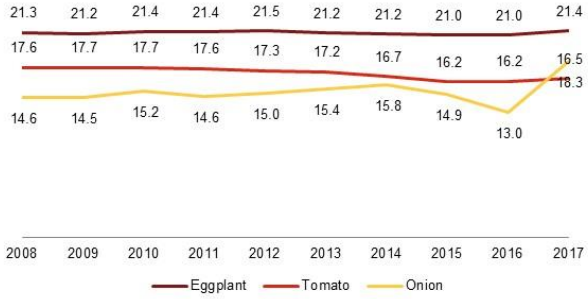
1.4.3. Lowland vegetable production

The supply of lowland vegetables is more diversified as compared to highland vegetables. Metro Manila, which is the largest market center for vegetables, depends on the northern part of Luzon and the CALABARZON region for its supply of lowland vegetables. The major producing provinces up north are Pangasinan, Tarlac, Nueva Ecija, Nueva Vizcaya, and the Ilocos provinces of La Union and Ilocos Sur. Laguna, Quezon, Batangas and Cavite are the major producers in the CALABARZON region. PSA data shows that in 2017, the total production for eggplant and tomato in CALABARZON amounted to 50,040 metric tons. For eggplant, 79.6 percent of production is attributed to Quezon province at 26,331 metric tons. For tomato, production amounted to 16,959 metric tons representing 48.1 percent of the region's production. Nueva Ecija is the major producer of onion at 115,474 metric tons, which is equivalent to 62.6 percent of the country's onion production during the same period. The top lowland vegetables supplied to the market are eggplant, tomato, and onion. These are the main lowland vegetable crops that are being monitored and prioritized by the DA Central Office as part of the High Value Crops Development Program. In this program, eggplant and tomato are under the lowland crops in local supply, while onion is part of the priority import crops.



Source: Philippine Statistics Authority

Figure 1.4.3 Annual production volume of target lowland crops in the Philippines in thousand metric tons



Source: Philippine Statistics Authority

Figure 1.4.4 Annual production area of target lowland crops in the Philippines in thousand hectares

Eggplant From 2008 to 2017, the production of eggplant increased at an average rate of 2.2 percent per year, while the area planted increased at an average rate of 0.1 percent. In 2017, eggplant production was about 241,900 metric tons, which increased by 2.7 percent from last year's production of 235,630 metric tons. The area planted on the other hand increased by 1.9 percent, from 21,040 hectares in 2016 to 21,450 hectares in 2017. Yield has remained constant at 11.2 metric tons per hectare.

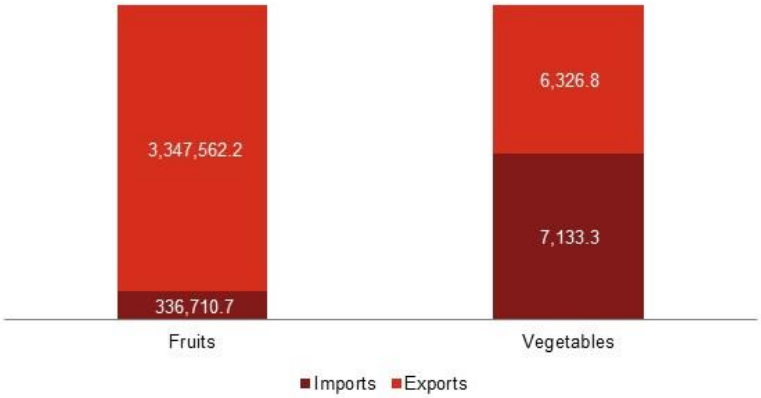
Tomato From 2008 to 2017, tomato production grew at an average annual rate of 1.3 percent. In 2017, tomato production increased by 3.8 percent from 210,720 metric tons to 218,790 metric tons of 2016. The rise in production is due to the increase in planted area, which went up by 1.8 percent from 16,200 hectares in 2016 to 16,490 hectares the following year.

Onion The production and area harvested for all types of onion from 2008 to 2017 increased at an annual average of 7.1 percent and 3.4 percent, respectively. In 2017, production was at 184,430 metric tons, which was 50.4 percent higher than the 2016 value of 122,590 thousand metric tons. The substantial improvement in production was attributed to the 40.6 percent increase in harvested area from 12,990 hectares in 2016 to 18,260 hectares in 2017. The increase in the 2014 production is attributed to the high germination percentage of the high-yield seeds in Nueva Ecija, expansion of growing areas in Nueva Vizcaya, newer farm areas in Ilocos Sur, and the recovery of silted growing areas in La Union. On the other hand, factors negatively affecting onion production are the strong typhoons and pest and disease infestation. Central Luzon, the top producer of onion in the country, experienced armyworm infestation during the 2016 planting season which significantly affected onion production during that time.

1.4.4. Import and export of vegetables

An analysis of the import and export volume of fruits and vegetables show the supply and production capacity of the country. Of the total import and export volume, the Philippines has been exporting 91 percent of the fruit production, mainly driven by bananas and pineapples. Imports, at the same time, are mainly oranges, apples, grapes, pears, and lemons, among others.

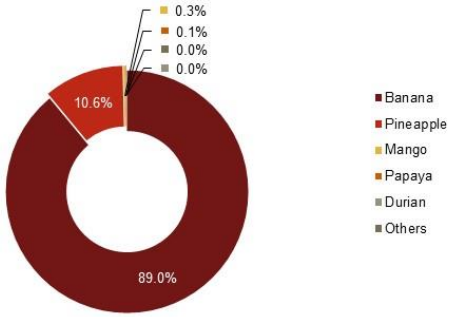
On the other hand, 47 percent of the total import and export vegetable production is being exported, while the imports are mainly potatoes, mushroom, and broccoli, among others.



Source: Department of Agriculture – Bureau of Plant Industry

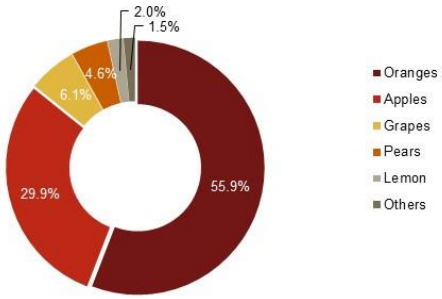
Figure 1.4.5 Philippine fruit and vegetable import and export volume during 2018 in metric tons

For the year 2018, bananas drive the fruit exports at about 2.98 million metric tons, which are mainly to the Japanese market. These are followed by pineapple, mango, papaya, and durian. On the other hand, the main fruits imported by the country are oranges at 0.18 million metric tons.



Source: Department of Agriculture – Bureau of Plant Industry

Figure 1.4.6 Philippine fruit exports during 2018



Source: Department of Agriculture – Bureau of Plant Industry

Figure 1.4.7 Philippine fruit imports during 2018

Table 1.4.1 Philippine fruit exports during 2018

Commodity	Volume (in MT)
Banana	2,978,506.7
Pineapple	356,484.1
Mango	8,841.0
Papaya	2,025.8
Durian	631.7
Others	1,073

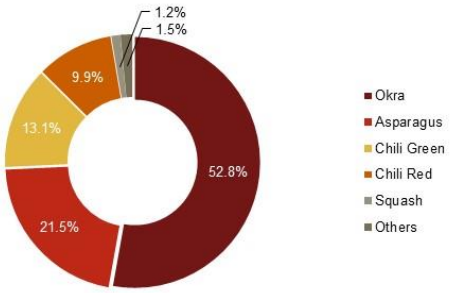
Source: Department of Agriculture – Bureau of Plant Industry

Table 1.4.2 Philippine fruit imports during 2018

Commodity	Volume (in MT)
Oranges	188,126.8
Apples	100,565.4
Grapes	20,688.5
Pears	15,645.4
Lemon	6,738.7
Others	4,946

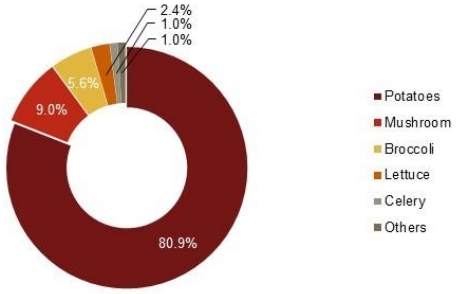
Source: Department of Agriculture – Bureau of Plant Industry

For vegetables, the top export produce is okra at 3,339 metric tons, primarily going to the Japanese market as well. This is followed by asparagus, chili (both green and red), and squash. As for the imported vegetables, this is driven by potatoes at 5,774 metric tons. These are primarily imported from Germany and the United States of America.



Source: Department of Agriculture – Bureau of Plant Industry

Figure 1.4.8 Philippine vegetable exports during 2018



Source: Department of Agriculture – Bureau of Plant Industry

Figure 1.4.9 Philippine vegetable imports during 2018

Aside from potatoes, the other target crops have insignificant amounts of import and export volume. This may be attributed to the large demand for the processed variety of potatoes which local farmers are unable to supply.

Table 1.4.3 Philippine vegetable exports during 2018

Commodity	Volume (in MT)
Okra	3,338.9
Asparagus	1,356.7
Chili Green	830.9
Chili Red	626.6
Squash	73.1
Others	101

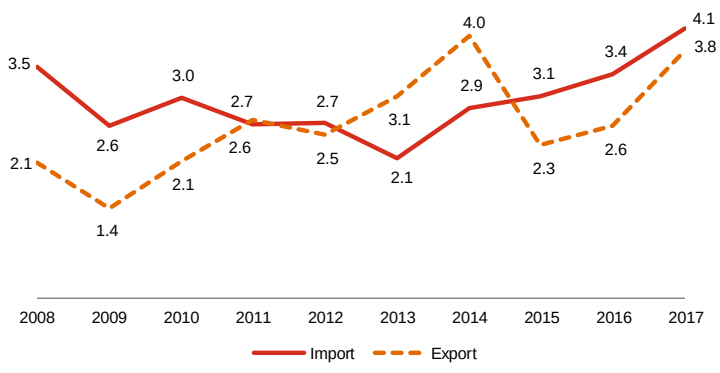
Source: Department of Agriculture – Bureau of Plant Industry

Table 1.4.4 Philippine vegetable imports during 2018

Commodity	Volume (in MT)
Potatoes	5,773.7
Mushroom	639.8
Broccoli	397.0
Lettuce	174.5
Celery	74.5
Others	74

Source: Department of Agriculture – Bureau of Plant Industry

According to World Bank data, the Philippine vegetable import and export values from 2008 to 2017 display a fluctuating trend. Even though the country has provinces which are strong producers of vegetables, the increasing vegetable importation from 2013 onwards indicate a widening gap between the current demand and the vegetables supplied by the local farmers. On the other side, there is a need to strengthen vegetable exportation as it continues to fluctuate sharply over the period observed.



Source: World Bank – World Integrated Trade Solution

Figure 1.4.10 Trend of vegetable import and export in the Philippines in USD billions

Table 1.4.5 Philippine annual vegetable import and export values

Year	Exported value (in USD thousands)	Imported value (in USD thousands)
2008	2,050,473.4	3,523,974.8
2009	1,358,905.7	2,616,799.5
2010	2,083,782.5	3,047,023.6
2011	2,717,546.7	2,644,801.0
2012	2,479,105.7	2,656,708.6
2013	3,073,628.8	2,123,309.7
2014	3,983,054.6	2,898,587.9
2015	2,331,947.0	3,077,750.1
2016	2,611,083.7	3,407,549.1
2017	3,756,315.9	4,093,050.6

Source: World Bank – World Integrated Trade Solution

1.4.5. Factors driving vegetable consumption

Vegetable consumption has been growing at an annual average rate of 1.6 percent per year (from 1990 to 2005) (Digal, 2005). However, per capita consumption at 107g/capita/day is still below the World Health Organization (WHO) recommendation of 200g/capita/day. This trend persisted over the years as indicated by the 177g/capita/day in 2013.[3] This increase can be attributed to the improving economic conditions, rapid progress of urban centers, and heightening health consciousness among Filipinos. According to Concepcion (2005), urban consumption of vegetable has been increasing at a rate of 4.42 percent from 1980 to 2003 as compared to rural consumption growth of only 0.20 percent.

Generally, the demand for vegetables is positively correlated with increase in population and economic growth. The National Capital Region (NCR), Central Luzon and CALABARZON are the three most populated and most economically progressive regions in the country. In 2015, the combined population of these regions accounted for 38.1 percent of the total population of 101.0 million. The Philippines' gross regional domestic product per capita was Php82,592 in December of 2017. On the other hand, CALABARZON, Central Luzon, and NCR have GDP per capita of Php99,328; Php83,044; and Php244,453, respectively. All of these are higher than the country's average. This high per capita income in developing regions has driven the establishment of more fast food restaurants, supermarkets, and hypermarkets which in turn, increase the demand for vegetables. The growing population represents the increasing natural demand for these and other food products.

In the Philippines, the consumption of vegetables differs by type and location. In the NCR, eggplant and tomato have the highest consumption levels of more than three kilograms per year[4]. The other preferred vegetables are bitter gourd, chayote, cabbage, and onion with per capita consumption ranging from 2.07 to 2.77 kilograms. In CAR, chayote was consumed the most at 5.76 kilograms, followed by eggplant and tomato at 4.50 kilograms and 4.18 kilograms, respectively. For the Ilocos Region, eggplant and tomato were at the top of the list with annual per capita consumption of 5.96 kilograms and 6.00 kilograms. Within NCR, there is also variability of vegetable consumption among districts. The Eastern Manila District, which is the leading consumer of vegetables in this Region, eat more chayote at 4.13 kilograms, squash at 2.26 kilograms, and carrots at 1.48 kilograms. On the other hand, the consumption in the Northern Manila District is more on ampalaya at 3.32 kilograms, cabbage at 2.97 kilograms, and tomato at 4.19 kilograms. In the Southern Manila District, preferences are more on gourd at 1.32 kilograms, habichuelas at 0.36 kilogram, and mongo (mung bean) at 1.39 kilograms.[5] This pattern of consumption is also true in other urban centers in the country. Factors influencing consumption is more demographic rather than economic. Some regions have preference for certain types of vegetables. In the Ilocos Region, the preference is more for the 'pinakbet' vegetables while in CALABARZON and NCR, it is more on the 'chopsuey' vegetables.

In analyzing the vegetable consumption per capita trend in the Philippines, data from the Food and Agriculture Organization of the United Nations (FAO) showed that the vegetable consumption was at 63.7kg/capita in 2013. In a JICA study, this was forecasted to increase to 85kg/capita by 2040.[6] The fluctuations in consumption is influenced by supply shocks. Population and economic growth has driven demand to higher levels but actual consumption is low because of the decline in per capita production due to weather disturbances and the slow development of the agriculture sector in the country. However, the projected values below do not include losses along the value chain. This shows the potential for vegetable consumption and demand.

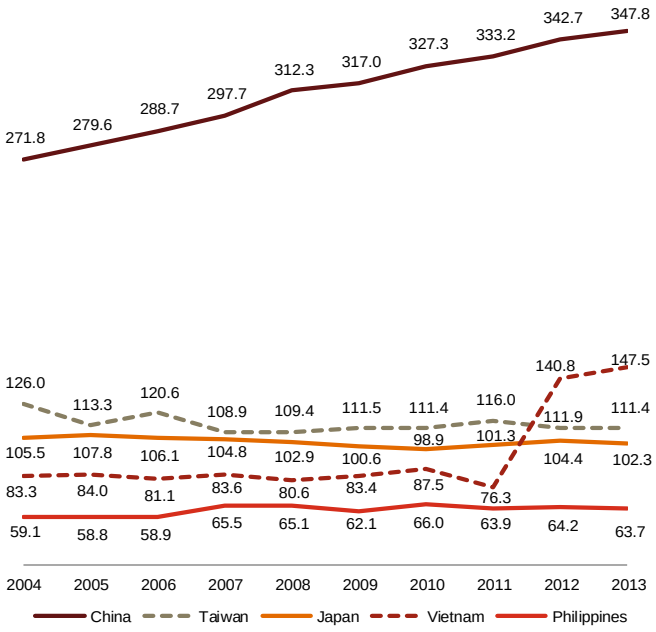
[3] FAOStat
[4] Consumption of Selected Agricultural Commodities in the Philippines. Volume 2. Philippine Statistics Authority, February 2017.
[5] Ibid.
[6] Agricultural Transformation and Food Security 2040 – ASEAN Region with a Focus on Vietnam, Indonesia, and Philippines: Philippines Country Report. JICA, January 2013

Table 1.4.6 Estimation of vegetable demand in the Philippines

Year	Population	Est. vegetable consumption per capita (in kg/year)	Demand (in tons)
2013	98,481,032	63.7	6,270,287
2014	100,102,249	64.5	6,455,186
2015	101,716,359	65.3	6,642,267
2016	103,320,222	66.1	6,831,303
2017	104,918,090	66.9	7,022,556
2020	109,947,900	69.4	7,628,348
2025	117,959,400	73.5	8,665,429
2030	125,337,500	77.5	9,718,763
2035	131,903,900	81.6	10,766,045
2040	137,532,200	85.7	11,786,510

Source: FAO, JICA, World Bank, PSA, PwC analysis

Comparing the vegetable per capita consumption of neighboring countries, data from the FAO show that the Philippines has the lowest vegetable consumption with an average of 62.7kg/capita for the 2004 to 2013 period. Other countries observed were China, Taiwan, Japan, and Vietnam. China displayed the highest vegetable consumption with an increasing pattern that reached 347.8kg/capita in 2013 and averaged at 311.8kg/capita over the same period. Vietnam has displayed notable improvement due to the growing awareness on food nutrition and health resulting to more attention to food safety and preference for healthier meals. This reinforces the need to strengthen the competitiveness of the Philippine agricultural sector to cope up with surrounding countries.



Source: FAO

Figure 1.4.11 Vegetable consumption per capita of neighboring countries in kg per capita per year

Currently, the government through the DA and the DTI is investing heavily in agriculture. Some of these initiatives include the strengthening of the programs for farm mechanization, national organic agriculture, and postharvest development. In addition, the crop insurance program is being expanded to cover the costs of devastating weather disturbances and pest and disease outbreaks. Financing assistance programs are also being revitalized in partnership with the Land Bank and other financing institutions. On the other hand, the Philippine Rural Development Program is leveraging private investments and

grants in building the capabilities of the agricultural and agribusiness value chains and in improving rural infrastructures.

Internal interventions, however, is not sufficient in improving the overall efficiency of the agricultural value chains. There is a need for collaboration among the ASEAN countries in market development, technology generation, adoption and transfer, and investment flows. The need for crop diversification, better utilization of resources, and exploitation of wider markets are also some of the other factors that need further support and development. Export experiences of Thailand and Vietnam could be adopted in developing a more outward-looking and competitive value chains. The collaboration of research and development projects could hasten the development of quality varieties that are adaptive to climate change, sensitive to fertilizer inputs, and resistant to pests and diseases.

The succeeding sections highlight key initiatives in the agricultural sector and characterize the current situation in the different nodes of the value chain.

Chapter 2. Involvement of the public and private sectors in the food value chain

2.1. Major corporations in each value chain node

Various local conglomerates dominate the agribusiness industry, branching in food manufacturing and distribution. The major players in production, along with the small-scale farmers, are the sources of the domestically consumed vegetables and fruits as well as some food products exported. The country's huge domestic consumption market partnered with strengthening government support will boost domestic and foreign investment and cause output expansion, better yield, and reduced wastage.

Table 2.1.1 Major corporations per value chain node

Production	Storage and/or Distribution	Wholesale and Retail
Del Monte Philippines, Inc. is a leading producer, distributor and marketer of premium quality and healthy food and beverage products. DMPI operates a fully-integrated pineapple operation with its 25,000-hectare pineapple plantation in Bukidnon, Philippines, and a factory that is about an hour's drive away from the plantation. It also operates a frozen fruit processing facility in Bukidnon and a beverage polyethylene terephthalate plant in Cabuyao, Laguna.		SM Food Retail include SM Supermarkets, SM Hypermarket, and Savemore. Savemore is SM's fast expanding vehicle for introducing organized retail in areas where there is either a limited offer of products or none at all. SM Food Retail also recently entered into a joint venture with Walter Mart stores which are anchor establishments in its community malls.
Dole, located in Bukidnon, is a producer and marketer of high-quality fresh fruits and vegetables with various product lines of packaged foods. Its Philippine plantation accounts for 80 percent of the global production. Dole Philippines aims to expand its plantation area by increasing its plantation facility in South Cotabato from 17,000 hectares to about 25,000 hectares to cater to the rising global demand for fruits.		Metro Retail Stores Group Inc. is a retail company based in Mandaue, Cebu, Philippines. According to a 2014 report by Euromonitor, Metro is the largest operator of department stores and hypermarkets in the Visayas region, as well as the second largest supermarket operator according to retail sales value.
Dizon Farms Produce Inc. was founded in 2004. The company's line of business includes the wholesale distribution of fresh fruits and vegetables.		Puregold is a chain of supermarkets operating a total of 147 hypermarkets, 100 supermarkets, 29 extra,

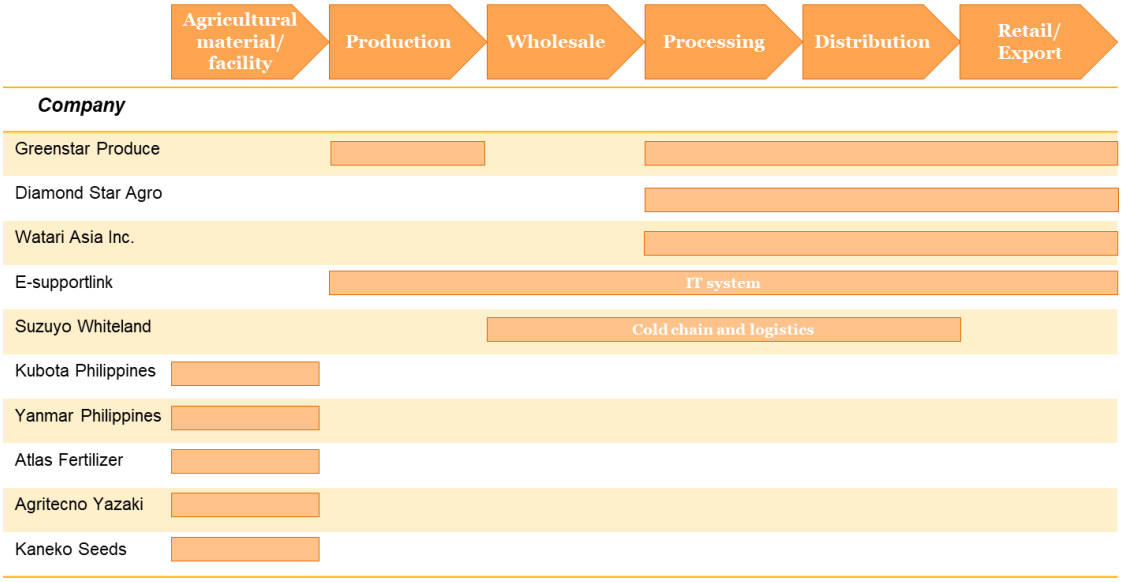
		and 1 minimart.
Profood International Corporation is the largest Philippine-based dried fruit producer and exporter of processed fruit products from the country. The company has established a network of buying stations/suppliers of fresh fruits throughout the country. It is constructing a new dried mango plant in Cambodia as it has seen the dwindling mango production in the Philippines insufficient for the global demand.	Royal Cargo carries over 39 years of experience in cargo transportation and handling, with its own global network of owned companies and trusted agents. Royal Cargo invested USD14.0m in a 36,000sqm property with a 9,000sqm covered warehouse in Cordova, Cebu. Potential hubs in Davao, Iloilo, and Bacolod are in the planning stage. The new cold storage warehouse in Bulacan was built in anticipation of the high demand for food and relocation of many food manufacturers particularly in Metro Manila, Clark, and Subic.	Rustan's Supercenters, Inc. is the operator of Rustan's Supermarkets, the Shopwise chain of hypermarkets and Wellcome. It is a leader and pioneer in the grocery shopping industry, well known for its focus on quality, customer service, and fresh food. Rustan's Supermarket is a pioneer in modern grocery retailing. At present, Rustan's Supermarket is continuously expanding with 16 branches in Metro Manila, 2 in Cebu, and 1 in Cagayan De Oro.
	Vifel Ice Plant & Cold Storage, Inc. is under the Ignacio Group of Companies. This company is equipped with advanced refrigeration systems with over 60,000 pallet capacity and is one of the leading players in the cold storage industry.	Robinsons Supermarket Corporation has three formats which include Robinsons Selections, Robinsons Easymart, and Robinsons Supermarket. Robinsons Supermarket is one of the largest supermarket chain in the country with 140 stores by end of 2016.
	Glacier Megafridge Inc. provides third party logistics through integrated operation, warehousing, and transportation services that can be scaled and customized according to its clients' needs. It has facilities in Panay, Bicol, and Metro Manila.	
	Jentec Storage was incorporated in 1999 and now has the largest volume count among all	

	commercial cold storage operators in the Philippines. Primary services are made up of Climate Controlled Storage, Refrigerated and Frozen Storage, Blast Freezing, and Fruits and Meat Processing while other services include trucking, packing, and crating.	

Source: Company websites and articles

2.2. Japanese companies in the Philippine agriculture business

Some Japanese private players conduct business in certain nodes of the vegetable value chain. With regards to the exportation of okra to Japan, the value chain from production to export has already started developing. The okra produced by contracted farmers are first washed, sorted, and packaged in factories then shipped to the airport to be delivered to Japan. This arrangement supports the stable supply and preserves the high quality of produce for export. In terms of domestic sales, some distributors source vegetables from different channels including contracted farmers. Purchasing produce in trading posts is also a conventional way. These vegetables from production sites such as Benguet are transported in refrigerated vans to major consumption sites like Metro Manila. These refrigerated vans have two temperature rooms to carry different produce for chilled and for frozen. To maintain the quality of the vegetables, these vehicles are equipped with closed-circuit television, drive recorder, and the global positioning system to monitor the temperature remotely. Due to these, the Japanese logistics company charge a higher service fee as opposed to the traditional transport vehicles of local companies. But since the vegetable quality and freshness are preserved, these can be sold at a higher price in the markets. This cold chain vegetable channel is the model value chain that is implemented in Japan. It increases the income of farmers, reduces intermediaries, decreases losses in distribution, and provides fresh produce to consumers. However, the traded volume in this channel is only about a few metric tons per week in the Philippines. The integrated use of cold chain facilities in the vegetable value chain incurs additional cost, which only high-end hotel, restaurant, and institutional buyers can afford.



Source: Company websites

Figure 2.2.1 Japanese companies involved in the agricultural value chain

It is expected that the demand for fresh vegetables will continue due to the growing population of the Philippines. Although it can be observed that the Filipino diet focuses more on meat than vegetables, there is a potential in the growth of vegetable consumption due to the increase in living standards and the shift towards health consciousness.

2.3. Trends in the Philippine agriculture and food enterprises

As major players and start-ups get involved in the Philippine agriculture, various trends and initiatives are being developed to slowly address challenges in the sector. Technological advancements and smart innovations, various ways of growing crops via healthier alternatives, increases in exports and imports, and behavioral changes of consumers are the key drivers of improvement in the sector.

2.3.1. Production

Dizon Farms: consolidator of fresh fruits and vegetables. Dizon Farms started its operations in 1960 and has since become the pioneer in the local vegetable and fruit industry. It also grows and exports Cavendish bananas to countries in Asia. Currently, the Dizon Group of companies has farms in Davao, Pampanga, and Mindoro Occidental. To date, they supply about 167 supermarkets, including SM, Robinsons, Ever, Waltermart, Shopwise, South Supermarket and Puregold chains of supermarkets, The Landmark, Pioneer Center, Rustans Supermarket, Makati Supermarket Alabang, Unimart, Cash & Carry, and Sta. Lucia East Supermarket, among others. Through direct purchasing and close link with growers in Luzon, Visayas, and Mindanao, the company is able to efficiently supply these stores. It also has good relations with local importers and foreign suppliers. Additionally, the company has its own quality transport and logistics with a fleet of more than 81 delivery trucks. The established quality controls, refrigerated and non-refrigerated storage facilities as well as periodic training seminars for their labor force ensure that the fruits and vegetables maintain the predetermined display specifications and retail level quality[7]. With their warehouse in Taguig City, Dizon Farms is able to efficiently cater to their major customers in the Metro Manila region.

Grameen Foundation: FarmerLink program. Grameen Foundation is a global non-profit organization that aims to eradicate poverty, reduce hunger, and extend microfinance to the world's poorest people. It began its operations in the Philippines after the government launched a new strategy to build the country's microfinance sector[8].

In collaboration with the Philippine Coconut Authority, Franklin Baker, and People's Bank of Caraga, Grameen Foundation launched FarmerLink with the purpose of increasing farming households' incomes and resilience by improving their productivity, providing them access to appropriate financial products and services, linking them directly to markets, and reducing their losses to pests, diseases, and weather calamities. In this program, basic information were gathered from registered farmers to come up with the *farmer profile*. This aims to understand their background and practices, particularly finances, household information, and education level, among others. This profiling is helpful in that it gathers relevant information that can be utilized to help farmers gain access to financing and assistance. For one, it was used by the Rural Bank as a supporting document in the credit scoring of farmers who want to avail agricultural loans. For another, it can be used by the local government in identifying and targeting farmers for farmer development programs.

An innovative aspect of this program is the employment of geo-tagging and short message services or text messaging as an avenue for the early warning system implementation and the distribution of relevant agricultural information. If certain conditions for weather, pest, and diseases are met, an alert is triggered and text message is sent directly to the farmer's phone. In addition, farmers receive bi-weekly reminders, tips on good agricultural practices (GAP), pest and disease management, and financial literacy. Through this, the farmers have increased access to needed timely information.

East West Seed with local government of San Fernando. In 2017, the company has helped develop the one-hectare city nursery in Brgy. Lara into a demonstration farm where various agricultural techniques using farm-ready seedlings were introduced to the Fernandino farmers. This has helped facilitate the improvement of the production of vegetable varieties as well as the promotion of sustainable agriculture that helps increase the income of farmers.

[7] http://www.dizonfarms.net/
[8] https://grameenfoundation.org/where-we-work/asia/philippines

In the past, the company has given significant support to Typhoon Yolanda victims through its sustainable livelihood recovery program in Samar and Leyte. It was able to donate some 22,650 seed pouches and 520 seed cans with the value of Php200,000 from its seed fund to the local government units (LGU) of Leyte, Samar, Bohol, Iloilo, Capiz, Aklan, Antique, and Cebu within the first 100 days after Yolanda. In addition, the company was able to raise Php1.4 million in donations from its employees and satellite offices and used the money to mobilize its Technology Transfer Department, the unit in charge of the post-Yolanda livelihood program.

East West Seed is active in technology transfer and extension services through public-private partnership projects with government, non-governmental organizations, other private companies, micro-finance organizations, and local and international funding agencies.

Technology innovation. The DA is implementing a farm mechanization program which includes distributing improved farming equipment to increase productivity, income, and "agri-preneurship" of local farmers. Part of the priorities in agriculture under the Philippine Development Plan is the distribution of farm tools and equipment to clusters of farms or farmer associations for pooled utilization. Concurrently, DA has also initiated solar-powered irrigation projects in different areas of the country. Other technological platforms were also introduced to help farmers improve farm management. Some of these are the Farmers Guide Map website, Rice Crop Manager, AgriDOC app, and KROPS app. In terms of financing, interested investors can help farmers through the use of crowdsourcing platforms such as Cropital and FarmOn.

Smart farming initiatives. In an effort to modernize and strengthen the agriculture sector, state and private companies promote the adoption of advanced technology and smart farming methods that will increase harvest while minimizing losses. The implementation of the Php128 million (USD2.5 million) Smart Plant Production in Controlled Environments (SPICE) program is designed to develop and promote urban farming and high-tech plant conservation. This was initiated by the Department of Science and Technology- Philippine Council for Industry, Energy, and Emerging Technology Research and Development (DOST-PCIEERD) in partnership with the Institute of Biology and the Electrical and Electronics Engineering Institute of the University of the Philippines - Diliman and the Institute of Biology of the University of the Philippines - Los Baños (UPLB). In this farm, new techniques will be practiced such as vertical farming, micro-propagation, cryopreservation and hydroponics to develop technology that will boost crop production and reduce manual labor. Additionally, partnerships between government agencies and the private sector aim to train farmers in implementing climate-smart practices (e.g. use of modern technology, and crop and soil management). An example of this is the smart farming initiative launched by Monsanto, a multinational agricultural firm. This program provides training about new technologies in improving corn planting and cultivation to corn growers.

Organic agriculture. To support organic agriculture in the country, the Republic Act (RA) 10068, otherwise known as the Organic Agriculture Act of 2010 was promulgated to ensure the prioritization and appropriation of funds to support programs, projects and activities for its operation and sustainability. In fact, the spending for organic agriculture increased from Php635 million in 2016 to Php818 million in 2017, and to a proposed budget of Php895 million in 2018. Additionally, the land dedicated for organic farming increased by 189.6 percent from 81.0 thousand hectares in 2012 to 234.6 thousand hectares in 2015.

2.3.2. Marketing, retail, and distribution

Jollibee Group Foundation (JGF): Farmer Entrepreneurship Program (FEP). Through the FEP, JGF supports local farmers by partnering with various organizations who train small-scale farmers to become agro-entrepreneurs who are capable of meeting the standards and requirements of corporate buyers while ensuring that farmers make a profit. JGF implements the "train the trainers method." In the FEP, JGF establishes relationships with local partners and equips them regarding agro-enterprise methods. These local partners then provide training, production support, farm monitoring, and guidance to the accredited farmers. This is because farmers are more adaptive when they are taught by their peers/locals.

In contracting with the farmers, JGF implements a monthly contract with qualified farmer cooperatives or associations, with the price locked for one month. To ensure equitable farmer income, the contract buying is at a negotiated price based on the cost production data provided by farmers.
In this program, best practices observed were the promotion of peer-to-peer learning from farmers and partnership with LGUs and institutions to understand the process and needs of the farmers.

SM Foundation, Inc. with Harbest Agribusiness Corporation and the DA, Department of Social Welfare and Development (DSWD), and LGUs. The "Kabalikat sa Kabuhayan" Farmers' Training Program is the leading program of SMFI for its livelihood advocacy. It is supported by its program partner Harbest Agribusiness Corporation with the cooperation of DA, DSWD, and LGUs. This program provides sustainable livelihood program to marginalized farmers by equipping them with new knowledge in practical agricultural methods and technology and skills in entrepreneurship and marketing. This is implemented over a 12-week period of modular lectures and hands-on training on high value crop production. One of its goals is to teach farmers how to effectively market and sell their crops to penetrate high-end markets. To achieve this, SMFI partnered with DSWD for the conduct of sessions in social entrepreneurship, basic accounting and values formation, and with DA for additional training inputs and materials. It was first launched in Negros Occidental at Brgy. Handumanan, Bacolod City in 2007. One of its latest training course was successfully completed last May 21, 2019 at the project's demo farm in Sitio Manalpaac, San Pablo, Cauayan City where 121 farmer-trainees were able to harvest and sell their produce at a "harvest festival."

Max's Group, Inc. (MGI) with DOST-PCAARRD. This partnership focuses on providing small farmers with a sure market through MGI and its subsidiaries as buyers. This aims to ensure a stable and reliable supply-base which is advocated by PCAARRD's Science and Technology Community-based farms and the TechnoMart projects.

Recently, MGI also requested support in developing the supply chain for a sweet potato variety that can produce quality fries. This is in relation to their product, "spring chicken with sweet potato fries." In response, PCAARRD provided assistance through its project, "Support Systems for Sweet Potato Value Chain Development and Establish Sweet Potato Value Chains in Leyte-Samar." This is being implemented by the Visayas State University – Philippine Rootcrops Research and Training Center (VSU-PhilRootcrops) under the PCAARRD-funded Sweet Potato Industry Strategic Program (SP-ISP). In conjunction, MGI engaged Nutri-pros, a private food-business entity leading a farmers' group. Through this partnership, the development of the sweet potato supply chain is sufficiently supported to meet the rising demand. It also means access to the company's corporate social responsibility program which can benefit farmers both in production and processing.

2.3.3. Processing

The growth of the urban population coupled with the economic progress of the country drives the growth in fast food chains, hotels, restaurants, and institutional buyers. This in turn leads to increasing demand for processed fruits and vegetables. Foremost of those is the demand for potatoes. In 2017, the Philippines imported about 121.7 thousand tons of pre-processed fries amounting to about 243.3 thousand tons of fresh potatoes. Accordingly, the Philippines is one of the fastest growing fry import market with up to about Php451.8 billion worth of potatoes imported from the United States, Canada, and Belgium, among others.[9] Currently, local farmers are unable to produce the potato processing variety at the quality and quantity needed. This is the reason why most companies import to fill the supply gap.

Federation of Aritao Rural Improvement Clubs, Inc.: Processing center. In Nueva Vizcaya, the Federation of Aritao Rural Improvement Clubs, Inc. was able to set up a tomato processing facility, in partnership with the local government, DA, Philippine Center for Postharvest Development and Mechanization (PhilMech), and the Department of Trade and Industry (DTI) in their Bottom-up

[9] https://potatoesnz.co.nz/news/philippines-fastest-growing-fry-market/

Budgeting (BUB) project. The product development is still underway through shelf-life studies and standardization of the fermentation process. The processed tomato products comprise of chewies, wine, and vinegar. In the period of January to April 2018, they were able to produce 266 kilograms of tomato chewies, which they sell in the Tuguegarao airport and various *pasalubong* centers.

XYZCO Foods Corporation: Pre-cut vegetables. The company was established in 2007 which first started with selling pechay in the market. Due to the stiff competition, the company diversified into pre-cut vegetables. Its processing facility operates in Marikina City. These pre-cut vegetables provide several benefits to restaurants and institutional buyers. First, the vegetables are clean, safe, and ready for cooking. Second, the quantity received is sufficient for the given period with consistency in delivery, quality, and price. Lastly, there is lesser time in food preparation and manpower.

In the processing plant, vegetables sourced from Benguet arrive early in the morning and are brought to the preparation room which is maintained at a temperature of 18 to 24 degrees Celsius. Some of the vegetables being processed are cabbage, carrot, and potato. These then go to the sanitation, cutting, and packing room. A sanitization process is implemented before the vegetables are cut or diced into standard sizes. Carrots and potatoes are peeled, with the latter soaked in water first before being vacuum packed. The pre-cut vegetables are then brought to a refrigeration room before they are delivered to clients.

The company has further expanded its product lines by venturing into the processing of fried garlic and sushi rice in response to the demand of their customers. The depth of the product lines is expected to expand as it responds to the specific needs of their clients. To preserve the quality of the vegetables deliveries are through refrigerated vans.

Other processing companies. Several enterprise process vegetables ranging from simple packaging and repackaging to processing of tomato paste and pre-cut vegetables. The Northern Foods Corporation processes tomatoes into tomato sauce, paste, and catsup. It supplies the needs of major fast food industry companies such as McDonalds, Jollibee, and others. Ram Foods Inc. processes both fruits and vegetables. In addition to tomato sauce and paste, canned peas and mixed vegetables with carrots, peas, and corn are also produced. Frozen cut vegetables are also a product line with supermarkets as their main client. Supermarkets such as SM, Robinsons, and South Supermarket have their own brand names for frozen cut vegetables. These pre-cut vegetables include carrots, corn, and green peas. These supermarkets also sell frozen cut potatoes for French fries sold to household consumers. On the other hand, Dizon Farms has a packaging arm for assorted vegetables which are sold mainly to institutional buyers such as supermarkets, hotels, and restaurants. The company also ventured into selling fresh salad packages which includes a salad dressing. These comprises of cut lettuce, carrots, and cucumber with some variants including tomatoes and zucchini. GTGF Food Corporation is also a leading company that locally processes vegetables, fruits, and ready-to-cook meal products for the consumption of Metro Manila and surrounding provinces.

2.3.4. Logistics

Air21 and 2Go Express with the Department of Science and Technology (DOST) and the DTI. DOST, in partnership with DTI, launched oneSTore.ph which is an e-commerce web application that provides an avenue for product promotions and marketing for micro, small, and medium enterprises (MSME) under its Small Enterprise Upgrading Program (SETUP). To solve its online payment, logistics, and other concerns, oneSTore.ph partnered with Air 21 for the door-to-door delivery of goods, and the Land Bank of the Philippines (Land Bank) for the e-payment portal. Through this initiative, Air21 was able to expand its operations in the provincial areas in delivering agriculture-based products to Metro Manila. Accordingly, the company is planning to improve about 270 of its trucks to cater to small and medium enterprise farmers who need temperature-controlled transport for their produce. The oneSTore.ph has also partnered with 2Go Express and the Filipino Inventors Society Producer Cooperative to improve its services and transactions. Through this, it has accumulated total online sales of about Php1.2 million and walk-in sales of Php39.2 million, as of 2018.

Mober application. This logistics company allows users to access transportation services through the use of the internet and a mobile application. The company offers on-demand, same day delivery services that enables buyers to track delivery location and estimate time of arrival through the application[10].

2.3.5. Consumer trends

Recently, Filipino consumers are leaning towards healthier food, beverage, and lifestyle choices. They are looking for functional foods that provide benefits either in reducing risk of disease and/or promoting good health. Consumers are going back to the basics – preferring vegetables/fruits, all-natural foods and those without genetically modified organisms. The trend in salad-based cuisine and fresh fruits and vegetables permeate the market with the rise of salad bars and restaurants, ready-to-go meals, and healthy food bowls. Lately, purchasing produce with organic labels has been the trend as more Filipinos become health-conscious. Various local small-scale producers with organic and/or farm-to-table branding have been joining weekend markets which give consumers access to these products.

2.4. Relevant projects implemented in the Philippine agriculture sector

2.4.1. Japanese public institutions

JICA is a major Japanese organization committed to improving the agriculture sector in the Philippine. The various projects by JICA has benefitted not only small farmers and cooperatives, but also the municipal, provincial, and national government. The projects extend from grassroots level to nationwide scale. One of their technical cooperation projects implemented titled "Enhancing the Competitiveness of Fresh and Semi-Processed Agricultural Products through the Application of Appropriate and Sustainable Packaging Technology", has helped small and medium enterprises (SME) involved in semi-processed vegetables as well as small scale farmers and farmer cooperatives involved in the consolidation and marketing of their produce. The appropriate and sustainable packaging technology introduced has reduced transport, post-harvesting, and handling losses, maintained the delivery of fresh and high quality produce, and enhanced the incomes of relevant players.

Another project implemented was the "Pilot Survey for Disseminating Japanese SME Technologies for Introduction of Information Technology (IT) for Agricultural Products Distribution". This project was implemented in coordination with the DA and the Department of Agrarian Reform (DAR). The target beneficiaries were the Sentrong Pamilihan ng Produktong Agrikultura sa Quezon Foundation, Inc. (Sentrong Pamilihan) and select cooperative members of the Federation of Patriotic Farmers Cooperative of Nueva Ecija (FPFCNE). This project aimed to develop the distribution system by introducing two technologies, namely the farm management system known as Farm Story and the sales management system known as ESL system. The Farm Story will record farmers' and cooperatives' production data to create a production ledger and harvest schedule to aid farmers improve their cultivation method and plan proper cropping patterns. On the other hand, the ESL system supports the transactions between farmers and buyers in trading posts. This will entail the following functions. Upon arrival of the produce, the farmer is recognized through the identification data in the database and relevant information (e.g. shipping data, kind of items, amount, price, date, time, etc.) are recorded. When selling the crops, the buyer's identification data, the kind of items, the amount, price, date, time, and other data are also gathered. To facilitate the efficient payment transaction, farmers can visit the market the day after and get the payment for their products based on the transaction database. At the end of the project period, the following outcomes were observed. The ESL system increased work efficiency in disbursing money to farmers, recording and analyzing data (e.g. selling quantity, amount, and average price), and visualizing the buying and selling transactions. Useful application of the production data would be in implementing strategic crop programming and analysis of supply and demand. As such, the Japanese SME's technology enhanced the efficiency of the vegetable production and trading in the markets.

[10] https://www.mober.ph/

Aside from JICA, some sister cities from Japan also have collaborations with major vegetable production sites in the Philippines. Although these relationships focus more on promoting cultural and commercial ties, the exchange of farmers for agricultural training and technical cooperation has also contributed in improving the agriculture sector. For example, Miyako City in Iwate Prefecture is a sister-city of La Trinidad and has accepted several farmers since 1996. In this, Filipino farmers are sent to Japan to learn about the culture and agricultural practices that can benefit their farms. Kochi Prefecture, partnering with Benguet, has continued the relationship for more than 40 years. In 2018, through the Young Farmers Exchange Program, twenty nine young farmers from Benguet were sent to Kochi, Japan for a three-year agricultural program. These continuous collaboration at the municipal or provincial level contributes to the development of the agriculture in specific areas.

2.4.2. Japan Agricultural Exchange Council (JAEC) programs

Safe vegetable production and efficient value chain promotion. In 2016, JAEC initiated the "Implementation of Safe Vegetable Production and Marketing Technology Improvement Project" in Benguet and CALABARZON. This addresses two key nodes of the vegetable value chain, particularly cultivation and marketing. On the production node, the Safe Vegetables from Rich Soil introduced the Japanese technology of utilizing the wood vinegar "Mokusaku," charcoal, and compost in implementing a safer and more effective fertilizer for selected farmers. The wood vinegar technology was used for the production of organic fertilizers from farm wastes and also acts as an organic pesticide to get rid of insects in the production areas. It supplements the production of organically grown highland and lowland vegetables such as lettuce, Japanese cucumber, and tomatoes.

On the marketing aspect, the Farmers Improvement Vegetable Packing and Shipment aims to deliver quality vegetables directly to the consumer by incorporating proper harvesting, sorting, and packaging at the farm level to increase the value of the produce. This promotes the use of plastic crates, plastic bags, and boxes to preserve the quality of the produce and lessen mechanical damages during transport. The objective of this program was to advance the production of organic, safe, and high quality vegetables. To further reinforce these programs, proper packaging and transport initiatives were developed. Proper packaging and direct transport to market resulted to reduced losses, time savings, and larger volumes of vegetables transported. Aside from the value chain players, consumers also benefitted from this project. Through this, vegetables sold at the supermarkets and restaurants have better quality.

However, since the project was only conducted at a small scale, the impact is yet to be felt in other farming communities. In 2017, the project started from 500 to 700 kg per week and was able to market up to 2,000 kg of vegetables per week. It is suggested that the program be scaled up and include other farmers and farmer cooperatives in Benguet and CALABARZON in order to transport more high quality vegetables to the market. However, another problem is encountered in the trading posts where the price of the commodity is usually dictated by the traders and the current supply in the market rather than the quality of the produce. As the consumers are price sensitive, more vegetables with lower prices are sold than organically grown, high quality, and safe vegetables. This makes it difficult for organic farmers to put a price premium for their produces.

JAEC crop programming. JAEC has conducted the implementation of crop programming in several places ranging from Benguet, Quezon, Batangas, Cavite, and Pampanga to Leyte. The purpose of this program is to stabilize the supply of fresh and quality vegetables through effective scheduling of crop production. This helps participating farmers understand the market requirements and learn to plan the seeding, harvesting, and shipping to these markets.

The crop programming trains farmers through a comprehensive approach. The program starts from land preparation such as application of compost, charcoal, and fertilizer. This also covers production where farmers are trained on how to prepare seedlings, manage growing vegetables, and reduce the use of chemicals through Mokusaku wood vinegar. On the harvest, farmers are instructed to clean, trim, and sort the produce at the farm level, including the use of plastic crates and refrigerated trucks during the transport. As to the marketing aspect, farmers are educated on the requirements of institutional buyers,

retailers, and other buyers. In Benguet, 60 selected farmers participated in this program and have achieved significant improvement. Likewise, similar practices were implemented across JAEC's targeted areas. The crop programming benefits farmers not only for participating farmers but also markets which those farmers access.

Several challenges were encountered in aspects of the project. As to cultivation, farmers lack knowledge and do not follow the program. Also, most farmers use chicken dung, instead of compost, charcoal, and mokusaku. Additionally, the varieties planted were not suited to the target markets. On the transportation node, farmers sell to others due to the lower volume when crops are placed in crates. Consequently, vegetables are not put in crates to maximize the transport vehicle. On the market, farmers sell to their connections in the open market system.

Addressing these challenges will enhance the benefit offered by this program. Recommendations include comprehensive agri-entrepreneurship trainings for farmers and farmer organizations to develop their capacity to supply corporate accounts. This can be provided by JICA, in coordination with DA. To improve the quality of their vegetables, farmers can be assisted in complying with the GAP for production and good postharvest practices such as precooling in the field, appropriate packaging, and cold chain transport to market centers. Once the farmer organizations are equipped in producing organically grown, high quality and safe vegetables, they can then be linked to high end markets in Metro Manila and other markets. Contract supply agreements with buyers will help farmers have a stable market and a set volume and price which will enhance farm profitability.

In order to expand the capacity of farmers, the government can assist in increasing the efficiency of the farmers. This can be done by utilizing the trading centers in production areas as a consolidation center for vegetables in the production areas with the Food Terminal Inc. (FTI) complex in Taguig as a distribution center to cater to the consumers in the Metro Manila region. In support, DOST can supplement research, development, and commercialization of appropriate packaging technology to preserve the quality of the vegetables. Concerned government agencies, such as LGUs, can assist farmers in implementing GAP and organic farming as well as promoting the vegetable quality standards with proper monitoring and application.

2.4.3. Related donor organizations

Asian Development Bank (ADB)
Irrigation system operation efficiency improvement project (33453-012)
The project aims to improve the performance of the irrigation system in order to increase agricultural production and farm income, while generating employment. It will (i) refine and institutionalize the processes and strategies for transferring operation and management (O&M); and ownership of below secondary level of irrigation canals in the National Irrigation Systems (NIS), and (ii) transfer the O&M and ownership of several NIS. The project was conducted in Visayas and Mindanao last November 6, 2008 to August 31, 2011.

In this, the outcome of the project preparatory technical assistance (PPTA) will be the formulation of an investment project that will improve agricultural productivity and production by (i) improving irrigation services and institutional arrangements that will increase the role of water users in system O&M; and (ii) upgrading rural infrastructure, including irrigation systems, roads, and postharvest facilities of selected irrigation systems in Mindanao and the Visayas. The PPTA was comprised of two phases. Under Phase 1, the output was an agriculture sector road map to guide future operations in the sector and strengthen the rationale of the ensuing project. Under Phase 2, outputs included (i) subproject selection criteria and a long list of potential projects; (ii) agreed irrigation management transfer (IMT) strategy for selected subprojects in response to the NIA rationalization plan; (iii) fully appraised selected core subproject design, and (iv) loan project design.

ADB and the Philippines. The partnership between ADB and the Philippines is in line with the government's vision of addressing underinvestment in infrastructure, reducing poverty, addressing

income inequality, and lessening the discrepancy of growth among regions. In 2018, two major loans from ADB were implemented by the government amounting to USD600 million. Half was allocated in supporting efforts to strengthen the framework under which the private sector can participate in the "Build, Build, Build" program, while the other half supports the reforms to expand financial services to the marginalized sector of the country, including farmers, workers, and vulnerable households. In 2019, lending operations focus on climate resilient infrastructure development and effective disaster risk management. In this avenue, JICA can work with ADB in initiatives that address the financing, infrastructure, and technology needs of farmers particularly in responding to the harmful effects of climate change.

World Bank Group (WBG)

Mindanao inclusive agriculture development project (P163107)

This project is still in the concept stage with a target project period from 2019 to 2025. The target locations are in the rural and marginalized areas of Mindanao, like in Regions IX, X, XIII, and Autonomous Region of Muslim Mindanao (ARMM). This project aims to increase the agricultural productivity and integration in the value-chains of smallholder farmers and fisher folk in targeted areas in Mindanao. Key outcome indicators include, (i) increased income from agricultural production activities (referring to agricultural production, reduction of losses, value adding/processing, agricultural employment); (ii) increased yield and quality of produce of targeted products; (iii) increased marketed outputs of targeted products; (iv) farmers have access to agricultural assets or services; and (v) number of beneficiaries disaggregated by gender.

The project would cover three proposed components over six years to address the main identified challenges of productivity improvements, business development and value chain linkage and convergence. These components are:

- Agriculture production and marketing support. This has the intention of focusing on increasing the agricultural production and productivity of smallholder farmers through organization/strengthening of production groups. Nutrition related messages and actions as well as increased knowledge on GAP could be integrated in the support offered. This has two proposed sub-components: (i) production and marketing support; and (ii) economic development support.
- Agriculture enterprise development and value chain linkage. This aims to advance linkages between agriculture producers, fisher folk and relevant markets to empower and increase their attractiveness as market partners, reduce market transaction costs, and focus their production decisions towards business and market opportunities. This would be achieved by supporting various models of joint actions of producer groups, federations or cooperatives of producer groups and private sector players. Two sub-components are proposed: (i) business partnerships and business promotion; and (ii) access to financing and market facilitation.
- Institutional support and convergence. This component will build the capacity of and provide incentives for relevant institutions to provide the supporting services for the community organizations. Further, it would provide support to the implementing agency, including procurement and financial management, and monitoring and evaluation. As much as possible, the project would aim to build on existing structures and institutions.

Philippine rural development project (P132317)

The Philippine Rural Development Project (PRDP) helps raise rural incomes, enhance farm and fishery productivity, and improve market access throughout the country. It supports provincial planning, rural infrastructure and agriculture enterprise development. It uses tools such as geotagging, value chain analysis, and expanded vulnerability and suitability assessments to help guide public investments toward a modern, value-chain oriented, and climate-resilient agriculture and fisheries sector. Since 2015, the project helped support provincial planning for priority agricultural commodities in all 81 provinces of the country. Rural road improvements number 1,553 km with an additional 1,171 km being improved. This benefits 600,000 households, and also supports irrigation, potable water systems, warehouses and other post-harvest facilities. Beneficiaries up to 126,000 receive support through 610 agriculture enterprise projects. Improved provincial planning further resulted in provinces being able to mobilize

an additional USD700 million of funds for identified priority investments in agriculture. This project started last December 31, 2014 with a target end on May 31, 2021.

Of notable interest is the success of its enterprise development component. So far, approved funding of 573 enterprise sub-projects worth Php1.8 billion benefitted roughly 122,000 farm or fisher households (members of proponent groups) of which around 38,000 benefit from completed sub-projects. These comprise of 433 micro enterprise sub-projects, 114 small enterprise subprojects, and 26 medium enterprise sub-projects. These sub-projects have gone through the preparation of Business Plans that are vital to adequately guide the proponent groups implement strategic models for sustainable viable enterprise operations. The proponent groups have established Enterprise Manual of Operations detailing the policies and procedures in the operation of the enterprise. They were also assisted in setting up of the simple financial management system to record transactions of the enterprise which will aide them in assessing the performance of the enterprise operations. As of the December 2018, the project has completed 228 enterprise sub-projects worth Php264.23 million benefiting about 38,500 farmers or fishers. These enterprises are already using the facilities, equipment, goods, knowledge and others acquired from the project in the operation of their enterprises, which are perceived vital towards greater productivity and income of farmer beneficiaries.

Other benefits of the project include increased real household incomes of farmer and fisher folk beneficiaries, increase in value of annual marketed output, and increase in farmers reached with agricultural assets or services. In 2018, the Project has conducted Rapid Appraisal of Emerging Benefits (RAEB) to 25 Farm to Market Roads (FMRs), with the results of the household survey showing that the beneficiaries gained about 15.20 percent increase in annual household real income. Of the 298 persons who responded to the household survey, 157 indicated they have achieved higher income due to benefits they are gaining from the presence/use of the concreted/rehabilitated FMRs. Also, the consolidated household survey results show that the value of marketed outputs of farm households increased by 21.5 percent from without subproject at Php30,031 to with subproject at Php36,489. RAEBs for completed FMRs are showing substantial cost savings (i.e. 13 percent reduction in hauling costs, influx of traders to previously inaccessible areas, reduced post-harvest losses, and an increase in use of market contracts by enterprises). Lastly, a key service reaching project beneficiaries is the provision of technical assistance by the LGU technicians to monitor operations of enterprises as well as support adoption of GAP or Good Animal Husbandry Practice (GAHP) and pest and disease management practices. Completed FMRs are serving some 129,653 households while beneficiaries of already approved enterprise subprojects number 125,968.

Participatory irrigation development project (P088926)
This project aims to improve irrigation service delivery on a financially and technically sustainable basis that will contribute to increased agricultural production and productivity among beneficiary farmers in irrigated areas. This was implemented from June 24, 2009 to August 31, 2018 and has the following components:

- Irrigation sector restructuring and reform. This component focuses on providing support to the implementation of NIA's Rationalization Plan, incorporating the program of severance payments and the corresponding institutional strengthening activities. In addition, it will help establish more sustainable financial and institutional mechanisms for improved participatory O&M and routine rehabilitation of NIS.
- Irrigation infrastructure development. This component will improve the delivery of irrigation services in about 58 NIS through rehabilitation and modernization of existing irrigation systems in order to provide more reliable and flexible irrigation services.
- Project management and coordination. This component will provide the support for an efficient coordination, implementation, and management of the project, including strengthening the financial management and procurement functions and the establishment and operation of the results monitoring and evaluation system for the project.

The project had significant impact on agricultural production and productivity.

WBG and the Philippines. For the period 2015-2018, the WBG has aligned their country partnership strategy for the Philippines with the 2011-2016 Philippine Development Plan of reducing poverty and promoting shared prosperity and inclusive growth. The priority areas targeted by the projects include empowerment of the poor and vulnerable, promotion of rapid, inclusive, and sustained economic growth, improvement of the climate change and disaster risk management, and institution of peace-building, and social and economic opportunities. With the shared goal of increasing income generation for the marginalized sector, particularly farmers, WBG and JICA can cooperate in implementing projects that increase financing access to and improve the living conditions of subsistence farmers.

Korea International Cooperation Agency (KOICA)

Panay-Island Upland – Sustainable Rural Development Project (PIU-SRDP)

The PIU-SRDP is a five-year program of KOICA that seeks to equip Panay upland farmers into direct distributors of their produce. The project has three phases. The first phase focused on community development in 15 pilot upland barangays from four municipalities in the provinces of Antique, Capiz, and Iloilo. The second phase moves on to income-generating projects in 10 selected upland barangays, represented by eight recipient farmer associations. The final phase aims to improve the marketing system of the upland produce by providing a direct link between the producers and the consumers. In this phase, ten Bayanihan Tipon Centers were established in Libacao and Madalag in Aklan; Patnongon, Sebaste, and Tobias Fornier in Antique; Jamindan and Tapaz in Capiz, and Alimodian, Lambunao and Tubungan in Iloilo. These will serve as marketing hubs for all upland produce in the four provinces of Panay. In addition, a local food terminal will be established in San Miguel, Iloilo to serve as the regional consolidation center for all the upland products from the various Tipon Centers. This terminal includes a solar-powered cold storage facility, an office, a training facility, and delivery vehicles. This means lower costs for farmers in bringing their products to Iloilo City. This also eliminates the middlemen who have been dictating the farm gate prices. In addition, KOICA also provided a Php20 million fund which can be utilized for marketing-related activities of farmer groups and individual farmers.

Smart greenhouses

The Philippines was able to secure USD2.43 million grant from South Korea through a memorandum of agreement between DA and the Korea Agency for Education, Promotion and Information Service in Food, Agriculture, Forestry, and Fisheries. This was for the development of smart greenhouses which allow farmers to control temperature, humidity, and soil moisture for optimal growth. The aim of this project is to enhance the competitiveness of small and mid-sized farmers by establishing greenhouse technology for high-value added agro-product. Another goal is to boost the income of farmers by strengthening the distribution channel through co-branding activities and shipping of produce across the Philippines. The agreement also includes the dispatch of Korean experts and farm consultants and the training and education of Filipinos in Korea, as well as the exchange of research materials. The first 18 K-Smart greenhouses is targeted to be established in the Benguet province to produce high value vegetables, especially tomatoes. This project is in line with the pressing need of farmers for productivity-enhancing technology, particularly smart greenhouse technology. Another avenue is in the knowledge transfer activities that will enhance the farm management skills and productivity of farmers. This can be an opportunity for JICA to implement a comprehensive technical cooperation project.

Food and Agriculture Organization of the United Nations

The *Development of Effective and Inclusive Food Value Chains in ASEAN Member States* was a three-year regional project funded by the Government of Japan. This aims to significantly improve the food and livelihood security of smallholders by integrating them into food value chains that will connect them to new market opportunities. The project will be implemented in two phases. The first phase comprises of the value chain study which aims to assess a specific value chain, identify constraints, and integrate necessary interventions. The second phase will implement the pilot activities to address the issues identified.

In the Philippines, the ginger value chain in Nueva Vizcaya was selected. The value chain study revealed several major constraints. This included the widespread outbreak of soft rot and bacterial wilt disease, the limited supply of clean planting materials, and the inadequate capacity to manage and

address this infestation. On the market node, there is a weak flow of market information with mistrust among value chain actors due to the varying interpretation of the standards. These affected the farm gate prices received by the farmers. On the production side, farmers are not organized into structured groups, and have limited knowledge and resources in complying with good management practices (GMP) and developing commercially viable healthy food products. To address this, the following interventions were suggested for the second phase: (a) developing the local capacity to produce quality clean planting materials, (b) strengthening the capacity of farmers and the LGUs in managing and controlling the spread of soft rot and bacterial wilt, (c) establishing a local and effective supply for organic input, (d) facilitating the formation of farmer groups and strengthening the existing organizations, and (e) improving the access of processors to product development, business incubation, and toll processing facilities.

The second phase of the project implemented the following activities aligned with the proposed interventions. A training was conducted on strengthening the core group of farmer organizations. Consequently, 10 demo-farms were established in August of 2018, while another 5 were established in May of 2019. These farmers then underwent a series of trainings on good ginger farming practices and in the preparation of organic inputs. In February 2019, a marketing forum was conducted to create linkages and ensure the producers' knowledge about the required quality, classification, pricing, and packaging, among others. In this, Dizon Farm, which is one of the major consolidator, expressed interest in dealing directly with a farmer group under the project. The farmers and traders also agreed that there is a need to revise the national standard for ginger to have common understanding among the key players. Additionally, the regional office of DA supported the project beneficiaries through the provision of organic inputs and technology. To support processors' access to product development, the Nueva Vizcaya Experiment Station was also upgraded through the procurement of a sealer machine. Other activities include training for small scale processors in improving processing activities, product development competition, and snapshot market testing.

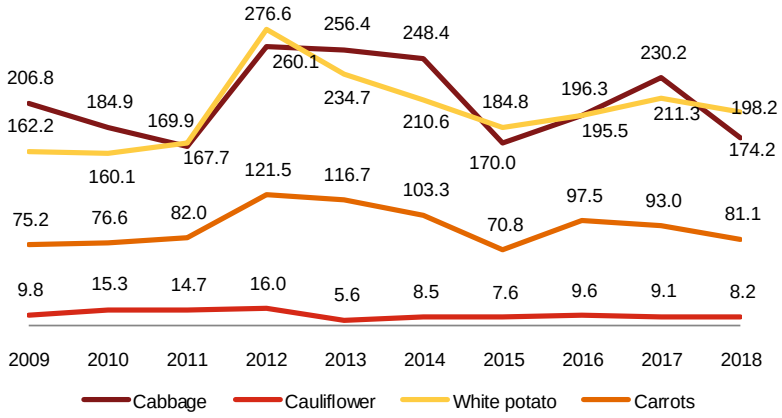
This project shows that the development of the value chain involves the improvement of the farmers and the effective and efficient linkage to the different stakeholders, such as the consolidators and consumers. This can be a model project that JICA can utilize in improving the vegetable value chain.

Chapter 3. Description of the vegetable value chain

3.1. Overview of the highland and lowland project areas

3.1.1. Benguet highland vegetable production

In Benguet, there is a decreasing trend in the production of certain crops, namely cabbage, cauliflower, carrots, and white potatoes. This may be attributed to the decrease in area planted and harvested over the same period. Moreover, the younger generation are less inclined to do farming due to other job opportunities available. Other factors include vulnerability towards extreme weather events (drought and typhoons), pest and disease infestations, and poor adoption of high-yielding varieties by farmers.

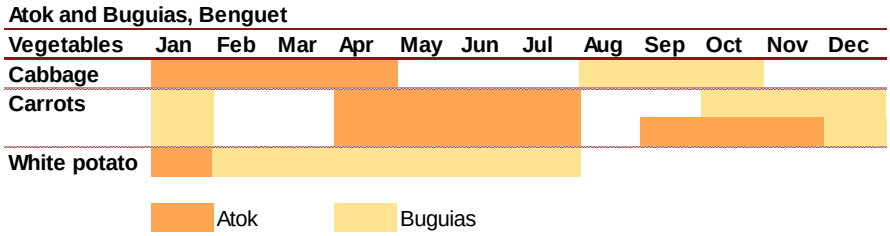


Source: Office of the Provincial Agriculturist of Benguet

Figure 3.1.1 Annual production volume of target highland crops in Benguet in thousand metric tons

The major inputs in production such as seeds and agrochemicals are mainly sourced from agricultural supply retailers/dealers companies such as East-West, Allied Botanical Corporation, and Ramgo. These companies are mainly located in La Trinidad – which is quite far from major production areas such as Buguias and Mankaya. The distance increase the prices of inputs due to the transport cost. To support the farmers in the purchasing of inputs, farmer associations provide their members supply at a discounted scheme. They procure the inputs directly from dealers as well as from seed, fertilizer, and agrochemical companies. Some associations also extend land preparation services such as the use of hand tractors for ease of sowing.

The cropping pattern differs depending on the farmers' access to irrigation, the type of crop planted, and the location of the farms. For those reliant on rain only, the pattern follows a regular planting period. In Buguias, farmers grow cabbage from August to October. Typically, cabbage is grown for 90 days. As for carrots, Atok farmers grow these from April to July and from September to November. While in Buguias, these are grown from October to December. With regards to white potatoes, both places plant these almost at the same period but Buguias farmers extend their growing production up to July. On the other hand, farmers with access to irrigation water for the whole year follow the regular cropping season but also plants off season to take advantage of high prices during the rainy months. They are more flexible in adapting their cropping pattern to market demand trends.



Source: PwC FGDs in highland survey areas

Figure 3.1.2 Cropping pattern of rain-fed farmers of the target crops in survey areas in Benguet

As to the pest and disease infestation, potato and carrots are affected by the same pests. These include damping off/bacterial wilt, leaf blight, black leg, white flies, thrips, and leaf miner. For cabbage and other leafy vegetables, these include club roots, diamond back moth, leaf miner, and cut worm. The chemicals used for all types of vegetables do not vary. Insecticides and fungicides used for all types are the same as well.

Table 3.1.1 Insecticides and fungicides used by highland farmers of the target crops in the survey areas

Vegetables	Insecticides	Fungicides
Cabbage	Same with Carrot and Potato	Same with Carrot and Potato
Carrots	• Kriss • Lorsban • Simisidin	• Equation • Dithane • Folicure
Potatoes	• Kriss • Lorsban • Simisidin • Carbeine • Cartap • Bazooka (shotgun) • Exalt	• Equation • Dithane

Source: PwC FGDs in highland survey areas

The incidence of pests and diseases is higher during the wet months than during the dry season. Farmers usually monitor their field to determine the level of disease and pest incidence. When the threshold level is reached, then they start to apply the agrochemicals. Some farmers practice preventive pest and disease control by regularly spraying the field.

In financing, farmers often have difficulty availing agricultural credit in banks due to the lack of collateral needed and the inability to provide the requirements. These banks are mandated by the Agri-Agra Reform Credit to allot at least 15 percent of its total loanable funds to farmers and fisherfolk. However, farmers cannot prove their eligibility as some of them do not have titles to their lands. In addition, farmers struggle in passing the banks' credit underwriting standards since agricultural production is vulnerable to external factors such as calamities and price fluctuations. As a support, fully subsidized crop insurance is offered by the government, but vegetable farmers find it a hassle to comply with the requirements for application. Due to this, most highland farmers prefer dealing with traders and/or disposers as they transact on a cash basis. These farmers sell to traders who provide cash advances to them. These loans from traders are then paid with interest after 2-3 months or at harvest by subtracting from the amount that the traders will pay for the crops.

Some farmers have been trained by the DA in implementing GAP. However, farmers expressed difficulty in complying with the requirements for the GAP certification. Some farmer cooperatives have been assisted by the DA in completing the process, but there is delay in the processing and approval of the certification. A farm applying for GAP certification will be audited not only in the quality of his crops, but also in all aspects of production such as the history of the farm site, the type of soil and its compatibility with the crops, the use of pesticides and fertilizers, the sources of potable water for

irrigation and washing, the harvest and post-handling procedures, the health and hygiene of the farmers and workers, and other factors. When surrounding farmers do not comply with GAP, the farm area may be affected by run-off chemicals which may affect the water source and soil health of the farm. This is an additional challenge to compliance with GAP requirements.

In terms of highland farm practices, there is a low degree of farm mechanization and production technology adoption. Most farmers depend on rainfall as a source of irrigation and only a few use machinery in irrigation (e.g. impact sprinklers during dry season) and land preparation (e.g. hand tractor). Additionally, traditional practices result to inadequate farm preparation of harvested vegetables. At the farm level, there is no adequate sorting and packaging. During transport, the produce are dumped bare packed to maximize the capacity of trucks. Some farmers have to manually carry their produce to the collection center since their farms are not accessible to transport trucks. There is also very minimal use of cold chain facilities to preserve the quality of the produce. The high rental cost of cold storage and refrigerated transport vehicles discourage farmers from doing so. Consequently, this lack of proper handling and transport results to high postharvest losses. To solve this, tramlines were provided by the DA but this is not commercially viable due to the cost of operating the equipment.

In Benguet, another major problem is the lack of access to a stable market. Although some farmers directly sell to traders at the trading posts, most are still selling through disposers and other intermediaries who bring the produce to the larger markets in Metro Manila. The disposers transact with wholesaler-traders at the market centers or trading posts and get a share of the vegetable price. These traders then dictate the price and the terms of trade, putting the farmers at a disadvantage. Other issues include the overproduction of certain crops often resulting to fluctuation of vegetable prices.

3.1.2. Quezon lowland vegetable production

Major agricultural inputs for lowland vegetables are somehow similar with that of the highland vegetables. There are enterprises producing seedlings for farmers such as the AGT Supply Seedling Co. in Bay, Laguna and others in Villasis and Urdaneta, Pangasinan and in the vegetable growing areas in the CALABARZON region. Fertilizer and other agrochemical dealers/retailers offer more diverse products such as foliar fertilizers and organic fertilizers (e.g. humus). The LGU, farmer associations, and private farm operation service providers, offer land preparation services. Lowland farmers also utilize more mechanization, such as the use of four-wheeled tractors, due to the relatively larger land areas.

Majayjay, Quezon

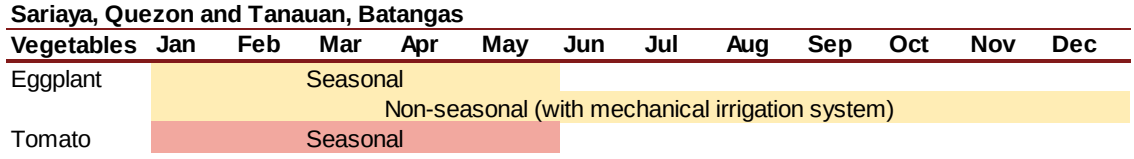
Vegetables	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Eggplant	Eggplant intercropped with coconut								Coconut			
	Eggplant								Rice			
Tomato	Tomato intercropped with coconut								Coconut			
	Tomato and sweet potato as relay intercropped with coconut								Coconut			

Source: PwC FGD in Majayjay, Quezon

Figure 3.1.3 Cropping pattern of lowland farmers of the target crops in Majayjay, Quezon

In terms of farm practices, lowland farmers practice multi-cropping and alternate cropping. Eggplant, tomato, and bitter gourd are the main crops multi-cropped with other types such as bottle gourd, string beans, pechay, hot chili, and bell or sweet pepper. On the other hand, rice and vegetable is a common alternate cropping scheme. Similar to the highland, lowland management practices include fertilization, irrigation, pest and disease control, weeding, and irrigation. Generally, these farmers supplement their stock knowledge with technical recommendations from seed producers, agrochemical manufacturers, DA, and LGU technical advisers. They still rely on past experience and traditional practices in the management of their farms, such as in the application of fertilizers and chemicals. Farmers of lowland vegetables follow a cropping pattern based on the seasonality of the vegetable, the alternate crop planted, and the location of their farms. These are shown in the tables below.

Farmers in Sariaya, Quezon and Tanaun, Batangas, as with other farmers who plant under lowland conditions, grow eggplant, tomato, and other vegetables from January to May. Others who have access to irrigation systems plant all year round. The type of vegetables grown depends on market conditions. If farmers perceive that demand and price is relatively good for a particular vegetable, then they implement up to two cropping periods per year.



Source: PwC FGDs in Quezon and Batangas

Figure 3.1.4 Cropping pattern of lowland farmers of the target crops in Quezon and Batangas

In Bongabon, Nueva Ecija, farmers follow a very similar cropping calendar as Pangasinan farmers. Onion growing is from October to February for onion seedlings planted while it extends up to March for the directly seeded. Like all other lowland farmers, they also plant other types of vegetables as well as other crops like rice and corn. Farmers are more inclined to grow the latter because of the higher price prevailing during the time of the KII.

Source: PwC FGD in Bongabon, Nueva Ecija

Figure 3.1.5 Cropping pattern of onion farmers in Nueva Ecija

Stem/Fruit borer, leaf miner, bacterial wilt, leaf rust, and damping off are some of the pests and diseases that attack leafy vegetables and fruit vegetables such as eggplants and tomatoes. For onion, anthracnose (Giberella moniliformis) is the most dreaded disease. No agrochemical so far can control this disease. Using healthy planting materials as well as good agricultural management practices are the deterrent approaches.

Table 3.1.2 Insecticides and fungicides used by lowland farmers of the target crops in the survey areas

Vegetables	Insecticides		Fungicides	
	Agrochemicals	Pest	Agrochemicals	Pest
Eggplant	• Atabron • Selecron	• Eggplant fruit and shoot borer • Leafhopper • Whitefly • Thrips • Aphids • Stem borer	• Cabrio • Antracole	• Downy mildew
Tomato	• Lannate F1 • Lannate F2	• Aphids • Cutworms • Nematodes • Whiteflioes • Damping off • Fusarium wilt	• Score • Montana • Forten (organic) • Antracole	• Early blight • Late blight • Leaf rust • Leaf blight
Onion	• Atabon • Selectron	• Army worm • Cut worm • Thrips	• Cabrio • Antracole	• Bulb rot • Downy mildew

Source: PwC FGDs in lowland survey areas

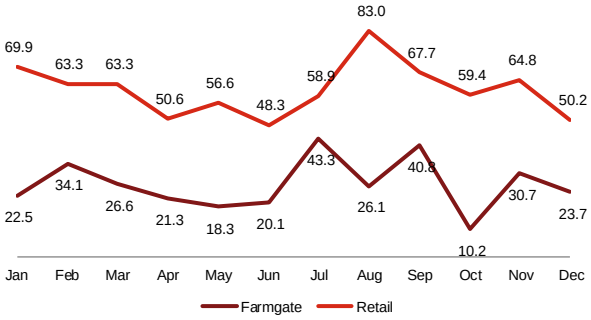
Similar pests and diseases are also found in other lowland and onion producing areas. The agrochemicals used more or less are common in the project areas.

In terms of financing and crop insurance, the same problems of highland farmers are encountered by the lowland. Although there are financial assistance offered by the government, such as Production Loan Easy Access (PLEA) and the Survival and Recovery (SURE) loan assistance, compliance with the requirements and delay in disbursement discourage the farmers from availing them. Due to the nature of agricultural production, farmers have difficulty in proving their ability to repay loans. Also, vegetable farmers find it a hassle to apply for crop insurance. They are either unaware of the benefits of insurance or have difficulty in complying with the insurance application requirements.

Similar to the highland, some farmers were able to undergo GAP training, but compliance with all the requirements and the long process of application constrain them from being certified.

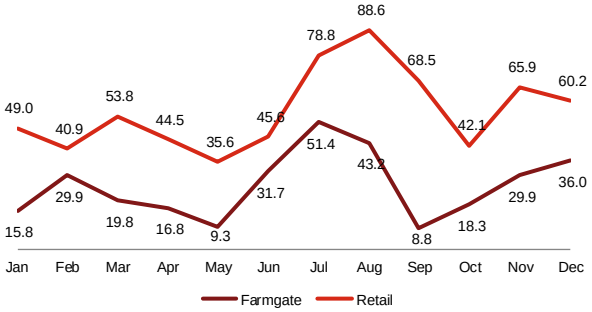
In the handling of lowland vegetables, there is an improvement due to the pre-sorting in the farm, particularly with tomatoes, which are placed in crates. But the problem of inadequate farm preparation still persists. Proper packaging of produce is still lacking, resulting to relatively high postharvest losses. In some areas, farmers have poor farm-to-market roads, and utilize animals, such as horses to transport the produce. There is also a lack of cold chain facilities for lowland vegetables.

Contrary to highland farmers who have farms in elevated areas, lowland farmers are nearer to the consolidation centers which make operations easier and less costly for them. In Sariaya, farmers bring their produce directly to Sentrong Pamilihan, who markets and sells their produce to wholesaler-retailers, traders, and other buyers. While that may be the case, lowland farmers still lack access to a stable market. Due to the seasonality of some produce, incidence of overproduction happen frequently resulting to lower vegetable prices.



Source: Philippine Statistics Authority

Figure 3.1.6 Eggplant monthly farmgate and retail prices in Quezon during 2018



Source: Philippine Statistics Authority

Figure 3.1.7 Tomato monthly farmgate and retail price in Quezon during 2018

In Quezon, farm gate prices for eggplant and tomato went as low as Php10.2/kg and Php8.8/kg, respectively in 2018. On the other hand, retail prices increased up to Php83.0/kg and Php88.6/kg, respectively, in the same period. According to the survey conducted in the Balintawak and Divisoria market, fluctuation in price largely depends on the current supply in the market. Farmers do not follow any crop programming and plant only based on what they perceive will sell in the market. This leads to overproduction and lower prices.

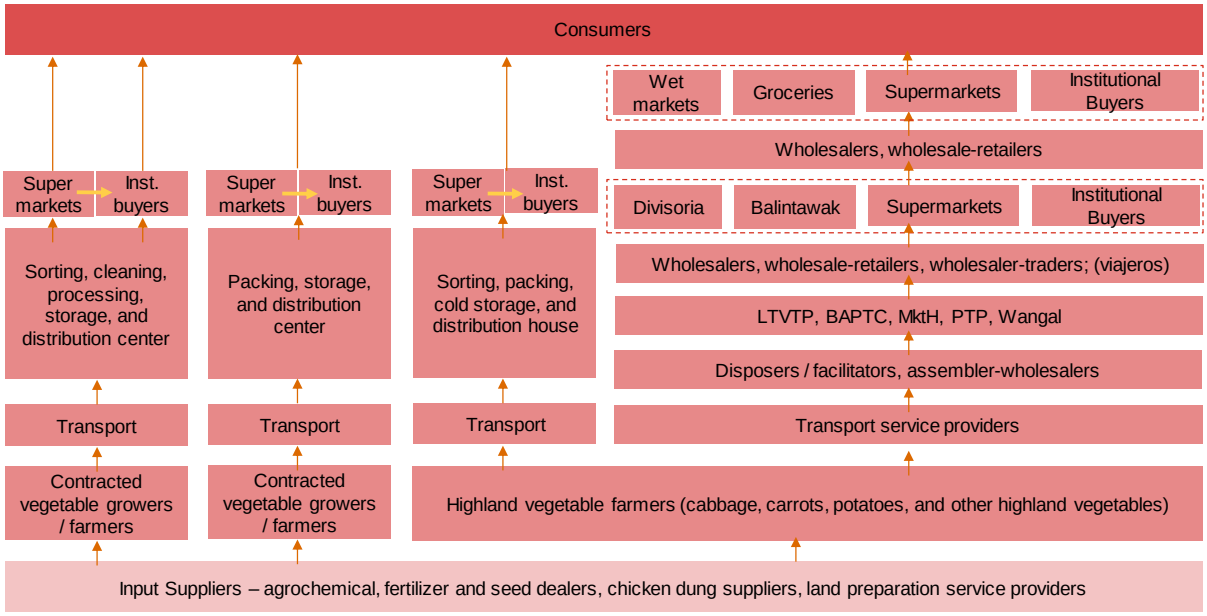
In summary, improving the vegetable value chain starts with the development of the farmers, enhancing harvest yield and quality, and efficiently connecting these farmers to the market. Addressing these issues in Benguet and Quezon will have a significant impact as these areas are major suppliers of vegetables for the Metro Manila market.

3.2. Vegetable value chain mapping

The mapping of the vegetable value chain illustrates the flow of the produce from one value chain player to another. This study identified the value chain map for the highland and the lowland vegetables and the key players in each node. Knowing the various roles of the key players will supplement the analysis of the major issues constraining the value chain.

3.2.1. Highland vegetable value chain (HVVC)

HVVC map. In the highland vegetable value chain, the produce have to go through various intermediaries before it reaches the consumers. Due to the distance of major production areas, farmers rely on traders, assembler-wholesalers, disposers, and facilitators to market their produce for them. These transact directly with farmers and consolidate vegetables from different farmers to cater to their buyers. The viajeros are transportation providers who act on behalf of the wholesaler-traders and/or wholesaler-retailers.

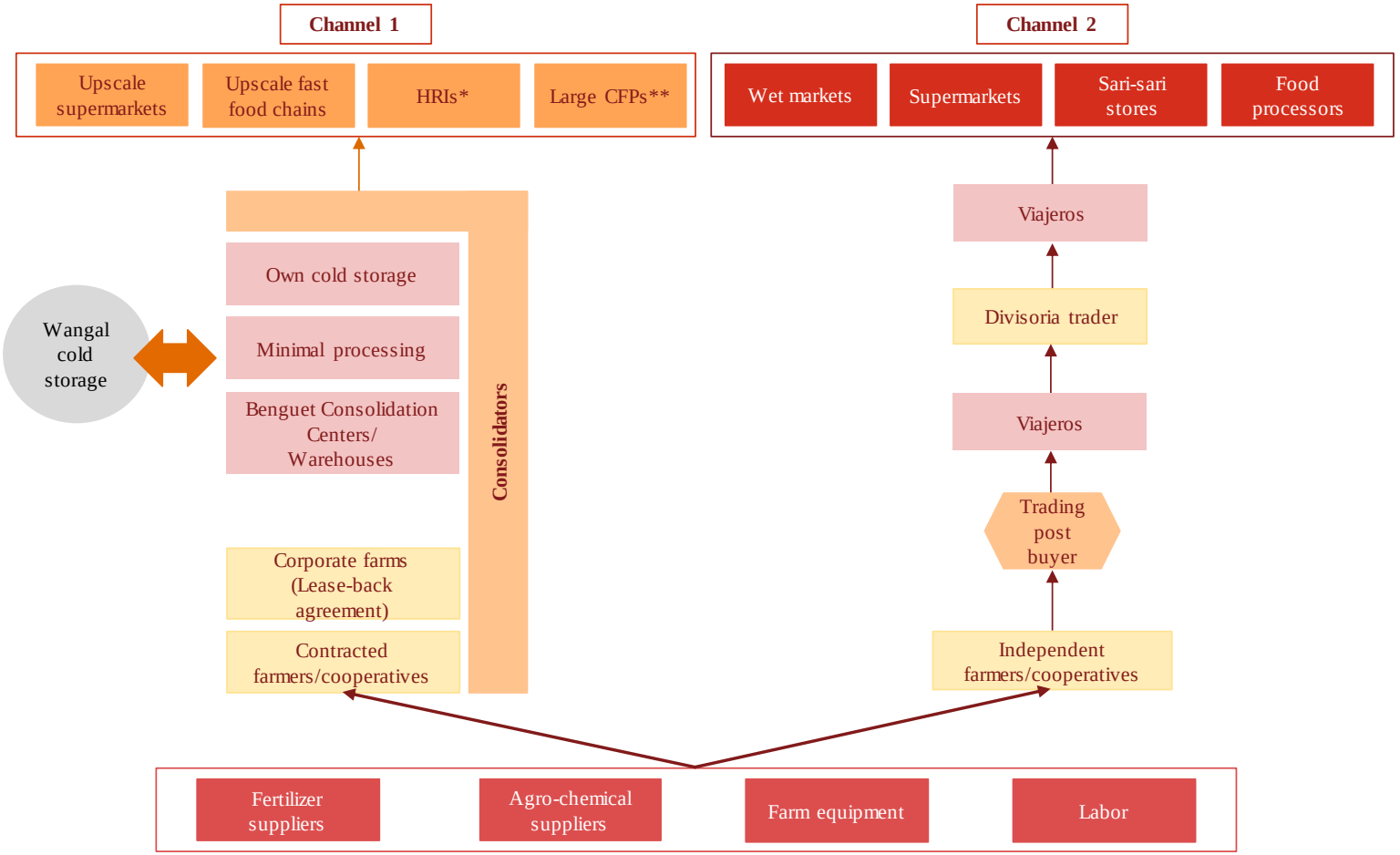


Source: Costales, 2018

Figure 3.2.1 Highland vegetable value chain in Benguet

The Benguet vegetable value chain has two marketing channels, one for the corporate vegetables consolidators and the other for the layers of traders and consolidators for wet markets and smaller supermarkets and restaurants. The first marketing channel consists of Dizon Farm, Diamond Star, UBM Corporation, Farmville Agriculture Service Team, and Happy Veggies Fruits and Vegetables supplier, among others. These are food service providers who provide quality vegetables to target consumers such as hotels, restaurant, and institutional buyers, among others.

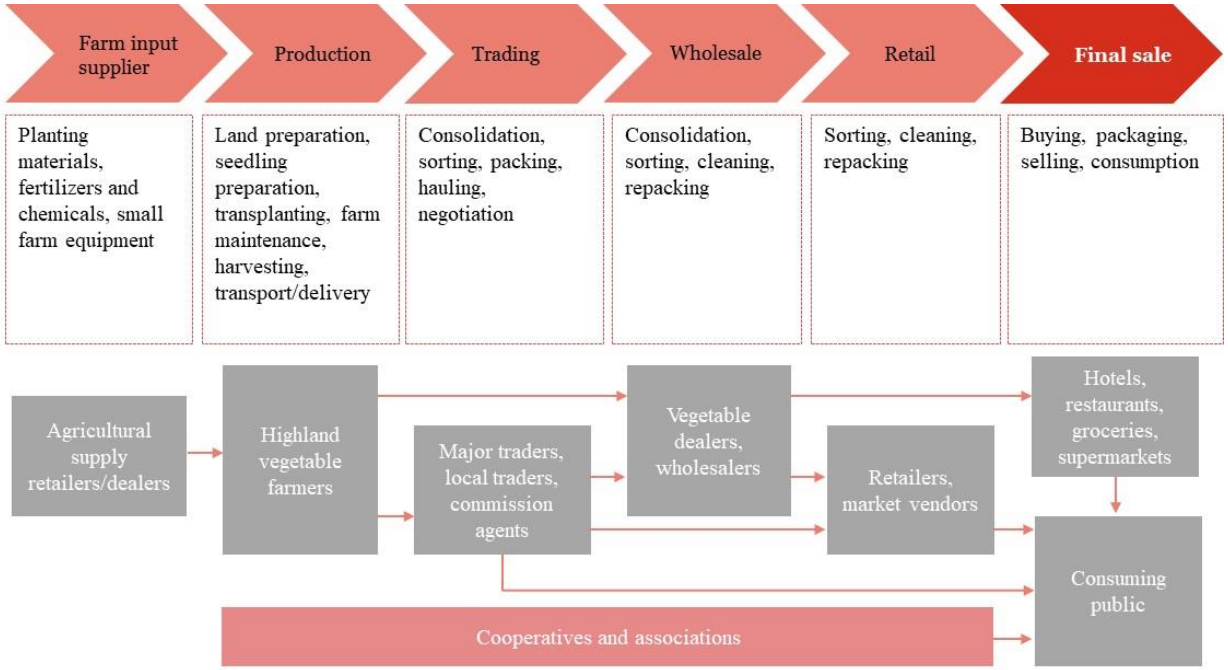
The other marketing channel consists of traders and consolidators who supply to open markets such as the wet markets of Divisoria and Balintawak in Metro Manila and other neighboring urban markets such as those in CALABARZON and Central Luzon regions. In the Balintawak and Divisoria market, major sources of highland vegetables are Baguio and Nueva Vizcaya in Cagayan Valley Region. Incoming viajeros/assembler-wholesalers procured agricultural commodities from farmers, trading centers, and other assembler-wholesalers, and sold them to wholesalers in the mentioned markets. These wholesale prices vary according to source and volume procured. In the Balintawak market, cabbage price from viajero is at Php40/kg, but it can double at Php80/kg for wholesale. The same occurs for carrots at Php35/kg in the trading center and reaching Php70/kg for the wholesale price. The supply of highland vegetables plays an important role not only in supporting food security but also in generating employment, improving the income of farmers, and contributing to the economic development of the province. More than 60,000 farmers depend on vegetable farming for their income in Benguet and thousands more depend on the subsector for direct and indirect employment.



**Hotel, Restaurant, and Institutional buyers*
***Commercial Food Processors*
Source: Costales, 2018

Figure 3.2.2 Marketing channels of the Benguet highland vegetables

Processes. In the production of highland vegetables, needed input includes planting materials, fertilizers and chemicals, and farm equipment which are mainly procured from agricultural supply retailers and/or dealers. The planting of the crops are done by vegetable farmers who implement traditional farm practices. At harvest, the produce are purchased by local traders who consolidate the produce at the trading posts, such as Benguet Agri-Pinoy Trading Center (BAPTC) and La Trinidad Vegetable Trading Post (LTVTP). These are then sold to either the wholesalers or retailers who distribute the vegetables to the domestic households or institutional buyers.



Source: Philippine Rural Development Project

Figure 3.2.3 Processes and players in the highland vegetable value chain

Highland farmers/vegetable growers. Highland vegetable production is largely based on a backyard or family farming system with an average landholding of less than one hectare to a little over two hectares. With less than seven hectares of land, these are considered marginalized and subsistence farmers, who depend on their harvest for living and farming expenses. Most of these farmers do not have a title to their lands as they own it under a stewardship contract. This certificate of stewardship is given to individuals or families actually occupying or tilling portions of forest lands for a period of 25 years renewable for another 25 years. Expansion of land is possible through leasing the land of other farmers who stopped farming due to financial constraints. They can also lease land from the LGU. However, land for planting in the highland areas has become scarce. Consequently, farmers implement contouring of hillsides to maximize production.

Farmers follow the same cropping every year but change the sequence of the crops planted depending on perceived market opportunities. Other factors considered are the acidity and condition of the soil. Consecutive planting of the same crop in the same land during the year is not implemented as this produces pest and disease infestation.

According to the DA of CAR, Benguet has 111 farmer organizations with a total of 6,366 members. Out of these, only 10 organizations practice GAP, while 9 practice organic farming. Majority of the crops produced are cabbage, potatoes, carrots, cucumber, snap beans, bell pepper, celery, and radish, among others.

While some farmers procure production inputs using the proceeds of their previous harvest, most highland farmers still depend on “cash advances” from traders for operational funds. These farmers have to pay their loans by selling their produce to the traders and receiving payment net of their credit with interest.

During harvesting, some farmers follow the "bayanihan" system where co-famers help each other by scheduling farm labor among themselves. Division of labor by gender depends on the nature of farm activities. For lighter farm activities, these are being carried/done by women and children of the household (e.g. weeding, harvesting, planting) while heavier farm activities are done by men (e.g. land preparations, spraying).

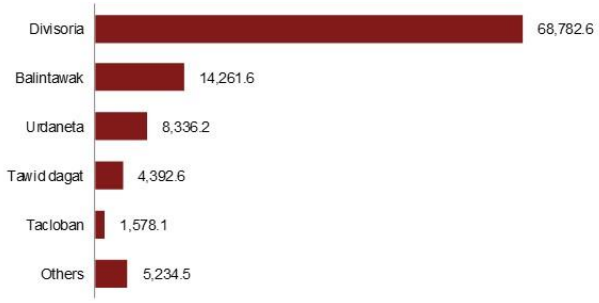
Logistics and processing. In the vegetable value chain, there is a wide range of logistics providers. The transport of produce to the market centers utilizes various vehicles, including tricycles, jeepneys, vans, two to five-tonner elf trucks, and big trucks with capacities of ten to twenty tons, among others. Highland vegetables such as cabbage, wombok, potatoes, and carrots are usually brought to La Trinidad trading centers using elf trucks and vans or on top of public utility jeepneys. Generally, cold chain facilities such as cold storage and reefer vans are not utilized due to the high cost. Only vertically integrated companies catering to institutional and retail buyers, such as supermarkets, are able to use cold storage and reefer vans to preserve the quality of the produce. In Benguet, the provincial government implemented a cold chain project with cold storage facilities and reefer vans in Brgy. Wangal, La Trinidad. This was mainly used by entrepreneurial farmers (e.g. Placido siblings and others) who bring their produce to the Dizon Farms depot in La Trinidad. This facility has two cold storage rooms with five and ten metric ton capacities that contains 8 and 16 slots, respectively. These are rented out at a rate of Php375 per slot per day. Dizon Farms used to rent the reefer vans with two to four metric ton capacities at a price range of Php4,000 to 6,000 exclusive of fuel and toll. At present, the company owns their own reefer vans. One of the entrepreneurial farmers has a 4-metric ton reefer van bringing broccoli and lettuce (romain, green ice and deep red) from Kibungan, Benguet to the Wangal Cold Chain project mainly for selling to Dizon Farms, Inc. The La Trinidad Vegetable Trading Post has cold storage facilities but these are not functional and instead are being used as ordinary storage rooms. For BAPTC, the cold storage rooms were not used mainly due to a design defect, as disclosed by a staff.

At the farm level, it can be observed that no proper packaging was implemented as the produce are transported to the trading posts. The main packaging used are plastic bags with the individual products wrapped in newspapers. This can be seen in the case of cabbage and wombok. For potatoes, plastic bags are also used both for short distance transport to the Pangasinan or Manila markets and long distance travel to Visayas and Mindanao. In the case of high value crops such as cauliflower and broccoli, the packaging used are cartons or plastic containers with ice. Lettuce, on the other hand, are placed in plastic polyethylene bags, which is thinner and smaller as compared to the standard plastic bags used for potatoes, carrots, and cabbage. After which, they are transported in reefer vans.
In the highland, further processing of vegetables is not prioritized, even in times of glut. Although some entrepreneurs ventured into carrot and potato chip processing, these are still at a small scale. They supply only the local market particularly La Trinidad, with their stalls located at the ground floor of the provincial government building of Benguet.

Trading posts. In the highland, trading posts or *bagsakan* centers serve as a consolidation and market center for vegetables. From the farm, vegetables are brought to the trading posts to be assembled, sorted, trimmed, washed, and sold to different buyers. The major trading posts in Benguet are the LTVTP and BAPTC. These centers provide an avenue where farmers, traders, and other buyers can interact and negotiate the prices. In these, trading is done mostly in the traditional fashion implemented over the decades.

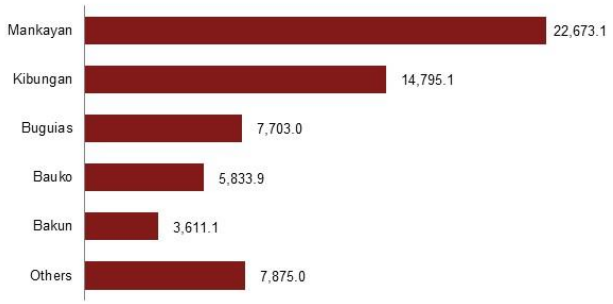
The LTVTP was set up in the 1980s as an economic enterprise of the municipality governed by the rules and regulations of the municipal government. It serves as an established ground for traders and farmers to transact. These farmers bring their produce to the vegetable dealers or disposers. In turn, these vegetable dealers utilize the facilities at the trading post where they trim, sort, and sell the produce. Accordingly, there is an average of 800 to 1000 tons of produce traded in LTVTP daily. Current activities of LTVTP focus on boosting food safety and waste reduction in the facilities through the conduct of weekly cleaning and flushing and strict monitoring and implementation of solid waste management.

On the other hand, BAPTC was established in 2015 and funded under the DA's Agri-Pinoy Trading center (APTC) program, a component of the Agri-Pinoy framework to attain sufficiency in food staples and improve the working conditions of farmers. This framework aims to make farmers trade-oriented rather than production oriented alone by introducing them to various parts of the value chain. As such, key programs of BAPTC include enhancing market linkages through contract trading and inter trading, agri-tourism and promotion, and capability building in safe food handling, grading, sorting, and classification. About 67.1 percent or 68.8 thousand metric tons of commodities traded in 2018 were sold to the Divisoria market, while 13.9 percent or 14.3 thousand metric tons were sold to the Balintawak market.



Source: Benguet Agri-Pinoy Trading Center

Figure 3.2.4 BAPTC top commodity destinations during 2018 in metric tons



Source: Benguet Agri-Pinoy Trading Center

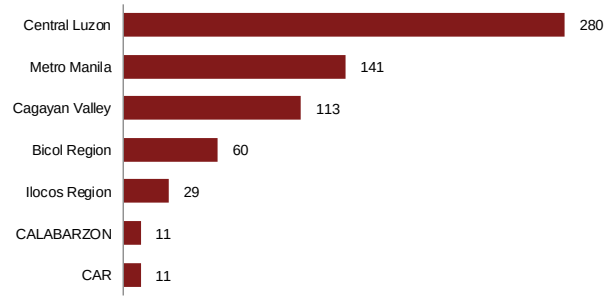
Figure 3.2.5 BAPTC top commodity sources during 2018 in metric tons

The top commodity sources of BAPTC were Mankayan, Kibungan, and Buguias with percentage shares of 21.3 percent, 13.9 percent, and 7.2 percent, respectively. In 2017, BAPTC records show that the volume of vegetable transaction reached 72.45 thousand metric tons, while a total of 106.66 thousand metric tons were recorded for 2018. As for the contract trading department, the annual volume of contract trading transactions for cabbage, carrot, Chinese cabbage, and potato grew from 253.6 metric tons in 2017 to 351.8 metric tons in 2018. Majority of this is composed of cabbage with a trading volume of 318.5 metric tons during 2018. This is followed by potato at 20.4 metric tons and carrot at 10.5 metric tons[11].

In Nueva Vizcaya, a trading post was established to provide market channels for the agricultural products of Nueva Vizcaya and the surrounding provinces of Benguet, Ifugao, Quirino, Isabela, Nueva Ecija and Pangasinan. The Nueva Vizcaya Agricultural Terminal, Inc. (NVAT) is a stock profit corporation established in 2001. Its stockholders compose of individuals, LGUs, the DA, the Land Bank, provincial governments, farmer organizations and cooperatives, and Lagawe Highlands Rural Bank, Inc., among others. It is a 6.7-hectare facility that assist producers improve their productivity and profitability by providing a facility where they can engage in trading, processing, storing, and marketing of their products. Some of its buildings are funded by DA, such as the wet market/vegetable retail spaces, fruits and vegetables trading center, and the washing, sorting and packing area. The stalls are being rented for Php3,000 per month.

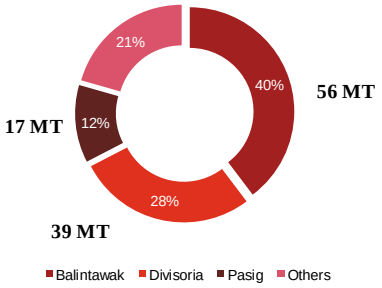
[11] BAPTC 2018 Annual Accomplishment Report

In 2017, majority of the vegetables traded daily in NVAT are brought to Central Luzon, followed by the Metro Manila market. In the Metro Manila market, most are brought to Balintawak and Divisoria. On the other hand, most of the incoming vegetables traded in NVAT are sourced from the local farmers in Nueva Vizcaya. These are mainly from Kayapa, Kasibu, and Dupax del Sur. Those sourced from Benguet amounted to 184 tons, followed by Ifugao at 115 tons.



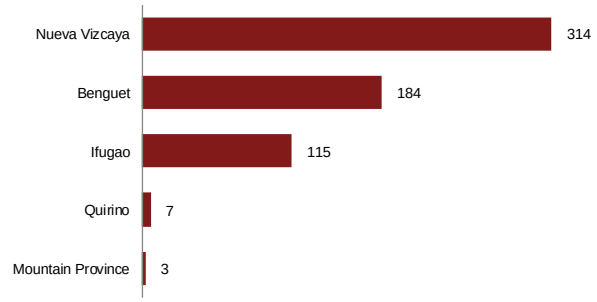
Source: Nueva Vizcaya Agricultural Terminal, Inc.

Figure 3.2.6 NVAT average daily vegetable outflow during 2017 in metric tons



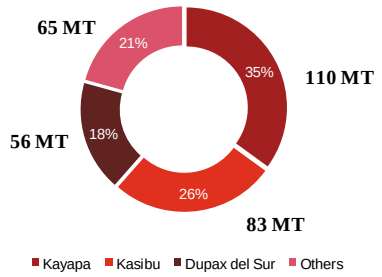
Source: Nueva Vizcaya Agricultural Terminal, Inc.

Figure 3.2.7 NVAT average daily vegetable outflow to Metro Manila during 2017 in metric tons



Source: Nueva Vizcaya Agricultural Terminal, Inc.

Figure 3.2.8 NVAT average daily vegetable inflow during 2017 in metric tons



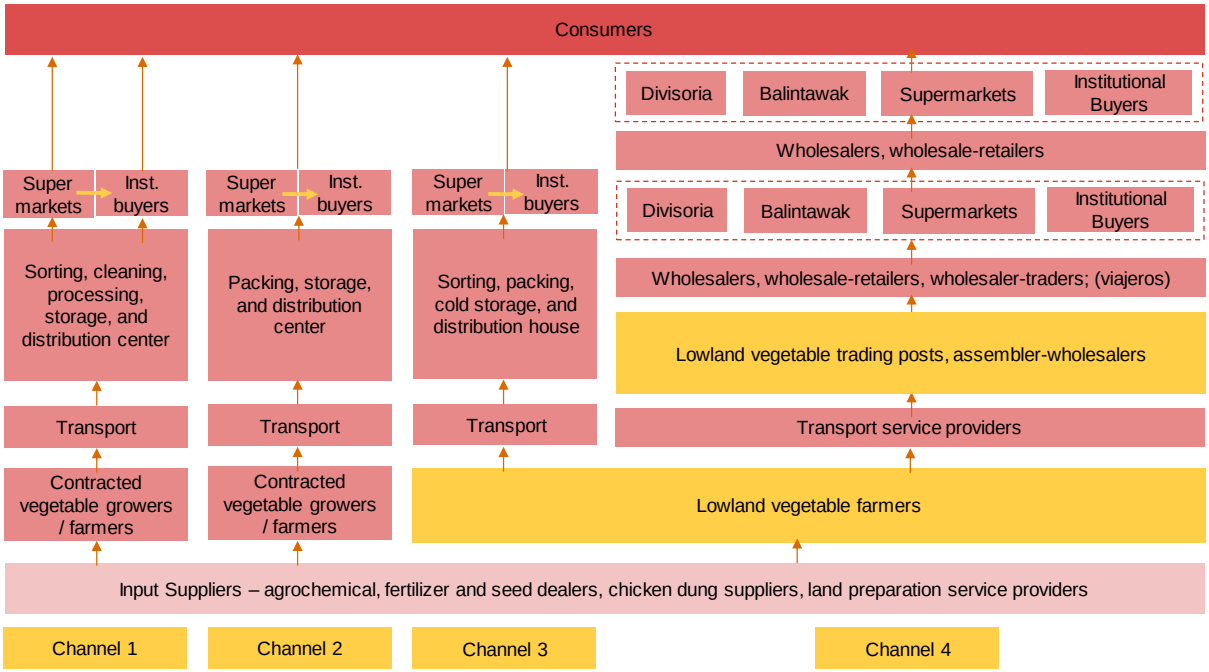
Source: Nueva Vizcaya Agricultural Terminal, Inc.

Figure 3.2.9 NVAT average daily vegetable inflow from Nueva Vizcaya during 2017 in metric tons

In 2018, NVAT launched a beta-testing of NVKrops.com, which is an online marketing platform to connect producers directly to consumers. This is in partnership with Nueva Vizcaya State University, DOST, NVAT, Lina Farms and Air21. In this, NVAT plans to consolidate the produce of the farmers to be sold online. However, it is not yet live due to the complex marketing system. According to the marketing officer, there is difficulty in determining the price of the vegetables and complying with infrastructure requirements.

3.2.2. Lowland vegetable value chain (LVVC)

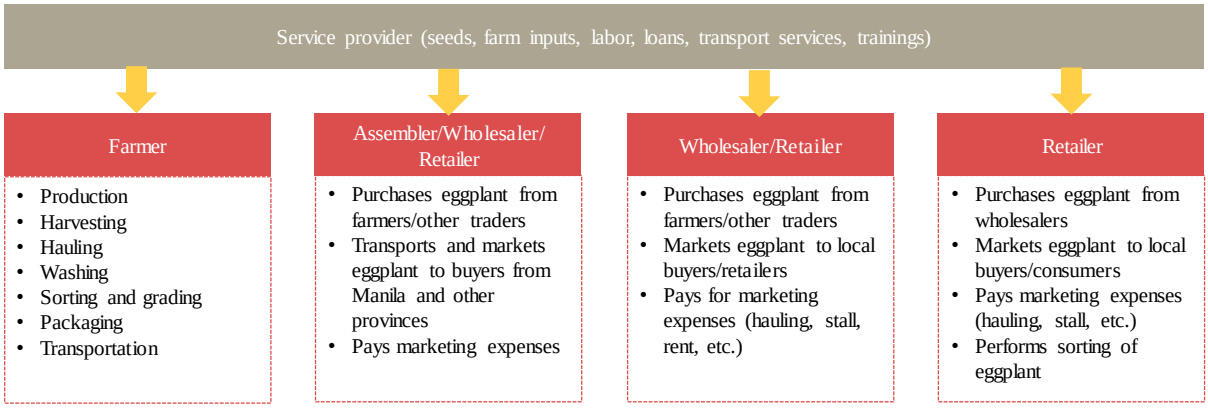
LVVC map. The lowland vegetable value chain is similar to the highland vegetable value chain in many respects. The lowland farmers sell either directly to wholesaler-traders or they can bring their produce directly to the trading post due to the nearer proximity of their farms. In Villasis, Pangasinan, a farmers' marketing association helps the farmers in selling their produce in the Villasis Trading post. In Sariaya, Quezon, the Sentrong Pamilihan sells the produce of the farmers through their trading post facility. The other marketing channels include wholesaler traders selling directly to the Metro Manila wet markets (e.g. Divisoria, Balintawak, and others) and other buyers (e.g. supermarkets, institutional buyers, restaurants, etc.) without passing through the Trading Posts. The proximity of the markets to the vegetable production centers allow lowland farmers to have better access to the market, as compared to highland farmers.



Source: Costales, 2018

Figure 3.2.10 Lowland vegetable value chain

Processes. The market flow of lowland vegetables in Quezon can be shown by the commodity flow of eggplant from the farm to the market.



Source: Philippine Center for Postharvest Development and Mechanization

Figure 3.2.11 Processes and players in the lowland vegetable value chain

In the Divisoria and Balintawak markets, major sources of lowland vegetables are Central and Southern Luzon regions, examples of which are the provinces of Nueva Ecija, Pangasinan, Quezon, Laguna, and Batangas. From the farm, the produce are brought by the assembler-wholesaler-retailer or the farmers to the Sentrong Pamilihan or to the Tanauan City market in Batangas. From here, viajeros or assembler-wholesalers procure agricultural commodities from farmers, trading centers, and other assembler-wholesalers, and sell them to wholesalers in Balintawak and Divisoria Markets. Wholesalers, either stall owners or ambulant vendors, are those who operate in Balintawak and Divisoria Market. They procure the commodities from incoming viajeros or assembler-wholesalers and then sell them to outgoing viajeros or wholesaler-retailers. Retailers in these markets purchase vegetables in Divisoria and sell it to household consumers.

Lowland farmers/vegetable growers. As compared to the highland, lowland farmers have relatively larger land areas ranging from 0.5 hectare and reaching up to 17 hectares, based on the FGDs conducted. Consequently, farmers implement a higher degree of farm mechanization and technology. This can be

seen as some lowland farmers prepare their land using four-wheel tractors. In Sariaya, a farmer was even able to use a drip irrigation system. Due to this, lowland farmers can plant some crops, such as tomatoes, for the whole year.

Lowland farmers acknowledge that dependence on traders for financing and marketing will only push farmers to bankruptcy. However, farmer organizations in the lowland still offer little support in terms of marketing the product of their members, and farmers often market their crops on their own. These farmer organizations are often created more for policy advocacy and accessing grants from the government and other development organizations. Moreover, since farmers buy agricultural inputs individually and lack economies of scale, cost of production is higher.

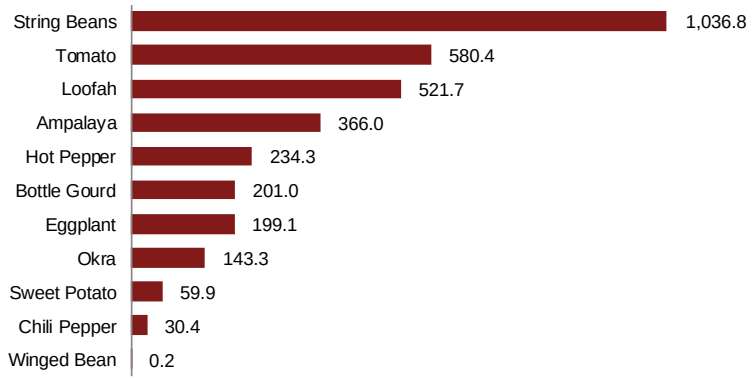
Logistics and processing. Similar to the highland, there is a wide range of transport vehicles used in the lowland. Tomatoes and eggplants are transported using tricycles when in smaller quantities, and jeepneys for larger quantities. The bigger trucks are usually used for transport from the trading posts to the market centers in Metro Manila and other cities. Likewise, cold chain facilities such as cold storage and reefer vans are not widely used in the lowland owing to the financial constraints of farmers. Primarily, large companies catering to institutional and retail buyers who prefer high vegetable quality are able to utilize these cold chain facilities.

In the lowland, there is also inadequate packaging used in the transport from the farm to the trading posts. Eggplants are placed in plastic bags, while net bags are used for onions. Contrary to the highland, there is an improvement for tomatoes which are sometimes placed in carton boxes or in other cases, in plastic crates to prevent physical damage during transport. This is illustrated in the crates used for tomatoes in the NVAT.

In the lowland, there is a cold storage facility given by PhilMech to the Sentrong Pamilihan trading post located in Sariaya, Quezon. Rental of this facility costs at least Php1,000 per day and are usually utilized by institutional buyers who bring their produce first to the bagsakan center then transfer via reefer van to their respective retail centers to retain freshness. In the interview with the administrator, it was mentioned that keeping the crops in the cold storage is too costly and means lost money for the farmers. This is because while the produce is in the storage, it will be not be seen by the customers and will not be sold.

Trading posts. A major trading post in the lowlands is the Sentrong Pamilihan, a private, non-stock, non-profit organization. According to its administrator, it was established with the objective of eliminating the middlemen or at least limiting their participation in the marketing chain. The foundation has about 1,300 member-farmers, who benefit primarily from input loans and technical assistance. The input loans can range from Php5,000 to as much as Php30,000 depending on the track record of loan repayment. Technical assistance, on the other hand, include recommendations on what crop to plant and guidance on the technologies to adopt for the entire management of the crops, and post-harvest. With this, the Sentrong Pamilihan was able to geographically schedule harvest of certain types of products within its coverage area. Foremost of these, farmer members benefit from the marketing support given by the foundation. The foundation sell the farmers' produce at a service price of Php0.75/kg and forced savings of Php0.50/kg to be used for operations. The farmers can also request an asking price for their crops which the marketing team will bid on their behalf. The foundation implements transparency of prices by considering the prices of major markets in Metro Manila and updating daily the price monitoring posted on their Facebook page. The marketing team bid the vegetable prices considering the principles of supply and demand.

According to data from Sentrong Pamilihan, the total monitored volume of vegetable amounted to 3,373 metric tons during 2017. Majority of this comprise of string beans, tomato, and loofah or patola at percentage shares of 30.7 percent, 17.2 percent, and 15.5 percent, respectively.

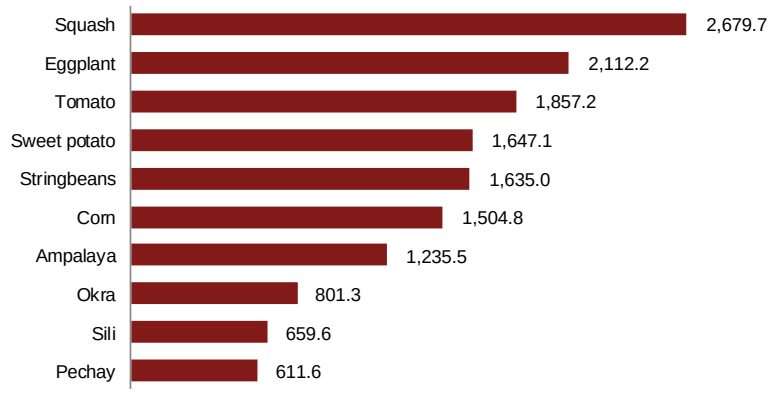


Source: Sentrong Pamilihan ng Produktong Agrikultura sa Quezon Foundation, Inc.

Figure 3.2.12 Volume of traded vegetables in Sentrong Pamilihan during 2017 in metric tons

Another trading post in the lowland is the Pangasinan Agri-Pinoy Trading Center (PAPTC) strategically located at Urdaneta, Pangasinan, which is known as being the "gateway to the north." This project was initiated with the goal of raising the average income of vegetable farmers in Pangasinan and reducing the retail/consumer prices of vegetables. These APTCs were created not only to function as individual regional trading posts but also to integrate them as inter-regional trading posts to balance the supply and prices of crops. Other operational APTCs are the Isabela Multi-Commodity APTC, Quezon APTC, Camarines Norte APTC, Regional Organic Trading Center, NVAT, Dalaguete APTC, Nueva Ecija APCT, and the largest, which is the Benguet APTC.

During 2018, the total volume recorded in PAPTC was about 16,977 metric tons. Foremost of the crop traded was squash at 2,680 metric tons, representing 15.8 percent. This was followed by eggplant and tomato at 12.4 percent and 10.9 percent, respectively.



Source: Pangasinan Agri-Pinoy Trading Center

Figure 3.2.13 Volume of traded vegetables in PAPTC during 2018 in metric tons

3.2.3. Common players for both the lowland and highland vegetable value chains

Input provision

The major input for highland vegetable planting are seeds which are normally purchased from agricultural supply retailers and/or dealers. The LGUs and the DA also distribute seedlings to farmers and cooperatives during calamities. However, some farmers expressed that these were not sufficient to help them. Farmer organizations also provide their members with production inputs at a discounted rate. Aside from these, other inputs sourced out during the pre-planting stage are organic and inorganic

fertilizers, pesticides and microbial formulations, and some farming equipment like hoes and other simple tools. In some areas, manual water sprayers, such as impact sprinklers or rain burst are procured and used.

Farming inputs (kinds and quantities) vary from farmer to farmer. This is due to their capacity to provide based on capital/cash on hand. There is a wide range of fertilizer and pesticide use depending on the financial capability of each farmer to purchase in times of need. In terms of fertilizer application, subsistence farmers use the least amount in their production while other farmers implement even excess fertilizer application to their crops. However, based on the FGDs conducted, pesticide use is very high. The frequency of application ranges from 3 to 4 times a month and lasting up to 2 weeks prior to harvest. As for farm labour, some farmers employ five workers per hectare for the duration of each cropping season.

Traders

In the vegetable value chain, both highland and lowland farmers rely on intermediaries to market their produce. These vegetables are sold by the farmers to local traders and commission agents. These are then sold to major traders who often has multiple regular contacts from whom he sources his supply. These traders are also considered wholesalers in their localities as they are the ones who distribute to various retailers like local market vendors and viajeros.

When the produce are brought to another province or region, another set of players receive the commodities before these reach the retailers and the final sale. These are the wholesalers who deal with the retailers in their area or directly deliver the produce to institutional buyers and concessionaires.

In the Metro Manila region, majority of the vegetables are brought to the Divisoria and Balintawak markets. The Divisoria market is known for its low-cost vegetables, fruits, fish, and other wet and dry goods sourced directly from wholesalers in the highlands and other vegetable production areas in Luzon. It is known as the central all-around market and one-stop shop in Manila located at M. De Santos St., San Nicolas, Manila. It has a night market that starts from 5:00PM and ends at 5:00AM.

Similarly, Balintawak is also known as the *bagsakan* or consolidation of produce coming major production areas in Luzon with the produce sold at very low prices. It has three vegetable markets, of which only two markets were covered in the survey conducted: Juliana and Cloverleaf Markets. The Juliana Market operates from 7:00AM to 3:00PM every day, while Cloverleaf Market operates 24 hours every day. Based on the survey, there are approximately 300-500 traders operating in Balintawak and Divisoria Markets every day. In conclusion, the vegetable value chain follow a multilevel trading system. These are composed of different types of traders that comprise the vegetable marketing channel.

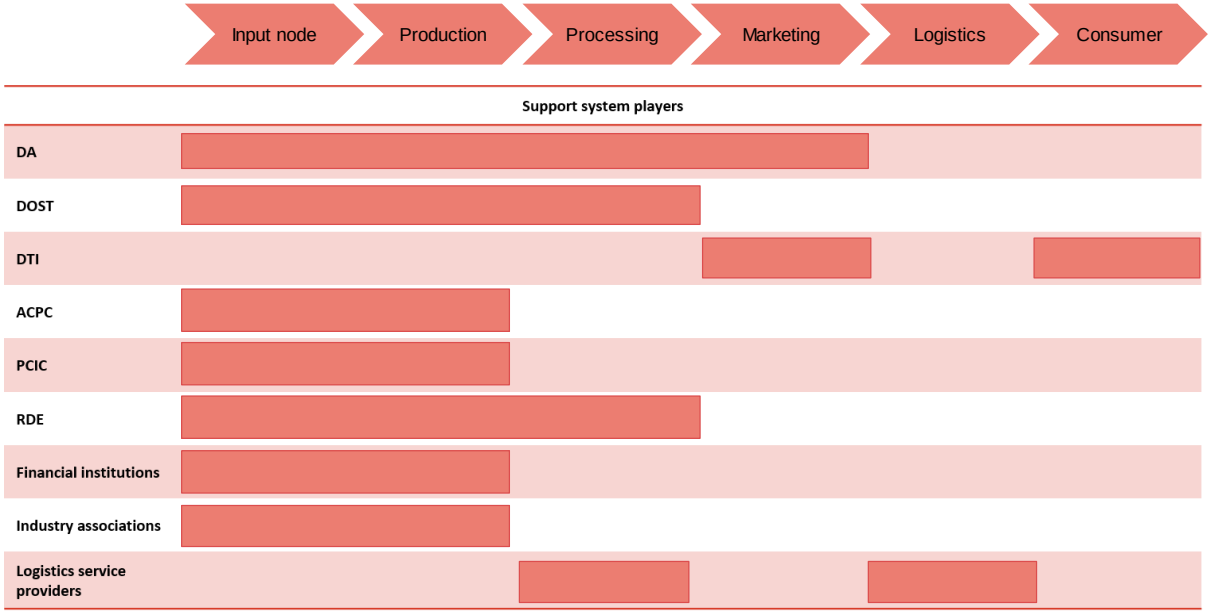
Disposers. These are traders who transact directly with farmers who rely on them to market their commodities.
Assembler-wholesalers. These are the ones who gather the commodities from several farmers, assembles or loads them into a large delivery truck, and sells them to the trading post or directly to other middlemen. They operate on a wholesale basis.
Viajeros. These middlemen do not have ownership of the commodities. Their role is to deliver the commodity from one key player to another along the chain. They only have control over the logistics part, namely the transportation and the costs incurred during the delivery.
Wholesaler-traders. These are large distributors who normally buy from farmers, other traders or commission agents. They usually have adequate logistical facilities such as trucks for their bulk procurement. These are the ones who sell the commodities in the trading centers, operating on a wholesale basis and selling in bulk or large quantities.
Wholesaler-retailer. They operate both as a wholesaler and retailer, and are found in both the trading centers and public markets.
Wet market retailers. These are the market vendors who have their own area or rented stall for the display of their products. They usually operate in the public markets.
Institutional and retail buyers. These buyers often contract with farmers at a fixed price and volume,

with specifications as to the quality of the vegetables. These include supermarkets, fast food chains, restaurants, and hotels, among others.

Vertically integrated vegetable processors
These are institutional buyers of vegetables who procure from farmer suppliers and provide additional support such as production inputs in exchange for a stable supply of specified quantity and quality of produce.

Food service providers
Food service providers are enterprises who supply vegetables and other food products for hotels, restaurants, fast food chains, supermarkets, specialty food buyers, and other institutional buyers under a formal or informal contract agreement.

Support system players
These are external value chain players that provide key functions to support the vegetable value chain. These are mainly composed of the government, related private sectors, and financial institutions.



Source: Company websites and articles

Figure 3.2.14 Major support system players in the vegetable value chain

Government
The government plays an important role in the governance of the vegetable value chain. These government agencies provide the regulation and assistance to enhance the production and market connection of vegetable farmers.

The *Department of Agriculture* is the executive department of the Philippine government primarily responsible for the promotion of agricultural and fisheries development and growth. DA provides the policy framework, assists direct public investments, and, in partnership with the local government agencies (LGUs), provides the support services necessary to make agriculture and agri-based enterprises profitable and help spread the benefits of development to the marginalized and subsistence farmers, particularly in the rural areas.

The *Department of Science and Technology* provides central direction, leadership, and coordination of all scientific and technological activities, and of formulating policies, programs, and projects to support national development. Through its Philippine Council for Agriculture, Aquatic, and Natural Resources Research and Development, it provides support to the agriculture sector through research and development (R&D) studies and active partnerships with international, regional, and national

organizations, and funding institutions for joint R&D, human resource development and training, technical assistance, and exchange of scientists, information, and technologies.

The *Department of Trade and Industry* is primarily tasked with enabling innovative, competitive, inclusive business, and empowerment of consumers. It supports the agricultural sector through facilitating the access of farmers to the market and also through its banner program of developing MSME particularly the agribusiness enterprises. The department aims to connect local farmers directly to consumers to address the problem of oversupply, low prices, and lack of a market for the produce.

The *Agricultural Credit Policy Council (ACPC)* assists DA in the creation and implementation of credit policies and programs to support the latter's priority programs. It continues to develop and implement strategies and policies to increase and sustain the flow of credit to agriculture and fisheries, improve the viability of farmers and fisher folk, and support agriculture modernization, food security and poverty alleviation.

The *Philippine Crop Insurance Corporation (PCIC)* provides insurance protection to farmers against losses arising from natural calamities, plant diseases and pest infestations of their crops.

Research, development, and extension (RDE)
State universities and colleges (SUC), such as the UPLB and the Benguet State University (BSU) has R&D facilities which support the vegetable value chain studies, and development of improved plant varieties and inputs.

Financial institutions
The *Land Bank of the Philippines* provides credit support to farmers through various agricultural loans offered in partnership with other government agencies such as DA, ACPC, and PCIC.

Rural banks provide basic financial services to farmers and fisher folk residing in the rural areas. They serve as key conduits of agricultural loans and subsidies offered by the government to marginalized and subsistence farmers.

Industry associations
These are relevant associations and private companies engaged in the agriculture sector, such as agriculture supply dealers, seed companies, foundations, and related development grant organizations.

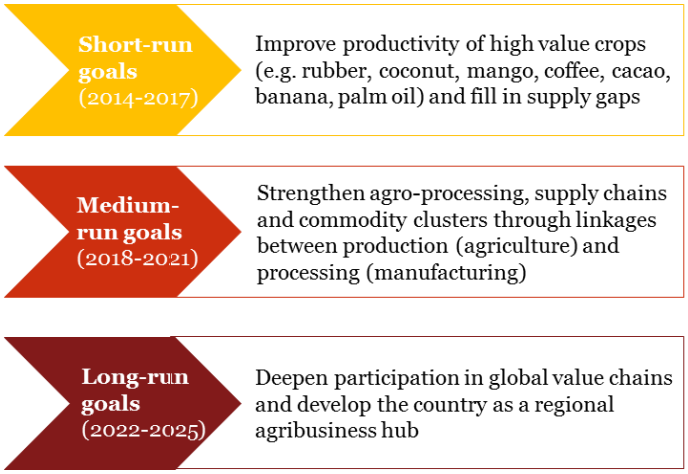
Logistics service providers
These refer to third-party logistics service providers who offer transport, storage, and warehousing services in the vegetable value chain. These are usually private entities serving the Divisoria and Balintawak markets including markets in the Visayas and Minadanao. In the lowland and the highland, these logistics providers transport pre-ordered vegetables from the production area various markets and buyers. In some cases, a disposer uses the available trunk space in ordinary public utility buses in transporting lowland vegetables from the Sentrong Pamilihan to the markets in the cities of Naga, Legazpi, and Sorsogon in Bicol to as far as Tacloban, Leyte. The buyers will then pick up the vegetables in the respective bus terminals.

Some progressive farmers buy their own elf truck to bring their produce to the trading posts as in the case of one farmer from Kayapa, Nueva Vizcaya. Other farmers then rent his truck for farm-to-market transport. In the case of onion growers, a cooperative manages the logistic transport provided by the government for rent to cooperative members at a certain fee for operational expenses.

3.3. Regulatory framework and economic policies governing the value chain

3.3.1. Regulatory framework

Government vision on the agribusiness sector. The DTI identified agribusiness as the catalyst to drive regional economic transformation. It aims to transform and upgrade agriculture from traditional farming to a globally competitive agribusiness sector. In line with this, it has formulated different strategies and goals for each node.



Source: Department of Trade and Industry

Other applicable laws for the agriculture sector include the following:

Republic Act 10601:
"Agricultural and Fisheries Mechanization (AFMech) Law"

Focuses on research, development, and extension, promotion, distribution, supply, assembling, manufacturing, regulation, use, operation, maintenance and project implementation of agricultural and fisheries machinery and equipment

- *Exemption from tariff and import duties* - Applicable to certified enterprises engaged in agricultural and fisheries on their importation of all types of agriculture and fisheries inputs equipment and machinery for five years after the effectivity of this act
- *Prohibited acts under AFMech* - (a) sell, mortgage or lease agricultural and fishery machinery without being registered with the Bureau of Agricultural and Fisheries Engineering; (b) sell new agricultural and fishery machinery without warranty or after-sales service; (c) claim ownership to an agricultural and fishery machinery that has not been properly registered in his/her name; and (d) operate a testing center without proper accreditation.

Republic Act 10068:
"Organic Agriculture Act of 2010"

Aims to promote, propagate, develop and implement the practice of organic agriculture in the Philippines to increase farm productivity and further protect the health of farmers, consumers and the general public

- *Labeling of organic produce* – The label of organic produce should contain the following:
  - Name, logo or seal of the organic certifying body
  - Accreditation number issued by the Bureau of Agriculture and Fisheries Product Standards
- Retailing of organic produce
  - Retail establishments or stores of organic produce should designate a separate area to display organic produce to avoid mixing it with non-organic produce.
  - Supermarkets, malls and similar establishment should designate a labelled area where organic products are conspicuously displayed, and only those which are verified and certified as such.
- Incentives
  - Exemption from importation duties on agricultural equipment, machinery and implements;
  - Local tax incentives by LGU for organic input production and utilization;
  - The Land Bank provides preferential rates and special window to organic input producers and users;
  - Zero-rated VAT on transactions involving sale/purchase of bio-organic products, whether organic inputs or organic produce;
  - Income tax holiday and exemption for seven years from date of registration.

Implementing rules and regulations on RA 10611: "Food Safety Act of 2013"	Strengthens the national food safety regulatory system to protect consumer health, facilitate market access of local foods and food products, and other purposes

- *Requirements for imported, produced, processed and distributed foods* – Imported foods must comply with quality standards and undergo cargo inspection and clearance procedures. Exported foods must comply with national regulations of the Philippines and those of the importing country.

Presidential decree 1159: "Agricultural Investments Incentives Act"	Prescribes the framework for the incentives for investments in agricultural enterprises to reinforce balance in the development of the agricultural and industrial sectors of the country

- *Incentives to investors in agricultural registered enterprises* - Capital gains tax exemption in proceeds of the sale invested in new issues of capital stock of a registered enterprise within 6 months from gain realization; *provided such disposal is registered and investment shall not be disposed of within 5 years.*
- *Incentives to a Pioneer Agricultural Enterprise* – Tax exemption from all taxes under NIRC, except income tax which shall be taxed in staggered extent; and post-operative tariff protection.
- *Special Export Incentives for Registered Agricultural Enterprises* – Special tax credit for materials used for its export products; and reduced taxable income for the first 5 years from registration.
- *Incentives to a Registered Agricultural Enterprise* – Deduction and tax credit for expenses enumerated; accelerated depreciation on fixed assets and capital equipment; net operating loss carry-over in any of the first ten years may be carried over for six years immediately following the year of loss.

3.3.2. Economic policy

The main economic policy governing the vegetable sector, particularly the high value crops, including cabbage, carrot, tomato, and onion, is RA 7900, otherwise known as the "*High Value Crops Development Act of 1995*." In this, the State aims to accelerate the growth and development of agriculture, enhance the productivity and incomes of farmers and the rural population, improve the investment climate, competencies and efficiency of agribusiness, and develop high value crops as export crops to significantly to augment the foreign exchange earnings of the country. This will be done through an intensive promotion of the production, processing, marketing, and distribution of high value crops in suitable areas in the country.

For this purpose, a High-Value Crops Development Fund shall be created to provide funding requirements for the production, marketing, and processing of high-value crops, and for the establishment of low-cost credit to qualified project proponents. This shall be managed by the Land Bank and the Development Bank of the Philippines. All financial institutions, be it public or private, shall be utilized to support the program.

In this Act, high value crops are defined as crops other than traditional crops which include, but are not limited to: coffee and cacao, fruit crops (citrus, cashew, guyabano, papaya, mango, pineapple, strawberry, jackfruit, rambutan, durian, mangosteen, guava, lanzones, and watermelon), root crops (potato and ubi), vegetable crops (asparagus, broccoli, cabbage, celery, carrots, cauliflower, radish, tomato, bell pepper, and patola), legumes, pole sitao (snap beans and garden pea), spices and condiments (black pepper, garlic, ginger, and onion), and cutflower and ornamental foliage plants (chrysanthemum, gladiolus, anthuriums, orchids, and statice).

The proponents of this act cover farmers, farmer organizations/associations/cooperatives, and other related beneficiaries, who shall enjoy the following benefits:

- Crop insurance – this is offered by the main insurance program of the Philippines under the PCIC which shall be expanded to cover high-value crops

- Credit assistance – the HVCDF shall be loaned out to farmer organizations/ associations/cooperations, subject to the prevailing Land Bank interest rates
- Credit guarantee – the Agricultural Guarantee Fund Pool (AGFP) of the DA provides guarantee coverage for 85 percent of "unsecured" loans extended by financial institutions to small farmer-borrowers.
- Market linkage – DA, in coordination with the DTI, shall connect agribusiness cooperatives directly with consumer cooperatives, agro-processing companies, or exporters with the purpose of providing marketing outlets and assuring relatively higher and stable prices.
- Technical and infrastructure support – DA, DTI, DOST, Cooperative Development Authority (CDA), SUCs, and other relevant government agencies shall provide technical support on research and extension, infrastructure development, and financial and market information
- Post-harvest facilities – support shall be given in facilitating access to post harvest facilities, storage, and distribution/transport facilities of existing government agencies. Assistance shall be given to qualified and viable farmers and farmer cooperatives in availing soft loans or grants for the construction of post-harvest, processing, and storage facilities.
- Good seeds and planting materials – DA, in coordination with SUCs, DTI, and farmer organizations shall facilitate the ready availability of good seeds and materials to farmers and farmer cooperatives to ensure high yield and good quality produce. However, project proponents may also import said high quality seeds/planting materials, free of duties, subject to quarantine laws and section 15 of the Seed Industry Development Act of 1992

3.3.3. Taxation system

Generally, taxation in the Philippines follows the concept of equality and equity, which means that tax laws and their implementation must be fair, just, reasonable, and proportionate to one's ability to pay. With this, the government acknowledges the inability of marginalized and subsistence individuals, particularly small-scale farmers, in paying taxes and duties. Due to this, certain tax exemptions are implemented according to their needs.

High Value Crops Development Act of 1995. Farmer organizations/associations/cooperatives organized under this Act are entitled to the following tax exemptions:

- Exemption from taxes and duties for cooperatives under the Cooperative Code of the Philippines (RA 6938)
- Exemption from taxes, fees, and charges under Title One of Book Two of the Local Government Code of 1991

Tax Reform for Acceleration and Inclusion (TRAIN) Act. Under the National Internal Revenue Code and as retained by TRAIN, the following shall be exempt from value-added tax:

- Sale or importation of agricultural and marine food products in their original state, livestock and poultry of a kind generally used as, or yielding or producing foods for human consumption; and breeding stock and genetic materials therefor.
    - Products classified under this paragraph shall be considered in their original state even if they have undergone the simple processes of preparation or preservation for the market, such as freezing, drying, salting, broiling, roasting, smoking or stripping.
- Sale or importation of fertilizers; seeds, seedlings and fingerlings; fish, prawn, livestock and poultry feeds, including ingredients, whether locally produced or imported, used in the manufacture of finished feeds (except specialty feeds for race horses, fighting cocks, aquarium fish, zoo animals and other animals generally considered as pets)

National Internal Revenue Code (NIRC) of 1997. Under the NIRC, the following corporations shall not be subject to tax with respect to income received by them as such:

- Labor, agricultural or horticultural organization not organized principally for profit
- Farmers' or other mutual typhoon or fire insurance company, mutual ditch or irrigation company, mutual or cooperative telephone company, or like organization of a purely local

character, the income of which consists solely of assessments, dues, and fees collected from members for the sole purpose of meeting its expenses
- Farmers', fruit growers', or similar associations organized and operated as a sales agent for the purpose of marketing the products of its members and turning back to them the proceeds of sales, less the necessary selling expenses on the basis of the quantity of produce finished by them

However, if these organizations have income of whatever kind and character from any of their properties, real or personal, or from any of their activities conducted for profit regardless of the disposition made of such income, these said income shall be subject to tax.

Export regulation for fresh produce. The International Plant Protection Convention (IPPC) is the basis for the export certification procedures and phytosanitary certification system in the Philippines. However, in order to ensure the acceptability of their commodities, exporters must also comply with requirements imposed by trading partners.

To obtain export certification, the following are required by the Bureau of Plant Industry - National Plant Quarantine Services Division (BPI-NPQSD):

1. Import permit (IP) from country of destination if required. This shall state the terms and conditions to be complied with to facilitate the clearance of commodities.
2. Clearance to export restricted and/or prohibited exports or movement of plants and plant products issued by designated agencies of the Philippines.
3. Accomplished application for Phytosanitary Certification.
4. Commodities must be submitted for inspection/examination/verification at least 48 hours prior to actual loading, either at the office of the PQS or at the premises of the exporter, whichever is convenient for both parties.
5. Unless compulsory or mandated by the importing country, treatment may be waived.

Upon compliance with the preceding requirements, a phytosanitary certificate (PC) or plant health certificate shall be issued for the commodities in accordance with International Plant Protection Convention/ Food and Agriculture Office (IPPC/FAO). In the Philippines, only the BPI-NPQSD is authorized to issue this certificate and only an authorized plant quarantine officer may validate such. This certification shall only be issued for commodities that completely meet the import requirements of the country of destination. The PC shall be denied for exports to countries where the commodity is prohibited by the plant quarantine regulations.

For in-transit shipments, a PC for re-export shall be issued if the country of destination requires such certification. This shall state any treatment and/or quarantine actions instituted on the in-transit cargo during its stay in the Philippines.

Revocation of permits and denial of further permit issuance may be implemented if the materials have the following findings:

- Confirmation of superficial inspection and certification
- Failure of the Permittee to give the required notice
- False notice
- Misdeclared shipment
- Falsification of plant quarantine terms and conditions imposed in the permit
- Other violations of plant quarantine rules and regulations

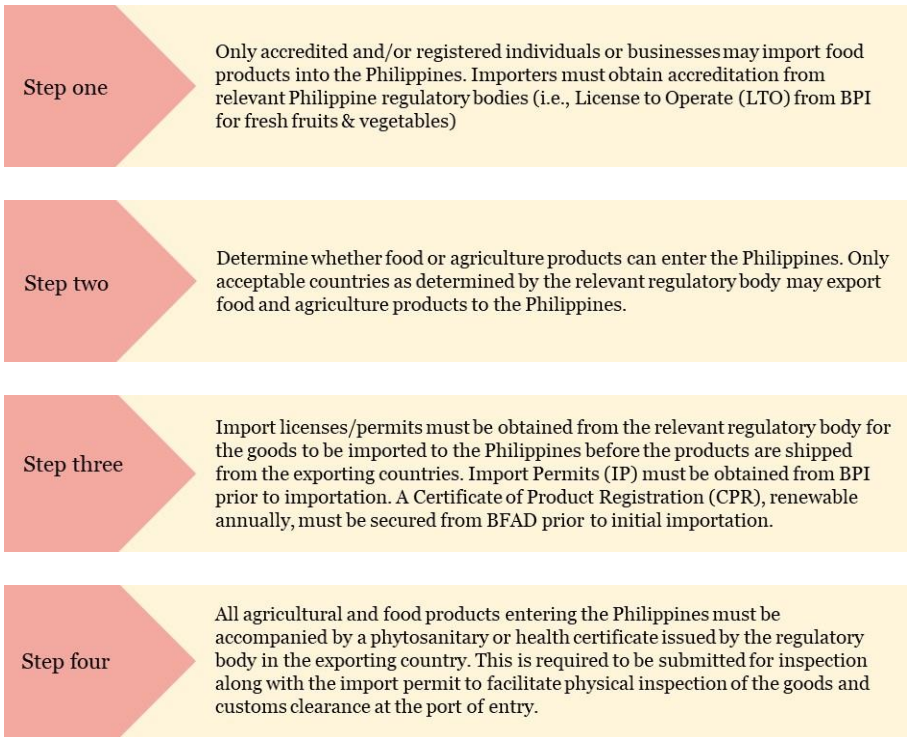
Overview of import regulation. All the imported food and agricultural products must comply with the food and health phytosanitary laws of the Philippines. Generally, none of these products can enter the country if it is deemed to pose a danger to human life or well-being, be it directly or indirectly. Before entry, all food and agricultural products, including plant products, must pass through procedures designed to test that they are not contaminated with any pest and that they are fit for their intended use.

At present, there is a lack of national microbiological standards for food. As such, Philippine food regulations are generally patterned after Codex Alimentarius Commission guidelines and regulations established by the Food and Drug Administration of the United States and similar regulatory bodies in other countries.

For all types of products, the health and phytosanitary regulations and procedures for imported agriculture and food products are broadly similar. Under Philippine import laws, the importer has the main responsibility to ensure that any product entering the country's customs territory is in full compliance with the related regulations. Enforcing authorities will check for compliance through inspection of the goods and relevant import/export documentation, then decide on whether the goods may enter the country. For cases of non-compliance, said goods may be required to be treated prior to release or may be rejected and ordered destroyed or disposed of outside the Philippines. It is therefore vital that importers and exporters ensure the compliance with relevant laws before the goods are shipped to the Philippines.

Import regulations for fresh produce. The DA has further tightened its import permit application procedures in response to pressure from domestic vegetable producers to limit imports and regulate illegal importation of fruits and vegetables into the Philippines. Additional requirements were imposed on the importation of fresh fruits and vegetables which resulted to supplementary checks and authentication processes that cause delays in imports of the affected products.

The Bureau of Plant Industry (BPI) regulates the import of fresh fruits and vegetables. All the imports of fresh produce require phytosanitary clearances from BPI, which also serve as import licenses. The following steps outline the basic procedures for the import of food and agricultural products:



Source: Bureau of Plant Industry

Customs duties and tariff classification of target crops. Applicable customs duties are determined based on the tariff classification of the import product. As with the rest of the Association of South East Asian Nations (ASEAN) countries, tariff classification in the Philippines is based on the ASEAN Harmonised Tariff Nomenclature (AHTN), which is patterned after the Harmonised Commodity Classification and Coding System (HS) Convention and its 2002 revisions. Although 267 classification rulings were issued to address commonly raised valuation and tariff classification, it is still advisable

that tariff classification rulings from the Philippine Tariff Commission be secured prior to importation into the Philippines in case of uncertainty as to the correct classification of a product. Note that while the tariff classification rulings issued by the Philippine Tariff Commission do not prevent the BOC from conducting its own verification, these rulings carry persuasive reference in support of the classification and duty rate used by an importer. The Philippines adopts the World Trade Organization (WTO) Valuation Agreement, where the declared invoice price is used as the basis for determining customs duties. As a protective measure, the Philippines retains higher tariff rates (20 percent to 50 percent) on sensitive agricultural products, such as grains, livestock and meat products, sugar, certain vegetables, and coffee. A few agricultural commodities are subject to minimum access volumes, but these represent less than 1% of all tariff lines.

In view of the existing free trade agreements in the region, such as the, the ASEAN-China Free Trade Area (ACFTA), the ASEAN-Japan Comprehensive Economic Partnership Agreement (AJCEPA), the ASEAN-Korea Free Trade Area (AKFTA), the ASEAN Trade in Goods Agreement (ATIGA), and the Philippine-Japan Economic Partnership Agreement (PJEPA), the Philippines has taken steps to progressively eliminate tariffs. Tariff reductions for the Philippines range from 10 percent to 35 percent for most products included in the Normal Track list. The following table enumerates the applicable rates for the select target crops, with the Most Favoured Nation (MFN) tariff schedule referring to the Philippine tariff rates that are applicable to imports from all sources. This schedule can be found in Section 1611 of the Customs Modernization and Tariff Act (CMTA).

Table 3.3.1 Schedule of tariff rates for the target vegetables

AHTN Code	Description	MFN	ACFTA	AJCEPA	AKFTA	ATIGA	PJEPA
0704.90.10	Round (drumhead) cabbages	40%	40%	0%	32%	0%	0%
0706.10.10	Carrots	40%	40%	0%	32%	0%	0%
0710.10.00	Potatoes	15%	0%	0%	0%	0%	0%
2001.90.10	Onions	15%	0%	0%	Rakkyo - 0%; Other - 15%	0%	0%
0702.00.00	Tomatoes, fresh or chilled	10%	0%	0%	5%	0%	0%

Source: Bureau of Customs

3.3.4. Quality control standards and certification

In order to gain a deeper understanding on the guiding outlines underlying the vegetable value chain, this section highlights the relevant standards and certifications in the sector.

General standard requirements

The Code of Good Agricultural Practices for Fresh Fruits and Vegetable Farming prescribes the general hygienic practices for the production and primary processing of fresh fruits and vegetables cultivated for human consumption. The notable guidelines per node include the following:

- Postharvest treatment. Anti-microbial agents should only be used when absolutely necessary and levels should be monitored and controlled. Chemical residues should not exceed the levels recommended by the Codex Alimentarius Commission. Also, the farm should only use materials for postharvest treatments such as waxes, pesticides to include fungicides, and other chemicals that are approved and registered by competent authority. Sprayers for postharvest treatments should be calibrated regularly to control accuracy of application rate.
- Cooling system. Condensate and defrost water from evaporator type cooling systems (e.g. vacuum cooling, cold rooms) should not drip onto fresh fruits and vegetables. The inner side of the cooling systems should always be cleaned. The water quality in these systems should be potable water and should be controlled and maintained.
- Waste management. Documented records should be kept for disposal of rejected produce and waste materials. Farm waste management plan should be properly documented including the types of waste products generated by property activities, and the practices to minimize waste generation, reuse, or recycling of waste, and storage and disposal of waste.
- Handling. To prevent leaching or pollution of water, storage places for inputs (manure and compost sites) should be covered or sheltered. There should be no commingling of organic and

non-organic produce. Organic produce shall be adequately identified and protected from contamination throughout the whole process until final labelling.

- Labelling. All information required should be indicated in the final label. All claims for contents should be verifiable (i.e. macronutrients, micronutrients, plant growth hormones, microbial inoculants etc.) and consistent with submitted documents.
- Traceability and Recordkeeping. Each separate site is identified by a name or code and is recorded on all documents/records. The documentation shall clearly identify the source, movement, use, and inventory of organic products at all stages of production/processing and handling. Records shall follow a retention period of at least 5 years

Specific Philippine National Standards for the target crops

The Philippine National Standards (PNS) are developed by the Bureau of Agriculture and Fisheries Products Standards (BAFPS) under the DA. These aim to promote common understanding among relevant sectors, provide a level playing field for businesses, and ensure the food safety of the general public. In the standards, the minimum requirements, classification, tolerances, sampling, packaging, and marketing and labeling of vegetables are enumerated. However, these quality control measures are not strictly observed as they are treated as voluntary guidelines only. Growers, traders, and importers of these products on the other hand are required to comply with RA 7394, otherwise known as the Consumer Act of the Philippines, as these provide guidelines on the conduct of business and industry in the country.

Certifications

As the agriculture sector handles the produce consumed by the people, each node is considered critical and sensitive. Various certifications and permits are issued by the government and/or accreditors in order to assure the consumers of the safety of what they are buying. Consumers who are aware of where their produce comes from and the standards it passed are highly likely to be confident in buying. These certificates are issued to establishments and producers to ensure the quality of food being handled. These, together with the government regulations, tightens each node of the vegetable value chain.

International Organization for Standardization (ISO) 22000 – ISO 22000 certification covers all the processes in the food chain that impact the safety of the end product. It specifies the requirements for a comprehensive food safety management systems as well as incorporating the elements of GMP and Hazard Analysis Critical Control Points (HACCP).

Food Safety System Certification (FSSC) 22000 – ISO-based, independently managed certification scheme for auditing and certification of food safety in the whole supply chain

- Ensure the safety of products during manufacturing of:
    - Perishable animal products, excluding slaughtering and pre-slaughtering;
    - Perishable vegetal products;
    - Products with long shelf life at ambient temperature;
    - Biochemical products for food manufacturing;
    - Food packaging manufacturing
- Supported by the European Food and Drink Association (CIAA) and the American Groceries Manufacturing Association (GMA)
- Fully recognized by the Global Safety Initiative (GFSI)

Hazard Analysis and Critical Control Points (HACCP) certification – HACCP is a systematic preventive approach to food safety from biological, chemical, and physical hazards in the production process. It establishes a framework for food management system.

- Principles of HACCP Certification
    - Conduct an Hazard analysis
    - Determine the critical control points
    - Establish critical limits

- Establish monitoring procedures
- Establish corrective actions
- Establish verification procedures
- Establish record-keeping and documentation procedures

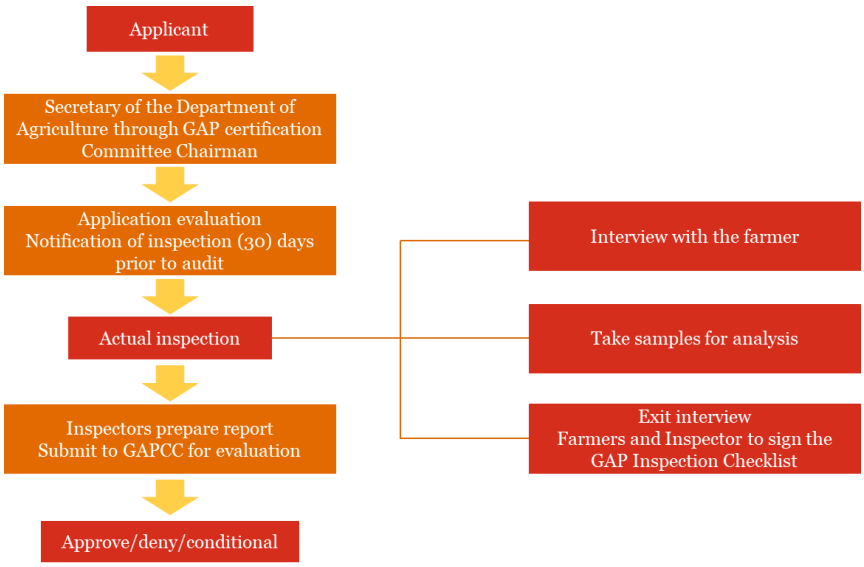
Organic certification – The organic certification in the Philippines is covered by the Organic Certification Center of the Philippines (OCCP) to serve as a certification and inspection body for food and food products, and agricultural inputs (e.g. fertilizer, pesticide, feeds, etc) to cater the agriculture industry and the consumers of certified products.

Inspection Path

- Farm Inspection – encompasses the following: environment, contamination, fields, brought in materials, production system, harvest, storage and processing, documentation, sales
- Processing Inspection – the scope includes: storage facility, processing, non-contamination, additives and processing aids, documentation, sales and inputs

GAP Certification – represents a set of consolidated safety and quality standards for on-farm fruit and vegetable production

Certification scheme



Source: Bureau of Agricultural Research

Figure 3.3.1 GAP certification scheme

The certification scheme is based on three options, depending on the type of organization:

- Individual grower – must operate under the same management systems and adhere to the DA Code of Good Agricultural Practices
- Produce Marketing Organization (PMO) – must illustrate its 100 percent control of the registered growers of the group requesting for certification
- Company/corporation that applies a national or company scheme

3.3.5. Agricultural financing and insurance

Government subsidies and assistance. Under the 2018 national budget, farmers were given financial assistance through the subsidy of irrigation service fees to the NIA. In addition, the DA had an allocation of Php2.67 billion for the construction, restoration, or improvement of small-scale irrigation projects and Php4.28 billion for the construction of facilities and procurement of agricultural machineries and equipment. Accordingly, the 2018 national budget aimed to strengthen the national programs of agriculture agencies by providing equipment, machinery, facility, and infrastructure needed by the

farmers and fisher folk in building their capacity to combat climate change and reduce disaster risks. The amount of Php20.2 billion was allocated for the national programs for rice, corn, high value crops development, organic agriculture, and livestock. Additionally, the funds amounting to Php1.05 billion under the Agro-Industry Modernization Credit and Financing Program Administration was transferred to government financial institutions, cooperative banks, rural banks, and viable non-governmental organizations for the exclusively use of establishing a flexible credit facility for the benefit of small farmers and fisher folks.

Financing programs implemented for farmers. Several initiatives have been initiated to increase the farmers' access to financing and assistance.

Agricultural Guarantee Fund Pool (AGFP). The provision of guarantee funds encourages partner financial institutions and other lending entities to lend unsecured agricultural food commodity production loans to small farmers.
Program for Unified Lending to Agriculture (PUNLA). PUNLA - Special Lending Facility for Marginal Farmers and Fisherfolk provides institutional and capacity building support to lending channels for delivery of credit to intended borrowers in the poorest provinces.
Cooperative Banks Agri-Lending Program II (CBAP II). This provides loans to eligible cooperative banks who lend to registered small farmers at lower pass-on rates.
Climate Change Adaptation Financing Program (CCAFP). This program is a special credit facility that encourages small farmers to implement climate change adaptation practices and technologies.
Agriculture and Fisheries Financing Program (AFFP). This provides registered small farmers access to agri-finance and agri-microfinance loans through AFFP partners.
Value Chain Financing Program (VCFP). This supports the implementation of a value-chain financing facility to registered farmers or groups of farmers participating in the agribusiness value chain.

Financing loan assistance packages. DA, in partnership with the Land Bank of the Philippines and other lending conduits, initiated several loan assistance packages that caters to subsistence and small farmers.

Survival and Recovery (SURE) Loan Assistance

A post-disaster facility providing loan assistance to calamity-affected small farmers and fisherfolk and their households through partner-financial institutions or lending conduits.
SURE Loan Assistance financial package includes:
- PHP25,000 interest-free recovery or rehabilitation loan
- Loan Moratorium of one year for affected SFF borrowers with outstanding loans from partner institutions /conduits

Production Loan Easy Access (PLEA)

Offers easy-to-access loans to small farmers and fisherfolk to address their financial needs. Non-collateralized loans are available for agri-fishery production through cooperatives, non-government organizations (NGOs)/associations, rural banks and cooperative banks as lending conduits.
- Eligible borrowers are marginal and small farmers and fisherfolk registered under the Registry System for Basic Sectors in Agriculture (RSBSA).
- Borrowers can avail of up to PHP50,000 for short-term crops/commodities and up to PHP150,000 for high value crops/long gestating crops
- Interest rate is 6% per annum or 0.5% per month.
- Only one member of the household can avail at a time.

Agrarian Production Credit Program (APCP)

Provides credit and capacity building assistance to achieve sustainable crop production and increase incomes of agrarian reform beneficiaries (ARBs) and their households.
Eligible projects:
- Agriculture and fisheries production (e.g. production of corn, sugarcane, coconut, coffee, livestock, poultry and fishery projects
- Agri-enterprise and livelihood projects (e.g. trading and processing of agricultural crops and commodities)

Interest rate:
- Short-term loans: 8.5% per annum
- Term loans: 9.5% per annum

Pass-on rate to end-borrowers:
- Short-term loan: 15% per annum
- Term loan: 16% per annum

Working Capital Loan Easy Access (CLEA)	Sikat Saka Program (SSP)
Aims to finance working capital requirements for trading, marketing and processing of agri-fisheries products *Eligible borrowers:* • Cooperatives and Associations of Marginal and Small Farmers and Fisherfolk (MSFF) • CDA/SEC/DOLE-BRW Registered • No pending case or investigation against the organization, its Board and key officers • With management capability to implement the project • With established/firm market and with existing facilities required for the project • Direct beneficiaries are MSFF *Loan Amount*: up to PHP5,000,000 *Repayment*: Amortized based on cash flow up to 5 years *Interest charge*: 6% interest per annum on diminishing balance	A project of the Department of Agriculture in support of its Foods Staples Sufficiency Program, in partnership with Land Bank of the Philippines to provide credit assistance to small palay and corn farmers for their production activities/projects. DA agencies with Irrigators' Association will provide support to farmers (e.g. extension, administrative services, assured market, irrigation) *Interest Rate:* • 15% per annum (inclusive of all other finance charges) • Declining interest rates for borrowers who establish a good credit standing • In the first 2 cropping cycles, the interest rate will be pegged at 15% which will be reduced by 1% every succeeding cycle starting from the 3rd cycle onward until it is reduced to 9% per annum.

Source: Department of Agriculture

Financing institutions, like banks, are looking for standard costing per hectare of land planted with various crops to assess funding requirements of farmers. At the moment, standard costing is only available for rice and corn but not for vegetables.

Government crop insurance policies. In the Philippines, the PCIC is the implementing agency of the government's agricultural insurance program. It is an attached agency of the DA which provides insurance protection to farmers against losses from natural calamities, plant diseases and pest infestations of rice, corn, and other crops. In addition, PCIC also provides protection against damage to or loss of non-crop agricultural assets such as machineries, equipment, transport facilities and other related infrastructures due to the hazards insured against.

The main insurance program for vegetables is the High Value Crop Insurance Program, which covers produce such as broccoli, cauliflower, cabbage, eggplant, onion (red, white, and yellow), potato, and tomato, among others. The amount covered comprise of the production input costs and a portion of the value of the expected yield, as agreed by PICC and the farmer. The period shall be annual for crops with long production periods, while those with shorter duration of less than one year, shall be from planting to harvesting. The insurance premium shall be market-rated and on a per crop basis, depending on the pre-coverage evaluation, the type and number of risks covered, and other factors. The premium rate ranges from 2 to 7 percent of the total sum insured, subject to deductible and co-insurance provisions.

In 2014, the government's Agricultural Insurance Program provided free insurance coverage to subsistence farmers listed in the Registry System for Basic Sectors in Agriculture (RSBSA). According to PCIC, the enrollees increased by 24.3 percent from 743,589 in 2013 to 924,343 in 2014. In the same year, the agency paid out Php734.97 million insurance claims to 99,335 farmers and fishermen.

As for vegetable farmers, specifically high value crops, the farmers and area covered have grown. According to PCIC data, the insured farmers of highland vegetables, particularly cabbage, carrots, potatoes, cauliflower, and broccoli, has increased from 2,233 in 2017 to 6,113 in 2018. As to area covered, it expanded from 1,104 to 3,977 hectares as more farmers availed of the free insurance coverage. In the course of this period, the claims paid were Php 6.3 million for 2017 and Php31.8 million for 2018. About Php31.7 million of the claims in 2018 were from the farmers affected by the two typhoons which caused great agricultural damage in Benguet and the nearby provinces. As for the lowland vegetables, the covered farmers of eggplant, onion, and tomato has increased from 5,171 in 2017 to 9,783 in 2018 with the area covered increasing from 4,135 to 6,843 hectares. Over the same period, the insurance claims paid were Php3.3 million for 2017 and Php4.5 million for 2018.

Given that the Philippines is prone to typhoons and other calamities, the protection provided by insurance is needed by farmers. In response, the government provided subsidies for farmers which amounted to Php3.5 billion in 2019 and is projected to increase to Php4.0 billion in 2020. Currently, PCIC is developing index-based insurance programs to eliminate the process of damage calculation.

Once an index is breached, the claimable amount is already computed resulting to faster payout. However, it is specific to the index, and does not include other risk factors such as pest and disease incidence. It also requires historical data and good infrastructure to monitor the indices. The traditional, indemnity-based insurance, on the other hand, has high human hazard and takes time as it depends on adjusters to determine the extent of damage and the calculation of the claimable amount. Its advantage is that it covers more risks than the index-based insurance. SUCs, including the UPLB are developing indices for Climate Risk Management through Agri-Insurance (CRM), which is designed to provide weather-based indices as a scientific basis in making crop insurance products/premiums. But these are only for five priority crops, which include rice, corn, coffee, cacao, and banana.

Private sector agricultural loans. According to RA 10000 or The Agri-Agra Reform Credit Act of 2009, all banking institutions, whether government or private, shall set aside at least 25 percent of their total loanable funds for agriculture and fisheries credit. Of this amount, at least 10 percent shall be for agrarian reform beneficiaries while the other 15 percent shall be for farming-related activities. However, according to central bank data, only Php707.4 billion loans out of the Php1.24 trillion were extended to the agriculture sector in 2018. Since the target lenders are unable to meet the regulation, such as provision of collateral and income tax returns, banks would rather pay the penalties for non-compliance instead of lending to a high-risk sector. In response to this, the Bangko Sentral ng Pilipinas (BSP) has approved other alternatives, such as investing in duly-declared eligible debt instruments, investing in the special deposit accounts of BSP-accredited rural lenders, wholesale lending to rural banks, granting rediscount loans to other banks covering farm loan credits, and the extension of loans for public infrastructure for the benefit of the farming sector.

According to PSA, the agricultural loans extended to small farmers and fishermen amounted to Php681.8 billion in 2017, which was 23.8 percent higher than the prior year at Php500.0 billion. About 56.6 percent of the 2017 agricultural loans amounting to Php350.4 billion were used for production purposes. The source of production loans were mostly from private banking institutions. Although this share was declining from 2013 to 2016, it increased to Php284.9 billion in 2017. Among the private banks, Private Commercial Banks (PKbs) were the largest providers of production credit at an increased share of 48.6 percent amounting to Php170.4 billion. This is followed by Rural Banks amounting to Php42.3 billion at 12.1 percent. On the other hand, Savings and Mortgage Banks (SMBs) and Private Development Banks (PDBs) had 8.02 and 7.3 percent shares, respectively.

3.3.6. Recent policy developments and implementation in the agriculture sector

A major factor that hampers the development of the vegetable productivity and profitability in the country is the focus on major crops such as rice, corn, and coconut. Most of the agriculture initiatives and loans are focused on the improvement of these crops. Diversification to high value crops need further support and development to supplement agricultural improvement.

Several agricultural policies were recently implemented. The National Land Use Act aims to address land use conflict, implement national and local levels of land use formulation, and integrate and monitor developments on usage of land. In connection with this, DAR was tasked to acquire all unutilized government-owned agricultural lands for redistribution to qualified beneficiaries. These lands will be awarded to farmers for free without the need to pay for amortization. This will address the problem of landlessness of farmers and boost agricultural production.

In 2018, due to the rising prices of basic goods and prime commodities, the Administrative Order No. 13 was signed to remove non-tariff barriers and streamline the administrative procedures on importation of agricultural products. A surveillance team composed of the DTI, National Food Authority, National Bureau of Investigation, and the Philippine National Police, was also created to ensure the distribution to warehouse and retail outlets and prevent price manipulation. The DA and DTI were also instructed take concrete measures that will reduce input costs through the improvement of logistics, transport,

distribution, and storage of agricultural products.[12] However, the influx of imported products at lower prices may negatively affect the marketability of local products. This demonstrates the need to support the local agricultural sector to produce quality crops at reasonable prices that is at par with the imported products.

As the Philippine government focuses on select crops, vegetables are at the lower end of the priority list. Even with the policies implemented, there is a gap between the desired outcome and the actual results due to weak policy enactment. Proper monitoring and implementation of policies will significantly improve the sector.

[12] https://www.sunstar.com.ph/article/1766042

Chapter 4. Dynamics in the vegetable value chain

4.1. Linkages and relationships of value chain players

4.1.1 Price setting and price trends

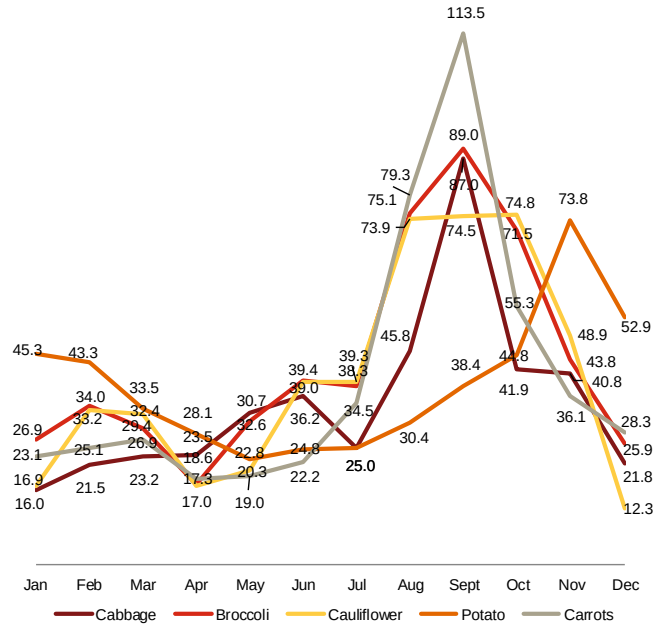
Pricing is crucial in the profitability of key players in the chain. The main objective is to maximize profit. However, pricing decisions in each value chain node could vary depending on availability of sufficient information to be able to do so.

Highland vegetable value chain. At the production node, the prices of farmers for each type of vegetable is practically the same since these are commodity products. Consequently, there is no significant difference between the price of cabbage produced in Atok as compared to those produced in Buguias and other vegetable producing municipalities of Benguet.

Wholesaler-traders who have access to market information dictate these prices, relegating most of the farmers as price-takers. Since they lack economies of scale and have inadequate market information, they do not have the leverage to negotiate for a better price. These farmers are placed at a disadvantage, especially during times of oversupply.

Price setting is also influenced by supply and demand conditions. Given that demand is less elastic, the occurrence of supply shocks that either decrease supply or result to oversupply given that demand is constant correspondingly results to price adjustments.

Production failures caused by natural calamities or pest and disease outbreak could significantly lower supply and cause prices to sharply increase. In 2018, the two consecutive typhoons that hit the Cordillera Administrative Region in August and September severely destroyed infrastructures and agricultural crops. Production of vegetables was substantially reduced and the supply route to key markets was blocked by landslides. With the supply considerably reduced, prices increased to more than twice the normal level for highland vegetables. Another factor affecting the price pattern is the seasonality of production. Prices during the dry season is generally lower since this is the peak harvest time and there is an abundance of supply in the market. On the other hand, prices are higher during the wet season since supply is substantially low. The occurrence of typhoons adds up to the sharp rise in prices during this period. Typically, the dry season starts in late November and ends in May, while the rainy season starts in June and lasts until October. September and October are often the typhoon season in the Philippines.



Source: La Trinidad Vegetable Trading Post

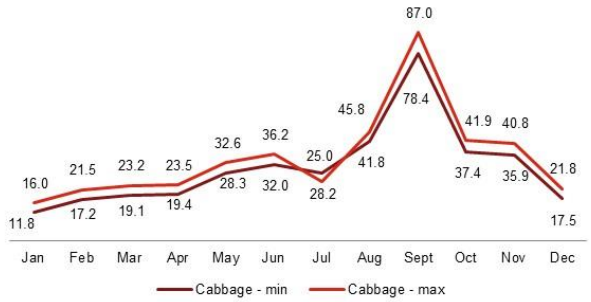
Figure 4.1.1 Price trend of select highland vegetables in Benguet during 2018

For farmers and players to gain profit, their prices should be higher than their break-even price (BEP). With regard to the price of farmers, these are usually above the BEP.[13] This can be clearly seen by comparing the breakeven prices of the target study vegetables to the minimum and maximum prices as monitored by the LTVTP in 2018.

Table 4.1.1 Break-even price computation for target highland vegetables

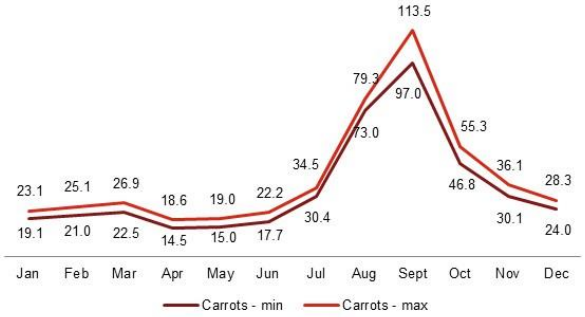
Items	Cabbage	Carrot	Potato	Cauliflower
Yield (kg/ha)	20,000	16,000	20,000	12,000
Cost of production (Php/ha)	148,263	150,621	272,380	157,972
Breakeven price (BEP-farm) (Php/kg)	**7.4**	**9.4**	**13.6**	**13.2**
Transport cost (Php/kg)	2.0	2.0	2.0	2.0
Disposer fee (Php/kg)	1.5	1.5	1.5	1.5
Packaging and handling (Php/kg)	0.5	0.5	0.5	0.5
BEP-trading post (Php/kg)	**11.4**	**13.4**	**17.6**	**17.2**

Source: Provincial Agriculture Office of Benguet and KIIs; BEP calculated by PwC Marketing Expert



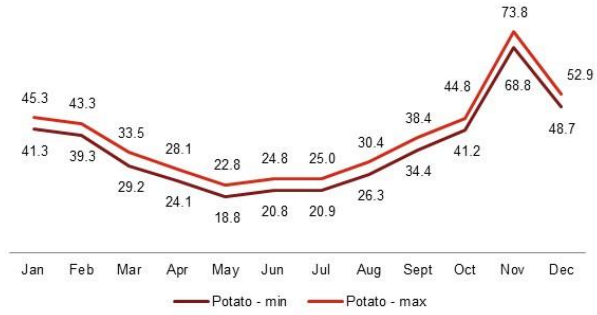
Source: La Trinidad Vegetable Trading Post

Figure 4.1.2 Low and high monthly farmgate prices of cabbage in Benguet during 2018



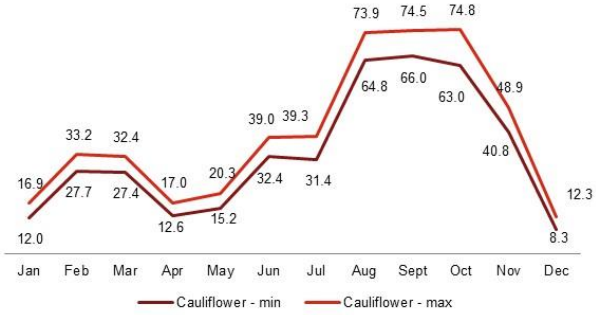
Source: La Trinidad Vegetable Trading Post

Figure 4.1.3 Low and high monthly farmgate prices of carrot in Benguet during 2018



Source: La Trinidad Vegetable Trading Post

Figure 4.1.4 Low and high monthly farmgate prices of potato in Benguet during 2018



Source: La Trinidad Vegetable Trading Post

Figure 4.1.5 Low and high monthly farmgate prices of cauliflower in Benguet during 2018

The BEP is calculated by dividing the total cost of production per hectare by the volume of production per hectare. It decreases as the yield per hectare improves. This highlights the importance of farm productivity improvement. It is an important intervention in mitigating the risks of market price fluctuation, which is a common concern raised by vegetable farmers.[14] Decreasing the cost of production and improving productivity and harvest quality enhances the profitability of farmers, often to the disadvantage of farmers.

[13] This includes the cost of transport and commission of disposers.
[14] PwC KIIs in Buguias and Atok, Benguet.

In the trading posts, wholesaler-traders dictate the buying price based on the prevailing market prices in the Divisoria and Balintawak markets in Metro Manila and the Urdaneta and Villasis markets in the Pangasinan province. Since they are the price-makers, they set prices to maximize their profits.
Each marketing player aims to maximize profit by setting the highest acceptable price. As can be observed in the results of the PwC survey in the Balintawak and Divisoria markets, some traders set abnormally high prices to get the highest profit. The amount of incremental price on top of the farm gate price depends on the type of vegetable. This activity of setting unequitable prices as well as the multiple layers of unnecessary intermediaries increase the price for consumers at retail outlets.

Table 4.1.2 Buying and selling prices of target highland vegetables in the Balintawak market

	Balintawak			
	Juliana market		Cloverleaf market	
Market players	BP	SP	BP	SP
In Php/kg	Cabbage			
Benguet farmers		23 - 28		20-23
Wholesaler-assembler	23 - 28	35	20-23	25
Viajero	35	40	25	30
Wholesaler	40	80	30	40
Wholesaler-retailer	80	100	40	60-65
Consumer	100-110		60-65	
	Carrot			
Benguet farmers		20-24		20-24
Wholesaler-assembler	20-24	28-30	20-24	28-30
Viajero	28-30	40	28-30	35-43
Wholesaler	40	48	35-43	43-45
Wholesaler-retailer	48	52	43-45	52
Consumer	52-55		52	
	Potato			
Benguet farmers		30-32		24-28
Wholesaler-assembler	30-32	32-34	24-28	28-32
Viajero	32-34	45	28-32	34
Wholesaler	45	50	34	38
Wholesaler-retailer	50	55	38	40
Consumer	55		40	
	Cauliflower			
Benguet farmers		30-34		30-34
Wholesaler-assembler	30-34	65-75	30-34	65-75
Viajero	65-75	110	65-75	100
Wholesaler	110	150	100	135
Wholesaler-retailer	150	180	135	150
Consumer	180		150	

BP (Buying price); SP (Selling price)

Source: PwC survey and LTVTP price monitoring

Table 4.1.3 Buying and selling prices of target highland vegetables in the Divisoria market

	Divisoria			
Market players	BP	SP	BP	SP
In Php/kg	Cabbage		Carrot	
Benguet farmers		23 - 28		20-24
Wholesaler-assembler	23 - 28	40	20-24	35
Viajero	40	46	35	38
Wholesaler	46	53	38	45
Wholesaler-retailer	53	70	45	65
Consumer	70		65	
	Potato		Cauliflower	
Benguet farmers		30-34		30-35
Wholesaler-assembler	30-34	38	30-35	80
Viajero	38	45	80	110
Wholesaler	45	60	110	150
Wholesaler-retailer	60	75	150	180
Consumer	75		180	

BP (Buying price); SP (Selling price)

Source: PwC survey and LTVTP price monitoring

Price setting in the value chain of vertically integrated food service providers (IFSP) is somewhat different. Since IFSPs have control of the processes in their value chains, they set prices based on market conditions and their cost structure. This procurement price for vegetables from farmers, cooperatives, and preferred assemblers are set through contract agreements. Consequently, the selling prices of these vegetables are also set through formal and informal agreements. These prices are relatively high to cover incremental costs in packing and logistics (i.e., cold chain and transport) and to reflect good quality. Some examples of these are Dizon Farms, UBM Corporation, and GTGF.

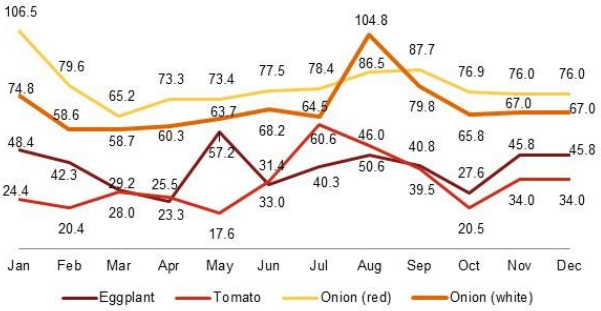
On April and June, informal surveys were conducted in two supermarkets in Los Baños and one supermarket in Sta. Laguna. It was observed that the retail prices of cabbage ranged from Php90/kg for the RB variety, and Php110-118/kg for the Scorpio variety. The prices of carrots ranged from Php100 to Php165/kg, while that of the potatoes ranged from Php82 to Php127/kg. Cauliflower exhibited the highest price at Php300/kg.

Prices of target highland vegetables in supermarkets at Los Baños and Laguna

It can be observed that the prices of cabbage at the other wet markets were significantly lower than those sold in the supermarkets. For the other types of vegetables, the price differences were larger. For carrots, the price in the supermarket can get as high as two to three times more than the highest wet market retail price of Php55/kg, while the cauliflower was Php120/kg higher than the wet market price.

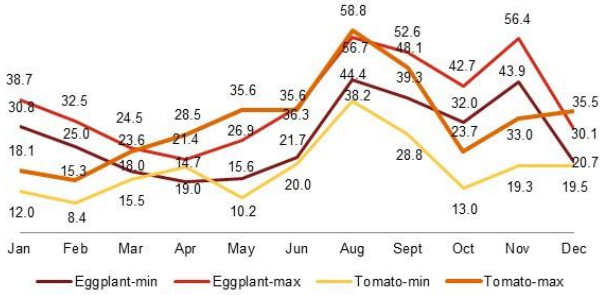
Lowland vegetable value chain. The price setting in the LVVC is similar to that of the HVVC. The main difference is that farmers can practice selective pricing. Most lowland farmers have access to market information because of their proximity to the market and their production volume is relatively higher due to larger land areas. Farmers in CALABARZON and Central Luzon are closer to the Metro Manila and other urban markets. The distance of Laguna and Batangas from Manila is about 103 and 109 kilometers, respectively, while the distance to Calamba and Pampanga are just 48 and 79 kilometers, respectively, from Manila. Consequently, lowland farmers have a higher bargaining power and can offer different prices to wholesaler-assemblers, wholesaler-retailers at urban wet markets, supermarkets, restaurants, and institutional buyers.

Factors that drive the difference in prices include, the type of vegetable, location of production areas, crop production season, market players, and the types of markets. Comparing the target lowland vegetables, onions (e.g. red and white) displayed higher prices than eggplant and tomato. In terms of the location, farm-gate prices of eggplants and tomatoes are higher in Sariaya, Quezon as compared to Pangasinan. Prices are also higher during the rainy season than in the dry season, when there is oversupply. These are illustrated by the monthly farm-gate price trends in Sariaya, Quezon and Urdaneta, Pangasinan in 2018.



Source: Sentrong Pamilihan ng Produktong Agrikultura sa Quezon Foundation, Inc.

Figure 4.1.6 Low and high prices of the target lowland crops in Sariaya, Quezon during 2018



Source: Pangasinan Agri-Pinoy Trading Center

Figure 4.1.7 Low and high prices of the target lowland crops in Urdaneta, Pangasinan during 2018

As indicated in the figures, prices rise during the rainy season months of June to August. The sharp rise in August and September is attributed to the supply shock resulting from production failures due to two typhoons that hit Luzon in 2018.

In the supermarkets, the price of eggplants substantially rose to Php150/kg at that time. The price of sayote at Php63.5/piece or Php130/kg, while the price of cabbage at Php300/kg reflected the abnormally high prices of vegetables.

High prices of vegetables in supermarkets

Price setting in the LVVC usually does not vary significantly among similar players in a given marketing channel. For example, two wholesaler-assemblers of eggplant from Nueva Ecija sells to a wholesaler at Divisoria at prices of Php10/kg to Php12/kg. This is the same range of prices at which viajeros sell eggplants to wholesalers at the Jualiana and Cloverleaf markets in Balintawak. This is also reflected in the tomatoes and onion value chains, where there is a similar range of prices for value chain players in the Balintawak and the Divisoria markets.

Table 4.1.4 Buying and selling prices of target lowland vegetables in the Balintawak market

	Balintawak			
	Juliana market		Cloverleaf market	
Market players	BP	SP	BP	SP
In Php/kg	Eggplant			
Nueva Ecija farmers		5		7
Wholesaler-assembler	5	7		
Viajero	7	12	7	10
Wholesaler	12	18-20	10	15
Wholesaler-retailer	18-20	25-30		
Viajero			15	20
Consumer	25-30		20	
	Tomato			
Nueva Vizcaya farmers		13		45
Wholesaler-assembler			45	55-60
Viajero	13	38		
Wholesaler	38	45	55-60	60
Wholesaler-retailer	45	65	60	62-65
Consumer	65		62-65	
	Onion			
Occidental Mindoro farmers		14-15		19
Wholesaler-assembler	14-15	15-20	19	26
Viajero	15-20	35	26	28
Wholesaler			28	30
Wholesaler-retailer			30	40
Consumer	35		40	

BP (Buying price); SP (Selling price)

Source: PwC survey and LTVTP price monitoring

Table 4.1.5 Buying and selling prices of target lowland vegetables in the Divisoria market

	Divisoria			
Market players	BP	SP	BP	SP
In Php/kg	Eggplant (Pampanga)		Eggplant (Nueva Ecija)	
Farmers		7		7-10
Wholesaler-assembler	7	20	7-10	10-12
Wholesaler			10-12	15-20
Wholesaler-retailer	20	30-40	15-20	25-30
Consumer	30-40		25-30	
	Tomato			
Nueva Ecija farmers		30		39
Wholesaler-assembler			39	43
Viajero	30	50		
Wholesaler	50	55	43	50
Wholesaler-retailer	55	60	50	60
Consumer	60		60	
	Onion			
Occidental Mindoro farmers		19		20
Viajero	19	23	20	24
Wholesaler	23	25	24	30
Wholesaler-retailer	25	30	30	40
Consumer	30		40	

BP (Buying price); SP (Selling price)

Source: PwC survey and LTVTP price monitoring

Similar to the highland vegetable value chain, market players starting with lowland farmers or vegetable growers to retailers, practice price discrimination. In the survey of LVVCs, the difference between the farm gate prices is highest in the Juliana market, especially for eggplant and tomatoes. This is seen in the table below, with price difference between farm-gate and retail for tomato reaching up to Php52/kg and for eggplant at Php20-25/kg. The Juliana market is a privately operated and managed dry and wet market located along EDSA at Balintawak, Quezon City. It is strategically located to cater to the markets in Makati City, other cities of the Metro Manila, and the Central Luzon and CALABARZON regions.

Table 4.1.6 Retail price differences of lowland vegetables

Crops	Balintawak		
In Php/kg	market	market	Divisoria
Eggplant	20-25	13	15-33
Tomato	52	17-20	21-30
Onion	20-21	21	11-20

Source: PwC survey and LTVTP price monitoring

In terms of location, the retail price differences are not significant. Based on the survey conducted in the Balintawak and Divisoria markets, the eggplants from Divisoria are sold at the same price of Php30/kg in Laguna, Batangas, and Cavite. Also, the tomatoes from Divisoria and from the two Balintawak markets are priced at the same range of Php60-65/kg in the wet markets of Antipolo and Montalban, Rizal, and Batangas. A factor affecting the price difference is the number of intermediaries before the produce reach the consumers. For the eggplant surveyed in Cloverleaf market, the chain only composed of a farmer who sold to a viajero, then to a wholesaler who again sold to a viajero who sold to the consumer. The other crops had more intermediaries which resulted to a larger difference. Other factors that affect the price difference include the seasonality of the crop, the quantity traded, and the quality of the produce.

Similar to the highland, the integrated value chain of food service providers in the lowland set agreed prices with contracted vegetable growers/farmers through contract growing and/or supply agreement. Price setting is based on cost plus pricing of integrated vegetable enterprises. Prices between these

enterprises and their corporate clients are confidential. These are, however, expected to be higher than the open market prices because of the quality required and the stringent delivery schedule, handling and packing.

The supermarket, which is one of the marketing channels of these food service providers, sets prices which are much higher than the prices in the wet markets. Last April, an informal survey in one of the supermarkets in Los Baños showed that the prices of eggplant, tomatoes, and white onions were Php91/kg, Php67/kg, and Php75/kg, respectively. These prices were higher than the retail prices recorded in the Balintawak and Divisoria markets, which only ranged on the average at Php25-30/kg for eggplant, Php60-65 for tomato, and Php30-40 for onion.

4.1.2. Margin distribution

Highland vegetables. The added value or margin varies with each player in the value chain, the type of vegetable, and the supply-demand balance. The main sources of the data are from the Philippine Rural Development Project and the Bureau of Postharvest Research and Extension as the basis for the analysis. For carrots, a loss assessment case study was conducted by the Bureau of Postharvest Research and Extension of DA last 2009. The study indicates that wholesalers and retailers accounted for about 44.2 and 40.0 percent of the profit, respectively. While the farmer gets a profit of Php1/kg for every peso of cost incurred, he also has the largest share of the cost at 60.9 percent. The farmers take high production risk compared to the other intermediaries.

Table 4.1.7 Relative financial positions of carrot vegetable value chain players

Value chain players	Costs			Profit			Margins	
In Php/kg	Added unit cost	% share to cost	Total unit cost	Selling price	Unit profit	% share of profit	Price difference	% added to Price
Farmer	7.5	60.9%	7.5	15.0	7.5	15.7%	15.0	27.3%
Wholesaler 1 (WS 1)	1.6	13.1%	16.6	33.0	16.4	34.4%	18.0	32.7%
Retailer 1 served by WS 1	0.5	4.1%	33.5	38.0	4.5	9.4%	5.0	9.1%
Wholesaler 2 (WS 2)	0.3	2.3%	33.3	38.0	4.7	9.9%	-	0.0%
Retailer 2 served by WS 2	2.4	19.6%	40.4	55.0	14.6	30.6%	17.0	30.9%
Total	**12.3**				**48**		**55**	

Source: Bureau of Postharvest Research and Extension, 2009

In the study of white potatoes in CAR conducted by the Philippine Rural Development Project of the DA, the retailer takes the most profit at 39.4 percent, followed by the wholesaler at 31.5 percent. The farmer has the highest share of the cost at 40.9 percent and only 17.3 percent of the profit. For the input supplier, the unit cost comprises of the planting materials, fertilizers, fungicides, and insecticides. The added unit cost of the farmer is composed of labor on the seed tuber production, transportation cost, equipment, and land rent. Labor is about 21.4 percent of the cost of production, which farmers may be able to eliminate if family members help in the farm work.

Table 4.1.8 Relative financial positions of potato vegetable value chain players

Value chain players	Costs			Profit			Margins	
In Php/kg	Added unit cost	% share to cost	Total unit cost	Selling price	Unit profit	% share of profit	Price difference	% added to price
Input supplier		-	8.1	8.1	-	-	8.1	17.2%
Farmer	5.5	40.9%	13.6	18.0	4.4	17.3%	9.9	21.1%
Disposer	1.0	7.4%	19.0	22.0	3.0	11.8%	4.0	8.5%
Wholesaler	5.0	37.0%	27.0	35.0	8.0	31.5%	13.0	27.7%
Retailer	2.0	14.8%	37.0	47.0	10.0	39.4%	12.0	25.5%
Total	**13.5**				**25.4**		**47.0**	

Source: Philippine Rural Development Project, 2017

Lowland vegetables. Unlike the highland, lowland vegetable farmers in general account for the highest percent added to price, with 33.1 percent for eggplants, 35.9 percent for tomato, and 50 percent for red creole onion. These are followed by wholesalers for eggplant and tomato at unit margins of Php5/kg and Php10/kg, respectively.

Table 4.1.9 Relative financial positions of eggplant vegetable value chain players

Value chain players	Costs			Profit			Margins	
In Php/kg	Added unit cost	%share to cost	Total unit cost	Selling price	Unit profit	%share of profit	Price difference	%added to Price
Farmer	5.9	42.0%	5.9	10.0	4.1	25.3%	10.0	33.1%
Trader	1.0	7.1%	11.0	15.0	4.0	24.8%	5.0	16.6%
Wholesaler	1.2	8.4%	16.2	20.0	3.8	23.7%	5.0	16.6%
Retailer	6.0	42.5%	26.0	30.2	4.3	26.3%	10.2	33.8%
Total	**14.1**				**16.2**		**30.2**	

Source: Philippine Center for Postharvest Development and Mechanization, 2016

However, similar to the highland, lowland farmers also have the largest share of the cost with 40.9 percent for tomato and 54.4 percent for red creole onion. The only exception is the eggplant farmer who is only second to the retailer at 42.0 percent. For the eggplant, the retailer also has the highest margin at 33.8 percent. This is not very far from the farmer who has a share of 33.1 percent.

Table 4.1.10 Relative financial positions of tomato vegetable value chain players

Value chain players	Costs			Profit			Margins	
In Php/kg	Added Unit Cost	%share to cost	Total Unit Cost	Selling price	Unit profit	%share of profit	Price difference	%added to Price
Farmer	4.2	40.9%	4.2	14.0	9.8	34.1%	14.0	35.9%
Wholesaler - Trading Post	2.5	24.6%	16.5	24.0	7.5	26.0%	10.0	25.6%
Wholesaler - Terminal Market	2.0	19.7%	26.0	32.0	6.0	20.8%	8.0	20.5%
Retailer	1.5	14.8%	33.5	39.0	5.5	19.1%	7.0	17.9%
Total	**10.2**				**28.8**		**39.0**	

Source: Philippine Rural Development Project, 2015

In the case of tomato and onion, there is a significant gap between the margins of the farmers and the retailers. As mentioned earlier, access to different markets allow lowland farmers to discriminate in their pricing and as compared to the highland, have a relatively higher bargaining power in dictating their price.

Table 4.1.11 Relative financial positions of red creole onion vegetable value chain players

Value chain players	Costs			Profit			Margins	
In Php/kg	Added Unit Cost	%share to cost	Total Unit Cost	Selling price	Unit Profit	%share of profit	Price difference	%added to Price
Farmer (fresh)	16.0	54.4%	16.0	20.0	4.0	37.7%	20.0	50.0%
Trader (fresh)	2.7	9.2%	22.7	24.0	1.3	12.4%	4.0	10.0%
Assembler (cold storage)	8.8	29.7%	32.8	36.0	3.3	30.9%	12.0	30.0%
Wholesaler (cold storage)	0.5	1.7%	36.5	37.5	1.0	9.5%	1.5	3.8%
Retailer	1.5	5.1%	39.0	40.0	1.0	9.5%	2.5	6.3%
Total	**29.5**				**10.5**		**40.0**	

Source: Philippine Rural Development Project, 2014

4.1.3. Marketing or product strategies

Practice of multi-cropping. Both highland and lowland vegetable farmers practice multi-cropping by producing one major crop concurrently with several minor crops. For example, highland farmers could plant cabbage as its main vegetable crop in combination with cauliflower, broccoli, Baguio beans, French beans, leeks, and others. Lowland farmers adopt the same strategy by planting a major vegetable crop such as eggplant or tomato together with minor crops such as pechay, bitter gourd, bottle gourd, tomatoes, string beans and other types of lowland vegetables.

This strategy reduces the production failure risk of a particular vegetable or group of vegetables. It also allows them to smoothen revenue generation. For example, lowland farmers could plant 'pechay' with about a month's production to generate early revenue while waiting for the harvesting and marketing of the major crop and other minor crops. In the highland, farmers could plant lettuce, which has a shorter production cycle in combination with other vegetables which have a longer cropping period.

Implementation of irrigation systems. Irrigation is critical in the production of vegetables. Some farmers cannot plant when there is little rain due to the lack of water source. Others move to areas with available irrigation so that they could plant during the summer months and harvest during the dry season.[15] On the other hand, some farmers use water pumps to draw irrigation water from deep wells, shallow wells or open water sources such as ponds, streams and rivers. In Buguias, farmers use impact sprinkler systems to plant during summer so that they can harvest during the rainy months. Some farmers make use of protective growing structure in order to produce crops for the whole year.

Contract growing arrangements. Some of the farmers go into contract growing and/or supply arrangements with buyers, particularly with vertically integrated food service providers. In these contracts, the terms include the price and quality of the vegetables, the volume required, and the harvest schedules. However, only a few of the farmers are involved in this production and marketing strategy. According to the 2017 BAPTC report, only about 549 farmers who were members of 8 farmer cooperatives affiliated with the APTC were into contract trading as of November 15, 2017. The total volume of vegetables transacted in BAPTC by this group of farmers was about 965 MT for the period of June to December 2017. This represents only 0.2 percent of the total vegetable production of Benguet in 2015. For the lowland, there is a relatively higher adoption of contract growing arrangements owing to the proximity of the production areas and the easier access to marketing intermediaries.

There are several advantages for farmers who involve in contract growing arrangements. Foremost of this is the certainty of the market, vegetable types and volume, quality required, delivery schedule, and prices set in the contract. Through this, farmers are able to plan their production volume, manage their costs, and determine their income. This provides a stable market and favorable prices that will increase the income of farmers as compared to those selling in the open market. From this, farmers can branch out to a more diversified market such as institutional buyers, corporate accounts, and specialty markets.

This is contrary to the current system where farmers are operating in an open market system mainly grounded on wet market transactions. Another benefit is the transparent and quick payment schemes that are set into the contract. The direct transaction with buyers also reduces the transaction costs and improves market efficiency. This ultimately benefits small scale farmers and provides quality vegetables to consumers. In addition, these arrangements involve private companies who provide adequate technical assistance through trainings and the introduction of productivity and quality-enhancement technologies.

In essence, contract arrangements provide a range of benefits to farmers but only a few are able to meet the quality requirements needed by this specific market. Most small scale farmers have inadequate infrastructure, facilities, and equipment. Since these farmers are relatively dispersed and have weak organizations, there is difficulty in integrating and managing their production. This makes it hard for farmers to meet the volume and quality needed of contract growing. In some cases, the price setting may be too rigid, which is disadvantageous to farmers when the market price is higher.

Organic farming. Other farmers go into organic vegetable production as a strategy to differentiate their vegetables. However, the market for organic vegetables is still in its formative stage. It is a niche market for high income buyers and high-end restaurants and institutional buyers. Prices of organic vegetables are much higher than conventionally grown ones. The difference could go as high as Php50/kg or more, depending on the type of vegetables. As of 2017, there are only 480 organic vegetable farmer practitioners transacting in the BAPTC. On the other hand, there are about 21,277 conventional vegetable affiliated with BAPTC.

Only a few farmers venture into organic farming due to several disadvantages identified. For one, the production of organic vegetables is still considered a niche market in the Philippines. Currently, organic products have a small market limited to only a few supermarkets, institutional buyers, and health

[15] KII with Majayjay and Urdaneta vegetable farmers.

conscious consumers who can afford to spend a premium price. This takes time to establish and involves specific requirements to be qualified as such. Farmers experienced difficulty in applying for organic certification due to the strict requirements and the long process. The short validity period of only 18 months is also an additional burden as farmers have to renew their certification every one and a half years. Others have difficulty adhering to organic farming protocols because of run-off chemicals from neighboring farms who practice conventional farming. For some, they do not have the financial capability to go into organic production. Organic farming also has lower initial yields than conventionally grown vegetables.

When interviewed, farmers stated that the difference in price is not sufficient motivation to go into organic farming. Small scale organic farmers often have difficulty disposing their produce at higher prices. This is due to difficulty of differentiating what is organically produced and what is conventionally grown product in the market. Because of this reason, farmers end up selling their organic produce at a similar price as that of the conventionally produced crop.

Group or consolidated marketing. Aside from these individual farmer marketing strategies, farmers go into group or consolidated marketing through farmer cooperatives and organizations. Consolidated or group marketing is the integration of the sales of a group of farmers or enterprises by a marketing arm or entity that represents the interests of the group. Farmer cooperatives could consolidate the production of farmers and act as a marketing arm for them. Small enterprises could consolidate their sales to create a volume sufficient to meet the requirements of larger markets such as institutional buyers and export markets. This could be through an enterprise representing the group, a marketing arm such as preferred brokers, and an industry association with a legal business personality. The cooperatives act as the marketing arm of the farmers in partnering with trading centers such as BAPTC, LTVTP, NVAT, and privately owned and operated trading posts. Examples for the latter are the Juliana and Cloverleaf markets.

In the privately managed trading posts such as Juliana market at Balintawak, Quezon City, farmers display their products in the market through a contract agreement. This is implemented through the farmer cooperatives and with assistance from the government.[16] In January 2017, the provincial LGU of Nueva Ecija partnered with the market in displaying the province's vegetable and other agricultural products. In 2018, the Ilocos Norte provincial LGU also took the initiative of establishing a *Pasalubong* and Trade Center at the market.[17]

"Suki" marketing system. The common marketing practice is the 'suki' system in which farmers are dependent on traders with whom they have established long term relationship. This marketing practice is based on trust developed over time and in most instances, family relationships. This type of marketing system results to a closed system that creates barrier to entry for new players such as new vegetable producers and traders. This is also susceptible to trade collusions that could lead to price manipulation or rent seeking activities.

Vertically integrated value chain. Vertically integrated food service providers on the other hand, go into supply arrangement with farmers and supply contract arrangement with its buyers. This could be formal or informal in nature. Some lease vegetables sections of supermarkets for direct merchandizing of both highland and lowland vegetables. Examples of these are Dizon Farms and UBM Corporation. Other vertically integrated food service providers specialize in the production of organic vegetables and market their produce directly to corporate accounts. The types of vegetables, quality required, volume needed, schedule of deliveries, and vegetable prices are set through a formal or informal agreement. An example of this is the Costales Nature Farms in Majayjay, Laguna which specializes in the growing and supply of organic vegetables and other organically produced food products.

[16] Manilastandard.net
[17] https://www.pna.gov.ph

4.1.4. Value chain governance

Value chain governance encompasses the relationships among the key players in the internal value chain and with the external players and regulatory institutions that operate within or influence the performance of the value chain. Governance is given by those who have power and control of coordinating the various activities to achieve the key parameters under which others in the value chain operate. These key parameters include the following: 1) what to produce, 2) how to produce, 3) how much to produce, 4) when to produce, and 5) how much is the cost to produce.

The generally prevailing environment in the vegetable value chain is the open market system. In this system, relationships among internal players are loose and governance lies on the hand of market intermediaries such as wholesalers and wholesaler-retailers. These traders connect the market and the producers and have access to market information which allows them to set prices based on supply-demand conditions. This is the usual situation for the Benguet highland vegetables value chain. It is not as pronounced in the lowland due to the marketing interventions implemented by trading posts, such as the Sentrong Pamilihan and NVAT.

Value chain relationships in this open market system could lead to predatory or rent seeking practices which is focused on realizing a quick-profit in the short term. This is why government interventions through policies, rules and regulations permeate this type of value chain. Through the DA, trading centers have been established, formation of farmer associations were encouraged, and technical and financial assistance were given to farmers. The BAPTC was built to play this role in coordination with other support institutions such as the BSU, Land Bank of the Philippines and the Benguet LGU.

In the value chain of the vertically integrated food service provider, there is better governance. The enterprise itself through owned and/or relational operations, control the value chain processes to comply with the requirements of its markets. Contract arrangements, both in the procurement and subsequent marketing of the vegetables, stabilizes the prices and effectively coordinates the various processes in the chain to cater to the type of vegetables, quality, volume, price, and delivery schedule required by its markets.

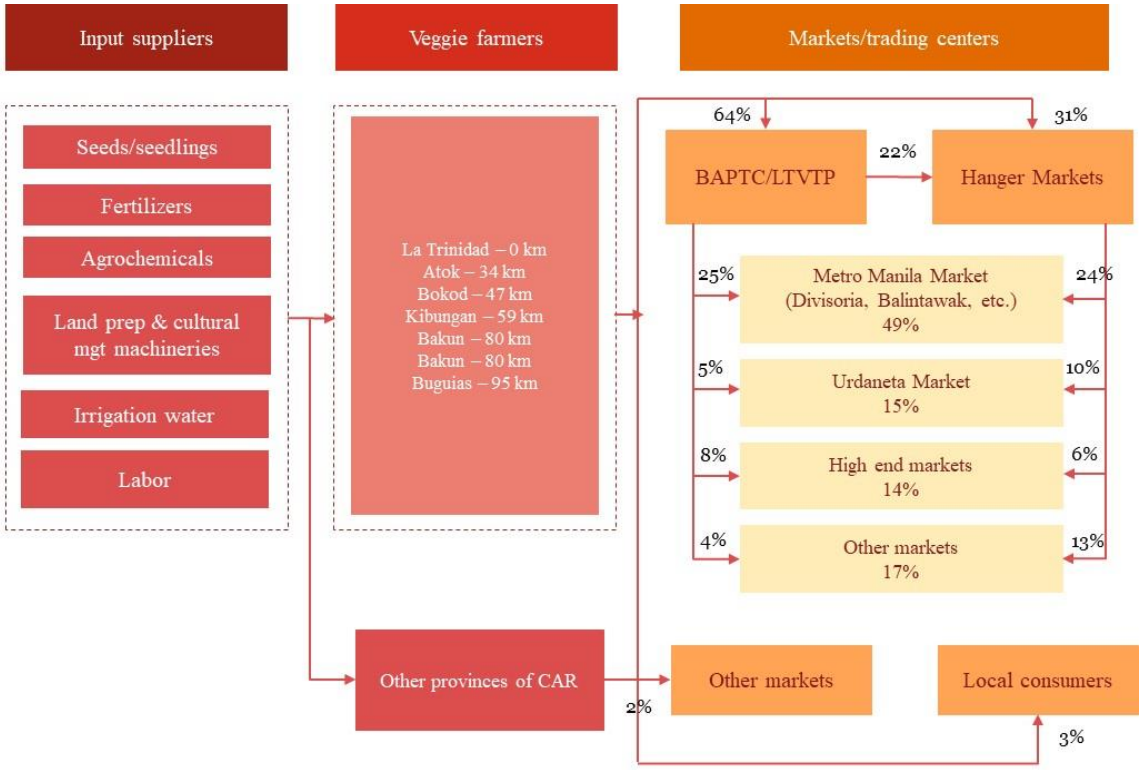
4.1.5. Vegetable flow

The current value chain of the vegetables is inward looking and mainly caters to the domestic market. The main producers of vegetables are CAR for the highland and the Central Luzon and CALABARZON regions for the lowland.

Highland. Vegetables produced in Benguet, other provinces of CAR, and Nueva Viscaya enter the various trading posts in La Trinidad Valley where farmers, farmer associations, and traders conduct their marketing transactions. In the highland, there are two government-owned and operated trading posts, namely the LTVTP and the BAPTC, and four private market hangars.
It is estimated that about 64 percent of highland vegetables pass through LTVTP and BAPTC, 31 percent go to market hangars, 2 percent directly to other markets, and 3 percent for local consumption[18]. Out of the 64 percent flowing through the two government trading posts, about 22 percent go to the hangar markets. Vegetables from these trading posts then proceed to the following: Metro Manila, Urdaneta and Villasis in Pangasinan, high end markets, and other markets such as Naga City in Bicol, CALABARZON markets, Ilocos Region markets, NVAT, and other urban markets in the Visayas and Mindanao[19].

[18] From Seed to Plate: Vegetable Supply Chain. UNIDO. 2010; Digal (2011)
[19] LTVTP 2017 Accomplishment Report

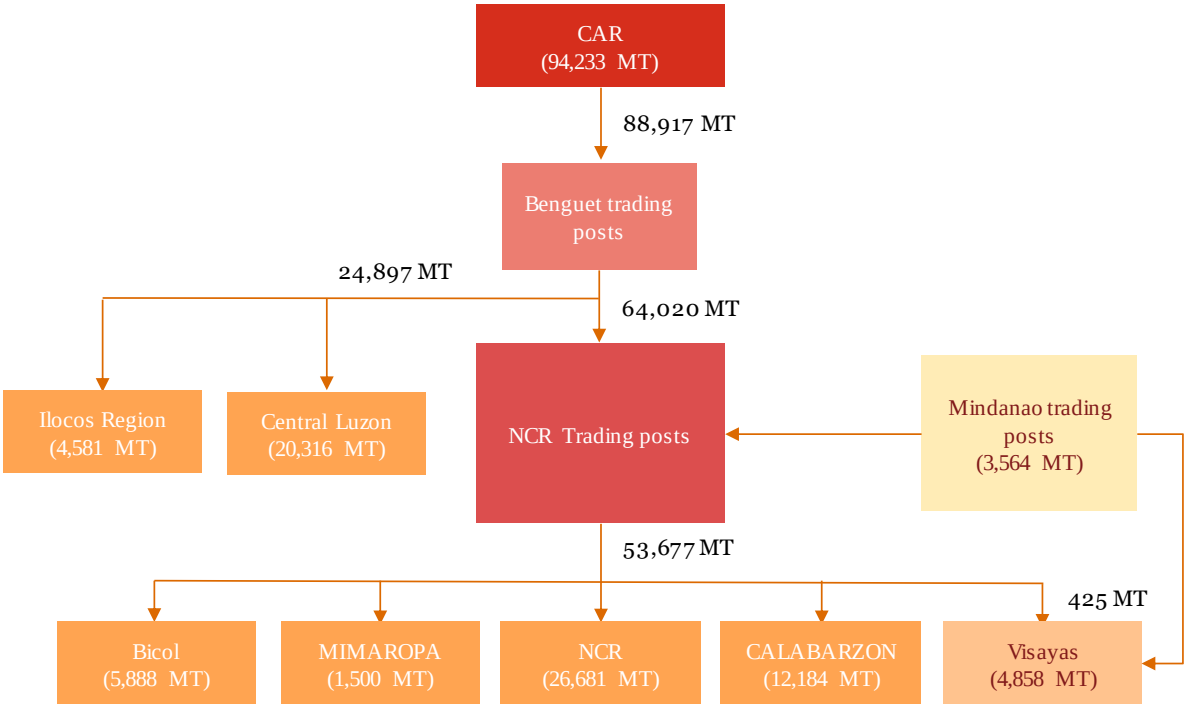
The vegetables destined for the Metro Manila are then traded at the Divisoria market, the Juliana and Cloverleaf markets, and other wet markets in Quezon City. From these markets, wholesaler-traders bring the vegetable to other wet markets in the Metro Manila region, CALABARZON, Central Luzon, and other provinces outside Luzon. Vegetables delivered to Urdaneta and Villasis also find their way to the provinces of Regions I and III.



Source: Digal (2011), Costales (2013)

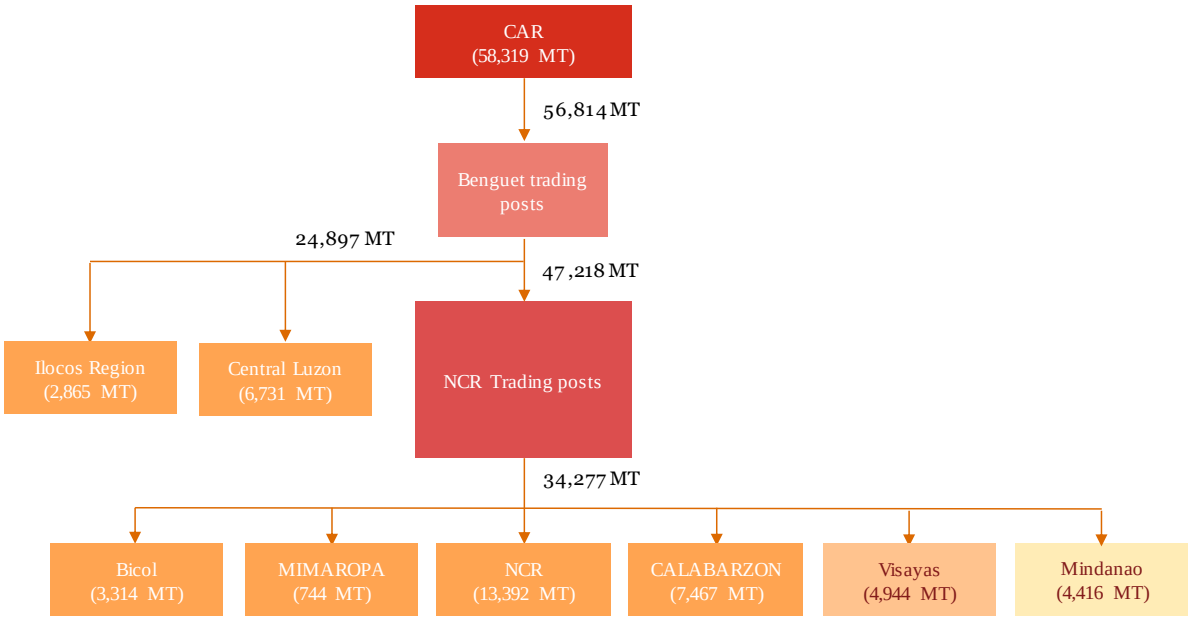
Figure 4.1.8 Estimated percentage flow of highland vegetables

The succeeding figures illustrate the estimated volume flow of the target highland vegetables from CAR to the major markets. The analysis utilized the PSA data of per capita consumption per region, the latest population census last 2015, and the per capita production per region to estimate the excess production that will flow to the other major markets.



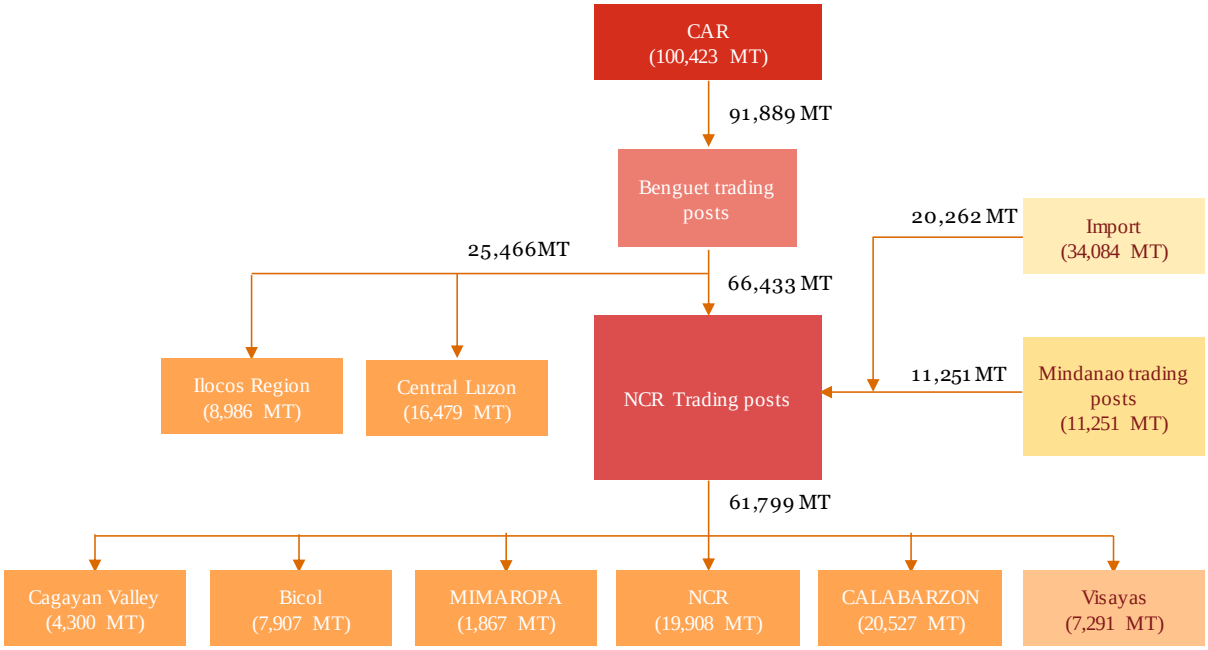
Source: Calculated by the PwC Marketing Expert using per capita consumption (PSA, 2017), population (Census, 2015), and per capita production (PSA, 2017) of cabbage

Figure 4.1.9 Estimated volume flow of cabbage from farm to markets



Source: Calculated by the PwC Marketing Expert using per capita consumption (PSA, 2017), population (Census, 2015), and per capita production (PSA, 2017) of carrot

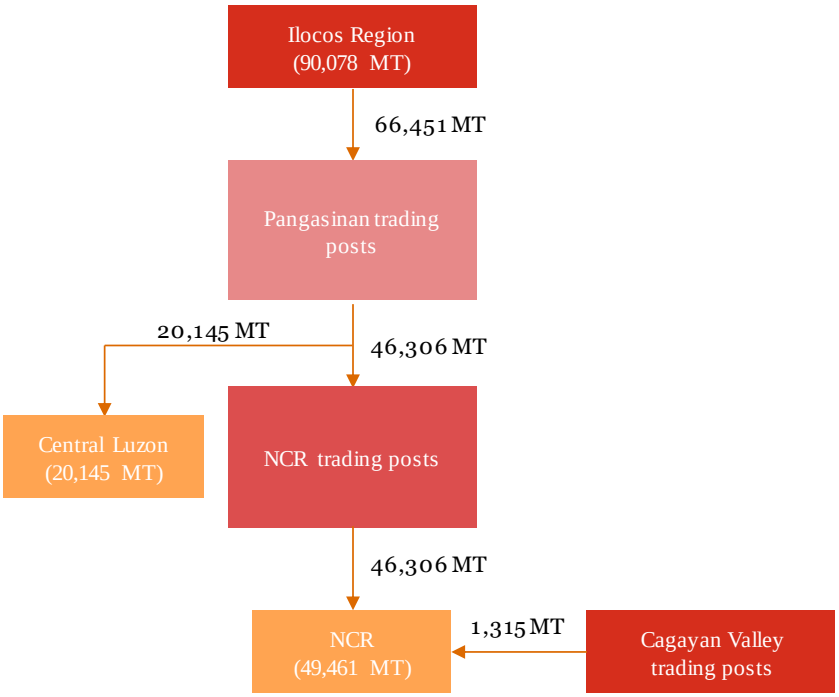
Figure 4.1.10 Estimated volume flow of carrot from farm to markets



Source: Calculated by the PwC Marketing Expert using per capita consumption (PSA, 2017), population (Census, 2015), and per capita production (PSA, 2017) of potato

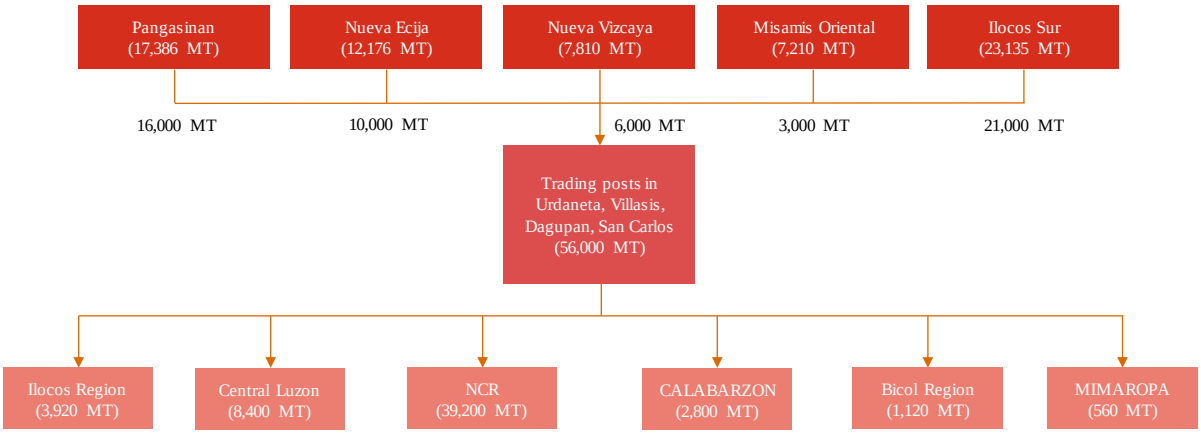
Figure 4.1.11 Estimated volume flow of potato from farm to markets

Lowland. The estimated percentage and volume of the target lowland vegetables are illustrated in the succeeding figures. The same estimation analysis used in the highland is implemented for the target lowland vegetables.



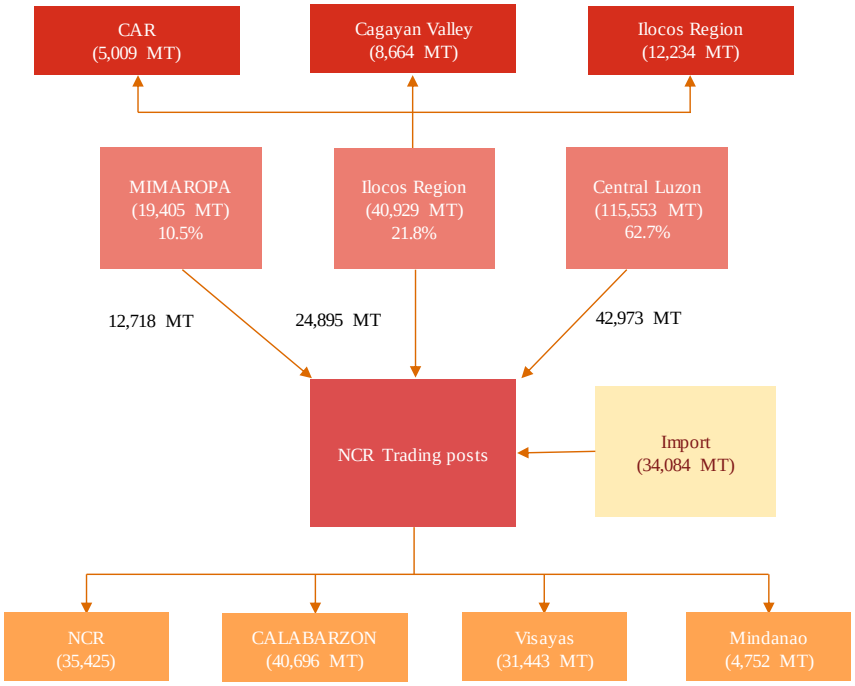
Source: Calculated by the PwC Marketing Expert using per capita consumption (PSA, 2017), population (Census, 2015), and per capita production (PSA, 2017) of eggplant

Figure 4.1.12 Estimated volume flow of eggplant from farm to market



Source: Calculated by the PwC Marketing Expert using per capita consumption (PSA, 2017), population (Census, 2015), and per capita production (PSA, 2017) of tomato

Figure 4.1.13 Estimated volume flow of tomato from farm to market



Source: Calculated by the PwC Marketing Expert using per capita consumption (PSA, 2017), population (Census, 2015), and per capita production (PSA, 2017) of tomato

Figure 4.1.14 Estimated volume flow of onion from farm to market

As can be seen in the preceding value chains for agricultural commodities and products, NCR is the main market. According to the 2015 National Census by PSA, the NCR had a population of about 12.9 million. However, this can increase to about 15.0 million in the daytime when people come for work.[20] Together with Central Luzon and CALABARZON, the aggregate population is about 38.5 million which equates to 38.1 percent of the country's population. It has the highest GDP and disposable income per capita which drives the per capita consumption of vegetables.

[20] http://worldpopulationreview.com/world-cities/manila-population/

In NCR, eggplant, tomato, onion and cabbage are the common vegetables consumed. For eggplant and tomato, the per capita consumption amounts to more than 3.0kg/capita. For onion and cabbage, this ranges from 2.1 to 2.8kg/capita. In Central Luzon, per capita consumption of tomato amounts to 4.7kg, eggplant at 4.3kg, and onion at 3.2kg. This indicates a relatively high lowland vegetable consumption in the region. However, the per capita consumption of highland vegetables and other types of vegetables are comparably lower, ranging from 0.3 to 2.3kg/capita. In the CALABARZON region, the estimated per capita consumption of eggplant was at 3.6kg per year, with the per capita consumption of bitter gourd, tomato, onion, and squash ranging from 2.0 to 2.9kg/capita. Household preference for cabbage and carrots are also evident.[21]

4.1.6 Transport route of the vegetable value chain

This section illustrates the geographical position and flow of the vegetable value chains from major production areas to the different markets in various locations in the Luzon islands.

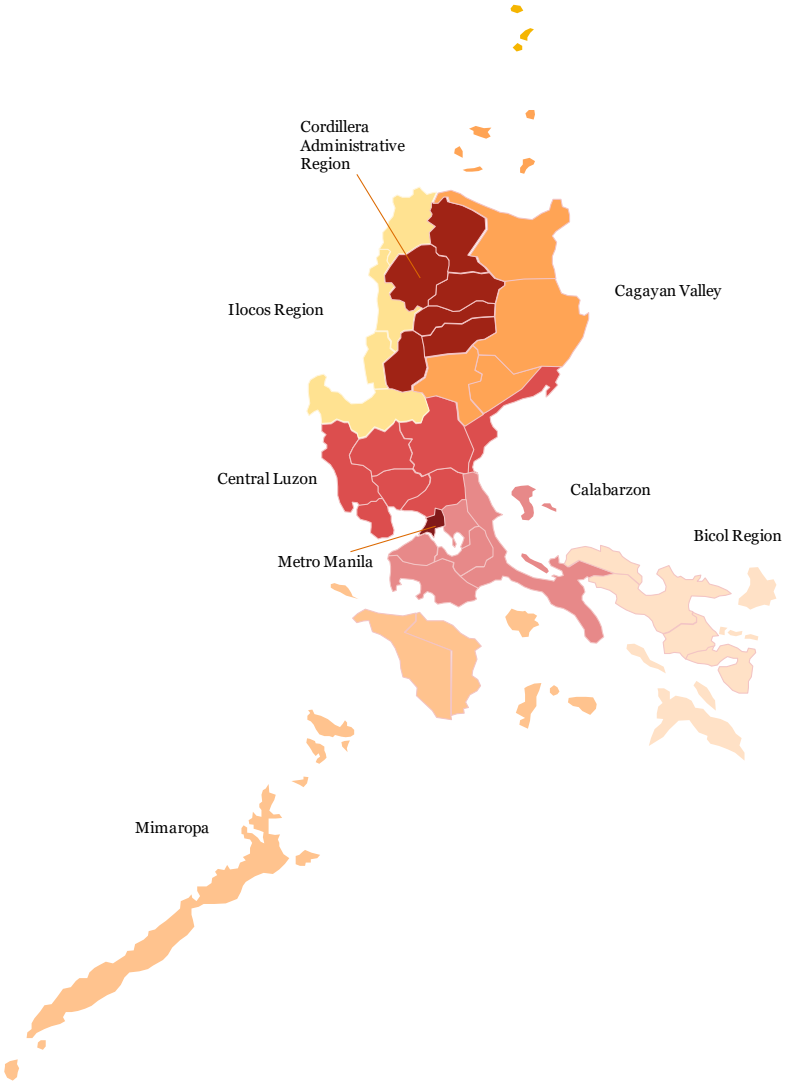
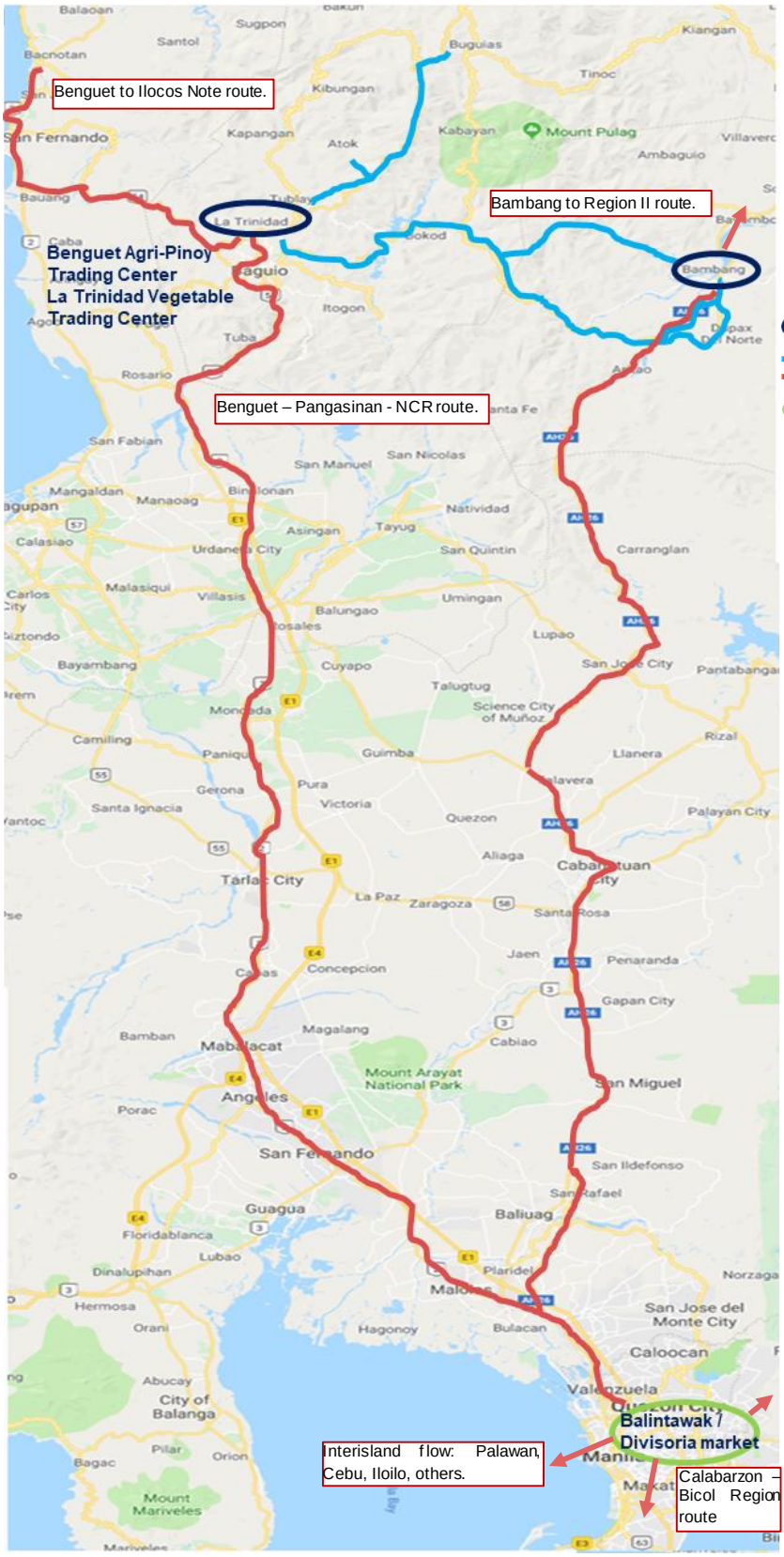


Figure 4.1.15 Map of Luzon islands of the Philippines

[21] Consumption of Selected Agricultural Commodities in the Philippines. Volume 2. Philippine Statistics Authority, February 2017.



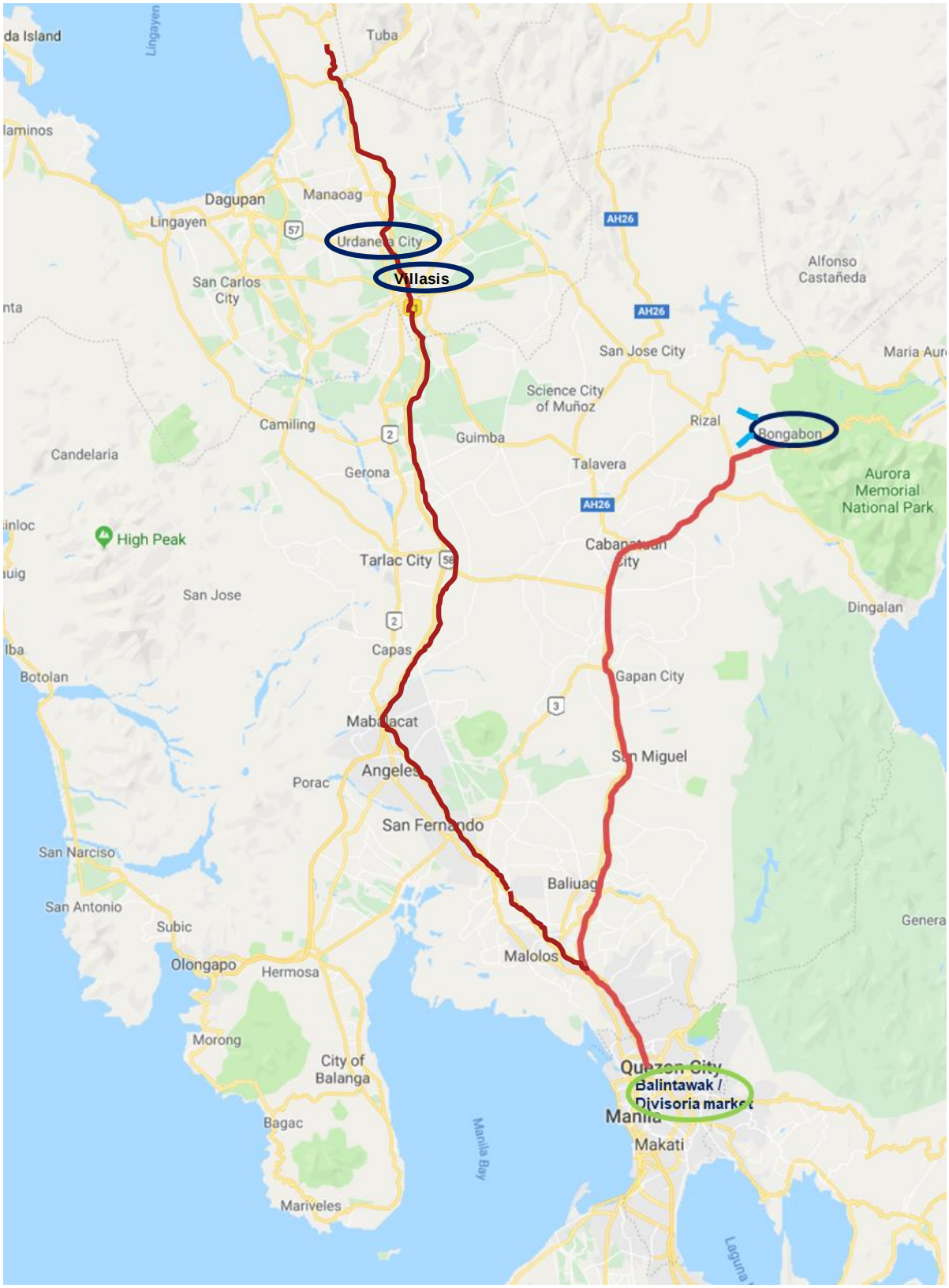
Notes:

1. Mutual flow of vegetables between Benguet trading posts and NVAT at Bambang, Nueva Vizcaya. This happens whenever price rises at either market trading centers.
2. Outflows from Benguet include the following routes:
   Benguet to:
   - Region I through the San Fernando, La Union route.
   - Region III through Urdaneta and Villasis trading posts.
   - NCR through Pangasinan and Bulacan routes.
   - NCR to out of island route.

   These are then distributed to wet markets, restaurants, hotels, supermarkets/ groceries and institutional buyers.
3. NVAT is another source of highland vegetables for the NCR and urban centers along the route.

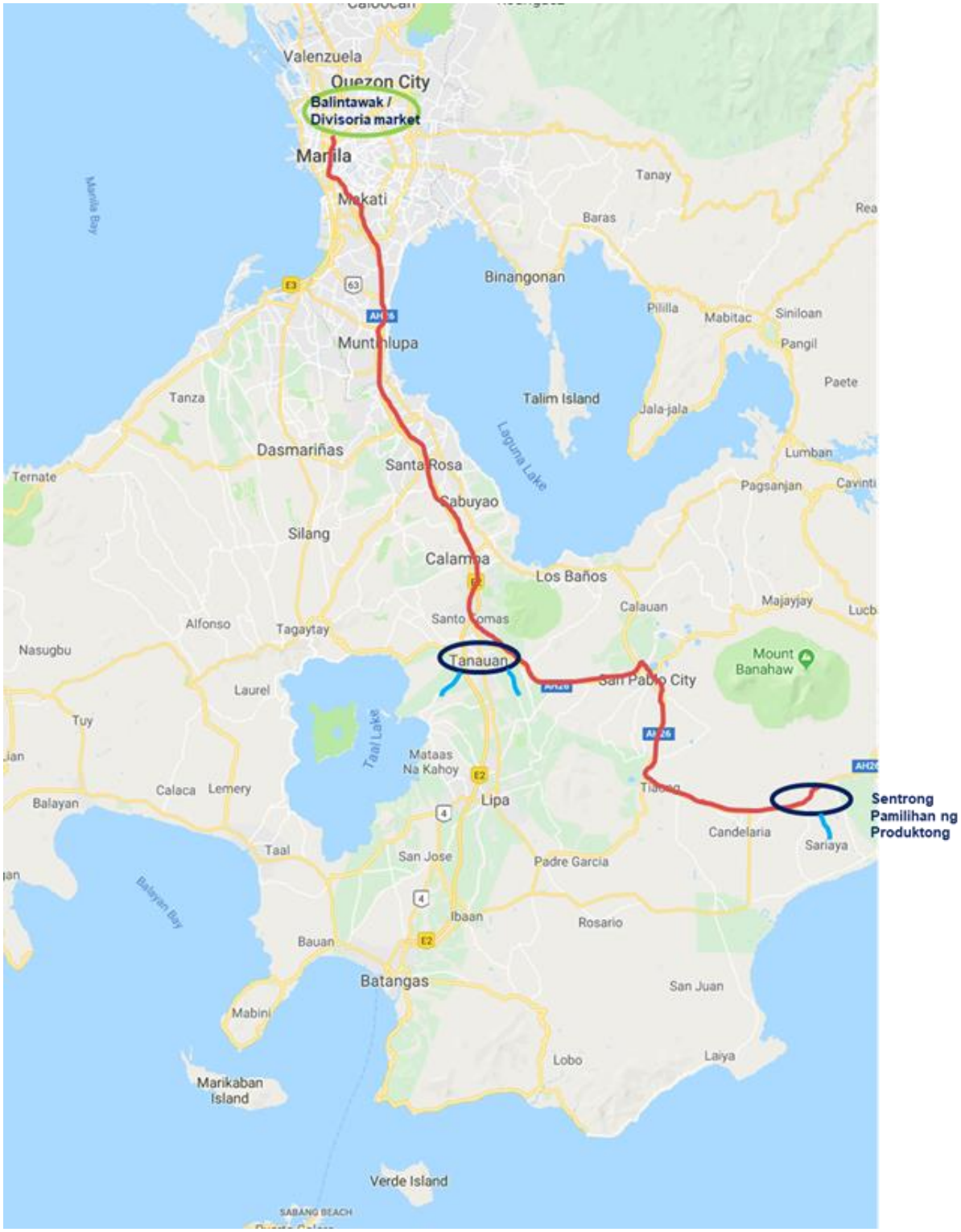
Source: KIIs conducted, interviews with traders at BAPTC, LTVTP, and NCR public markets

Figure 4.1.16 Transport route of highland vegetables



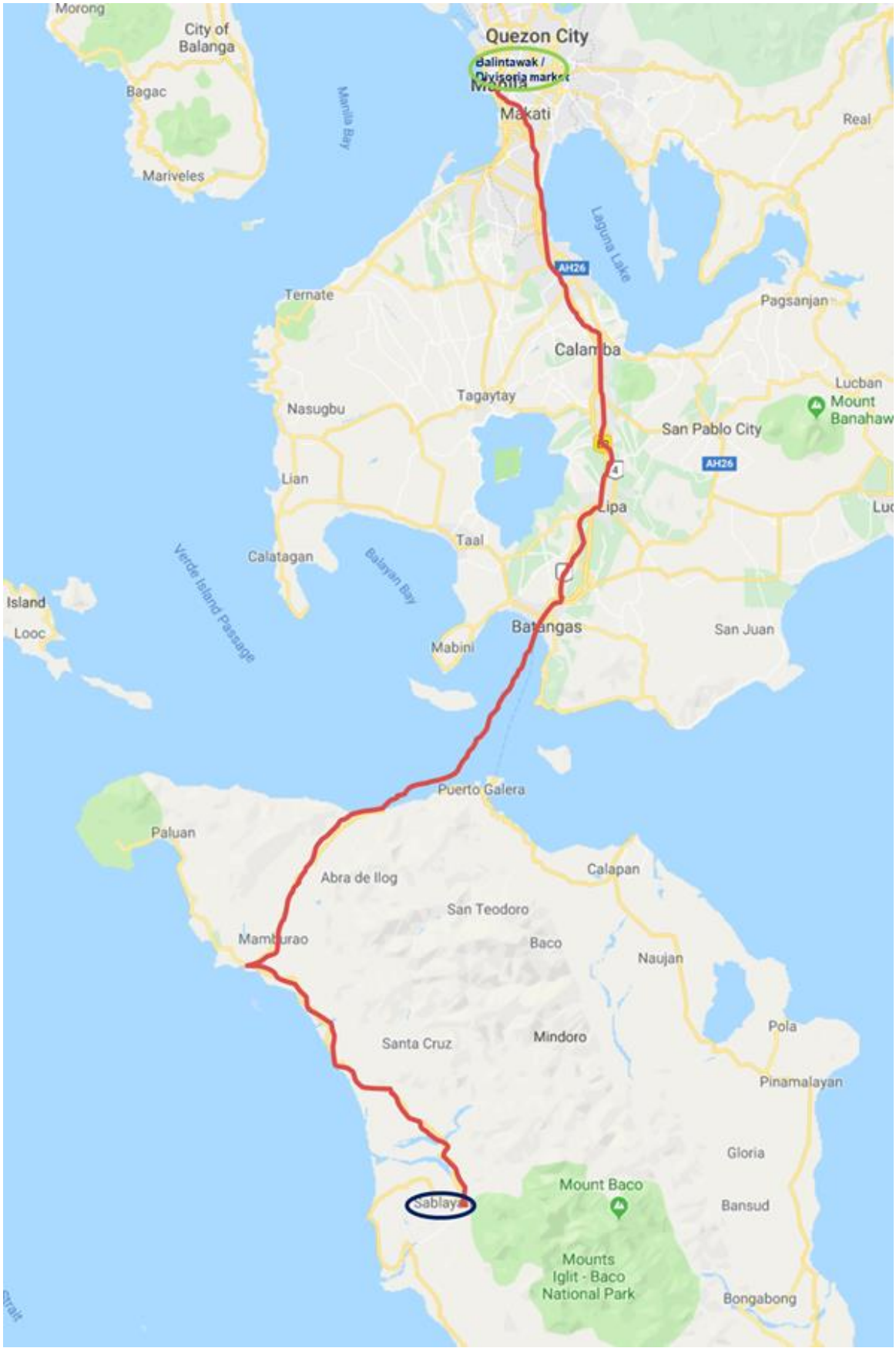
Source: KIIs conducted, interviews with traders at Urdaneta PAPTC and NCR public markets

Figure 4.1.17 Transport route of lowland vegetables from Northern zon



Source: KIIs conducted, interviews with traders at Sentrong Pamilihan and NCR public markets

Figure 4.1.18 Transport route of lowland vegetables from Southern Luzon



Source: KIIs conducted, interviews with traders at NCR public markets

Figure 4.1.19 Transport route of lowland vegetables in Region IV-B (MIMAROPA)

4.2. Vegetable value chain performance

4.2.1 Profitability

The profitability of the vegetable value chain depends on its pricing behavior and production efficiency. As discussed earlier, most of the farmers are price takers but there are some who are into contract growing arrangements and consolidated marketing through farmers' cooperatives and associations. In the former, farmers depend on the buying price of traders which highly fluctuates within a given day. Although farmers want to maximize their profits, they cannot do so given that traders have the market power. In this section, the analysis will focus on whether the farmers earn enough to have a reasonable return on their investment. The profitability analysis implemented considers the average and ideal performance of production. As such, it does not take into consideration external factors such as weather disturbances, natural calamities, and disease infestation, among others.

Highland vegetables

For the highland vegetables, the profitability analysis uses the cost and return data provided by the Benguet PAO and the monitored prices of LTVTP during 2018. Since these are average values, they may not reflect the effect of production season which is a factor influencing productivity and prices. The sensitivity analyses show the effect on gross income as price and yield varies.

Cabbage. The LTVTP price monitoring in 2018 indicated the price of cabbage ranging from Php16/kg to Php87/kg. The higher price, however, is quite abnormal as there is severe production failure in August and September due to two typhoons that hit Benguet. The average yield during this year was 20MT/ha. Given this price and yield, a farmer grosses an income of Php171,737/ha per production cycle. The Php20/kg farm-gate price is more than double the break-even price of Php7.4/kg. Cabbage growers had positive gross income during this period.

Table 4.2.1 Gross income and BEP computation for cabbage in 2018

	Farm Gate Prices		
Items	Low	Average	High
Yield (MT/ha)	20.0	20.0	20.0
Farm gate price (Php/kg)	16.0	20.0	30.0
Gross revenue (Php)	320,000	400,000	600,000
Production cost (Php)	148,263	148,263	148,263
Break-even price (Php/kg)	7.41	7.41	7.41
Break-even yield (MT/ha)	9.27	7.41	4.94
Gross income (Php)	**171,737**	**251,737**	**451,737**

Source: Office of the Provincial Agriculturist of Benguet, PwC analysis

Table 4.2.2 Gross income and BEV computation for cabbage in 2018

	Farm Gate Prices		
Items	Low	Average	High
Yield (MT/ha)	15.0	20.0	30.0
Farm gate price (Php/kg)	20.0	20.0	20.0
Gross revenue (Php)	300,000	400,000	600,000
Production cost (Php)	148,263	148,263	148,263
Break-even price (Php/kg)	9.88	7.41	4.94
Break-even yield (MT/ha)	7.41	7.41	7.41
Gross income (Php)	**151,737**	**251,737**	**451,737**

Source: Office of the Provincial Agriculturist of Benguet, PwC analysis

At an average price of Php20/kg, the gross income increases to Php251,737, which is a 47 percent increase. Gross income further increases by 79 percent as price rises to Php30/kg, given all other items remain constant. The gross income are all positive within this price range as these are all above the BEP of Php7.5/kg. Varying the yield given that price and all other cost items remain constant also shows positive gross income as the yield range is above the BEV of 9.27MT/ha. Cabbage yield ranges from 9MT/ha to 45MT/ha depending on variety, location, and season. The improvement in productivity increases gross income given that price is constant. This highlights the importance of farm productivity improvement and government initiatives of technical and financial support to farmers.

Carrots. The profitability analysis of carrots show similar results. At an average price of Php25/kg, farmers generate a gross income of about Php249,379/ha. For the range of low to high prices, all gross incomes are positive due to the prices being higher than the BEP of Php9.4/kg. Varying yield from a low of 10MT/ha to a high of 30MT/ha at a constant average price of Php25/ha results to positive gross incomes. These yields are all above the BEV of 6MT/ha.

Table 4.2.3 Gross income and BEP computation for carrot in 2018

Items	Farm Gate Prices		
	Low	Average	High
Yield (MT/ha)	16.0	16.0	16.0
Farm gate price (Php/kg)	20.0	25.0	30.0
Gross revenue (Php)	320,000	400,000	480,000
Production cost (Php)	150,621	150,621	150,621
Break-even price (Php/kg)	9.41	9.41	9.41
Break-even yield (MT/ha)	7.53	6.02	5.02
Gross income (Php)	**169,379**	**249,379**	**329,379**

Source: Office of the Provincial Agriculturist of Benguet, PwC analysis

Table 4.2.4 Gross income and BEV computation for carrot in 2018

Items	Farm Gate Prices		
	Low	Average	High
Yield (MT/ha)	10.0	16.0	30.0
Farm gate price (Php/kg)	25.0	25.0	25.0
Gross revenue (Php)	250,000	400,000	750,000
Production cost (Php)	150,621	150,621	150,621
Break-even price (Php/kg)	15.06	9.41	5.02
Break-even yield (MT/ha)	6.02	6.02	6.02
Gross income (Php)	**99,379**	**249,379**	**599,379**

Source: Office of the Provincial Agriculturist of Benguet, PwC analysis

Potato. The harvesting of potato is at the later part of the year when prices are relatively high. The average price at Php30/kg is higher than that of the cabbage and carrot. At this average price given a yield of 20MT/ha, the gross income is P327,620/ha. Within the range of low to high price at constant average yield, gross income range from Php127,620/ha to Php527,620/ha. The range of prices is above the BEP which approximates Php14.0/kg. Given the low to high range of yield, gross income ranges from Php102,620/ha to Php477,620/ha. The BEV at the average farm gate price of Php25/kg was about 11MT/ha.

Table 4.2.5 Gross income and BEP computation for potato in 2018

Items	Farm Gate Prices		
	Low	Average	High
Yield (MT/ha)	20.0	20.0	20.0
Farm gate price (Php/kg)	20.0	30.0	40.0
Gross revenue (Php)	400,000	600,000	800,000
Production cost (Php)	272,380	272,380	272,380
Break-even price (Php/kg)	13.62	13.62	13.62
Break-even yield (MT/ha)	13.62	9.08	6.81
Gross income (Php)	**127,620**	**327,620**	**527,620**

Source: Office of the Provincial Agriculturist of Benguet, PwC analysis

Table 4.2.6 Gross income and BEV computation for potato in 2018

Items	Farm Gate Prices		
	Low	Average	High
Yield (MT/ha)	15.0	20.0	30.0
Farm gate price (Php/kg)	25.0	25.0	25.0
Gross revenue (Php)	375,000	500,000	750,000
Production cost (Php)	272,380	272,380	272,380
Break-even price (Php/kg)	18.16	13.62	9.08
Break-even yield (MT/ha)	10.90	10.90	10.90
Gross income (Php)	**102,620**	**227,620**	**477,620**

Source: Office of the Provincial Agriculturist of Benguet, PwC analysis

Lowland vegetables

The profitability analysis for this type of vegetable follows the same approach as that of the highland vegetables. The analyses based on data gathered show positive gross revenues for low, average, and high scenarios of prices and yields.

Eggplant. At an average price of Php22/kg and an average yield of 18MT/ha, an eggplant farmer realizes a gross income of Php256,000/ha. In the low end price, the gross income drops to Php130,000/ha while at the high end price of Php30/kg, the gross income rises to Php400,000/ha. Under the given yield and production cost, the BEP is Php7.8/kg. The yield sensitivity analysis also shows positive gross income ranging from Php146,000/ha to Php410,000/ha. The BEV, given constant farm gate price and production cost, is about 6.5MT/ha.

Table 4.2.7 Gross income and BEP computation for eggplant in 2018

Items	Farm Gate Prices		
	Low	Average	High
Yield (MT/ha)	18.0	18.0	18.0
Farm gate price (Php/kg)	15.0	22.0	30.0
Gross revenue (Php)	270,000	396,000	540,000
Production cost (Php)	140,000	140,000	140,000
Break-even price (Php/kg)	7.78	7.78	7.78
Break-even yield (MT/ha)	9.33	6.36	4.67
Gross income (Php)	**130,000**	**256,000**	**400,000**

Source: PSA, Urdaneta Municipal Agriculture Office (MAO), Sentrong Pamilihan, PwC analysis

Table 4.2.8 Gross income and BEV computation for eggplant in 2018

Items	Farm Gate Prices		
	Low	Average	High
Yield (MT/ha)	13.0	18.0	25.0
Farm gate price (Php/kg)	22.0	22.0	22.0
Gross revenue (Php)	286,000	396,000	550,000
Production cost (Php)	140,000	140,000	140,000
Break-even price (Php/kg)	10.77	7.78	5.60
Break-even yield (MT/ha)	6.36	6.36	6.36
Gross income (Php)	**146,000**	**256,000**	**410,000**

Source: PSA, Urdaneta MAO, Sentrong Pamilihan, PwC analysis

Tomato. The yield of tomato averages 35MT/ha and can go to as high as 45MT/ha. At an average price of Php35/kg, the gross income is Php480,000/ha. At the low end price level of Php10/kg, the gross income drops to Php130,000/ha per cropping cycle, while at a high price of Php25/kg, the gross income can reach up to Php830,000. The BEP at this production volume and production cost is Php6.29/kg. At various yield levels, the gross income are Php380,000, Php480,000, and Php580,000, respectively. The BEV at constant price and production cost is 11MT/ha.

Table 4.2.9 Gross income and BEP computation for tomato in 2018

Items	Farm Gate Prices		
	Low	Average	High
Yield (MT/ha)	35.0	35.0	35.0
Farm gate price (Php/kg)	10.0	20.0	30.0
Gross revenue (Php)	350,000	700,000	1,050,000
Production cost (Php)	220,000	220,000	220,000
Break-even price (Php/kg)	6.29	6.29	6.29
Break-even yield (MT/ha)	22.00	11.00	7.33
Gross income (Php)	**130,000**	**480,000**	**830,000**

Source: PSA, Urdaneta MAO, Sentrong Pamilihan, PwC analysis

Table 4.2.10 Gross income and BEV computation for tomato in 2018

Items	Farm Gate Prices		
	Low	Average	High
Yield (MT/ha)	30.0	35.0	40.0
Farm gate price (Php/kg)	20.0	20.0	20.0
Gross revenue (Php)	600,000	700,000	800,000
Production cost (Php)	220,000	220,000	220,000
Break-even price (Php/kg)	7.33	6.29	5.50
Break-even yield (MT/ha)	11.00	11.00	11.00
Gross income (Php)	**380,000**	**480,000**	**580,000**

Source: PSA, Urdaneta MAO, Sentrong Pamilihan, PwC analysis

Onion. At an average yield of 22MT/ha and an average price of Php22/kg, the gross income in red creole onion production is Php273,815. At the lower end price of Php15/kg, a farmer could still gross an income of about Php119,815/ha. At a price of Php30/kg, gross income shoots up to about Php449,815/ha. According to the KII with onion farmers in Nueva Ecija, the price sometimes reaches up to Php60/kg. At this price the gross income is Php1.1 million/ha. This is the reason why farmers after harvest hold on to their onions and keep it in cold storage to wait for a good price. The BEP at this production level and cost is about Php10/kg. At various yield levels, gross income ranges from Php119,815/ha to Php449,815/ha based on constant average price of Php22/kg and production cost of Php210,185/ha. The BEV at this price level and production cost is 10MT/ha.

Table 4.2.11 Gross income and BEP computation for onion in 2018

Items	Farm Gate Prices		
	Low	Average	High
Yield (MT/ha)	22.0	22.0	22.0
Farm gate price (Php/kg)	15.0	22.0	60.0
Gross revenue (Php)	330,000	484,000	1,320,000
Production cost (Php)	210,185	210,185	210,185
Break-even price (Php/kg)	9.55	9.55	9.55
Break-even yield (MT/ha)	14.01	9.55	3.50
Gross income (Php)	**119,815**	**273,815**	**1,109,815**

Source: PSA, Bongabon, Nueva Ecija, PwC analysis

Table 4.2.12 Gross income and BEV computation for onion in 2018

Items	Farm Gate Prices		
	Low	Average	High
Yield (MT/ha)	15.0	22.0	30.0
Farm gate price (Php/kg)	22.0	22.0	22.0
Gross revenue (Php)	330,000	484,000	660,000
Production cost (Php)	210,185	210,185	210,185
Break-even price (Php/kg)	14.01	9.55	7.01
Break-even yield (MT/ha)	9.55	9.55	9.55
Gross income (Php)	**119,815**	**273,815**	**449,815**

Source: PSA, Bongabon, Nueva Ecija, PwC analysis

The profitability analyses of the target crops show that there is positive earning potential when there is proper management of costs and ideal marketing conditions. Given that the country is prone to typhoons and there are constraints in the production and marketing of the produce, farmers need more support in improving production, recovering from disasters, adapting to climate change effects, and developing a strong agribusiness value chain.

Effect of natural disasters on agricultural production

In the Philippines, there is a big gap between the information on the impact of natural disasters and the data available on the quantitative and qualitative effects of natural calamities to agricultural production. According to a study conducted by the Philippine Institute for Development Studies (2013), natural calamities have both positive and negative impacts on the agricultural sector. For the direct positive effects, typhoons increase water supply for production while flooding deliver nutrients from uplands to the lowlands which improves soil fertility. In contrast, the direct negative impacts include destroyed agricultural crops, damaged farm infrastructures, and limited farm planting options. Furthermore, this can cause to increased overall cost of production, lowered agricultural output, limited food supply, and higher food prices. Accordingly, the overall effect of natural calamities is assumed negative, but the data is not sufficient to quantitatively measure all the actual impacts of previous natural disasters on agriculture.

Among the main challenges in the Philippine agricultural sector is its vulnerability not only to the inherent climate volatility within the region, but also to the global climate change as well. The study shows that on the average, 17 typhoons hit the country annually. Moreover, the highest number of typhoons occur in Luzon, particularly in the Cagayan Valley, Ilocos Region, CAR, Central Luzon, and the Bicol Region. It is to be noted that these are also major vegetable producing regions. Substantial economic losses are also incurred from natural disasters. From 2000 to 2010, the total value of agricultural damage brought by typhoons, floods, and droughts amounted to USD2.2 billion. The commodities with the most damages were rice, corn, and high value cash crops. Other commodities affected were vegetables, coconut, abaca, sugarcane, tobacco, fisheries products, and livestock. Damage to agricultural facilities were valued at USD102.4 million, while those to irrigation were estimated at USD203.3 million.

The study concludes that since typhoons may have significant negative impacts on local production, assistance for the agricultural sector as a whole should be more specific to locations that are more vulnerable. There is a need to provide concrete assistance, particularly defensive investments and rehabilitation expenditures to enable farmers to cope with natural disasters[22].

Another study by FAO (2015) reports that in developing countries, the agriculture sector comprising of crops, livestock, fisheries, and forestry absorb approximately 22 percent of the economic impact caused by medium and large-scale natural hazards and disasters. In the Philippines, these disasters have a high

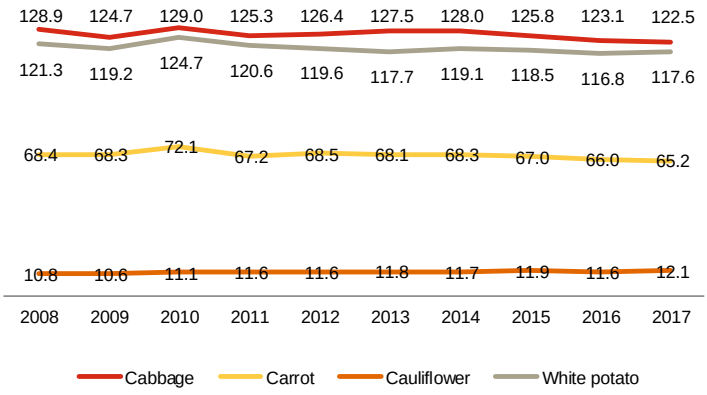
[22] Philippine Institute for Development Studies (2013). *Impacts of natural disasters on agriculture, food security, and natural resources and environment in the Philippines.* Retrieved from http://www.eria.org/ERIA-DP-2013-15.pdf

impact on the agricultural sector. Between 2006 and 2013, the government estimates that natural disasters damaged over six million hectares of crops with total losses estimated at USD3.8 billion. These were brought by 78 natural disasters including 2 droughts, 24 floods, 50 typhoons, 1 earthquake, and 1 volcanic eruption. About 93 percent or USD3.5 billion were caused by typhoons/storms. Among the subsectors, crops often attain the most damages amounting to about USD3.1 billion over the same period. However, even though natural disasters clearly have a significant impact on the sector, major gaps exist in the data and information available worldwide. Quantifying and analyzing the losses and effects of these natural disasters are needed to understand the challenges and implement interventions to address them.

Furthermore, the study emphasizes the need for disaster risk reduction measures to lessen, prevent, and mitigate the significant impact of disasters on agriculture. In order for the sector to grow and improve, the production systems must be resilient against shocks caused by climate variability and natural calamities. This can be achieved through sector-specific disaster risk reduction planning, conduct of vulnerability assessments, implementation of early warning systems, and promotion of more sustainable uses and management of vital resources such as land, water, soil nutrients, and genetic resources. The government policy formulation and implementation also play a vital role by embedding national agriculture development plans that proactively reduce disaster losses in the sector. Inherent in all this is the need for financing resources to support disaster risk reduction and enable sustainable recovery and growth of affected farmers. These will enable sector growth and food security and nutrition for vulnerable populations[23].

4.2.2. Supply and production growth trends

Highland. The production of the study's selected vegetables show a flat trend. This indicates a saturated production area where agricultural land availability constrains production expansion. Ten years ago, the hillsides were not utilized for vegetable production. Currently, it can be observed that sloping hill areas were terraced and used for planting of vegetables. Limited supply of land constrains the growth of demand.

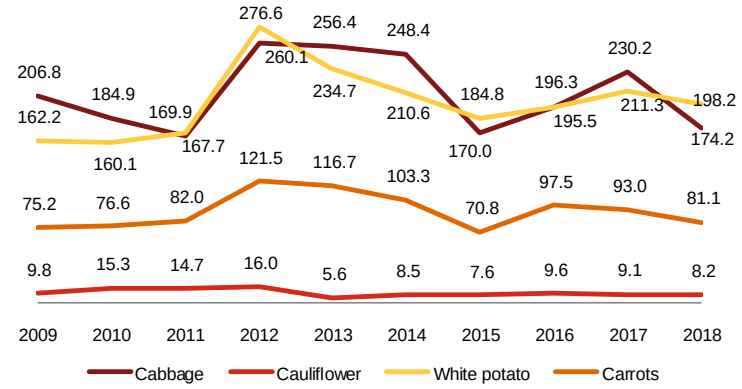


Source: Philippine Statistics Authority

Figure 4.2.1 Annual production volume of select highland vegetables in the Philippines in thousand metric tons

In Benguet, the production volume of these vegetables show cyclical pattern of ups and downs. These could be attributed to effects of weather disturbances and price fluctuations. In 2011, Typhoon Mina, internationally known as typhoon Nanmadol, directly hit CAR causing severe damage to properties and agricultural production. The Region again was hit by typhoon Egay in 2015 and by typhoon Ompong in 2018. The occurrence of these typhoons corresponds to the troughs in the production pattern from 2009 to 2018.

[23] FAO (2015). The impact of natural hazards and disasters on agriculture and food security and nutrition. Retrieved from http://www.fao.org/3/a-i4434e.pdf



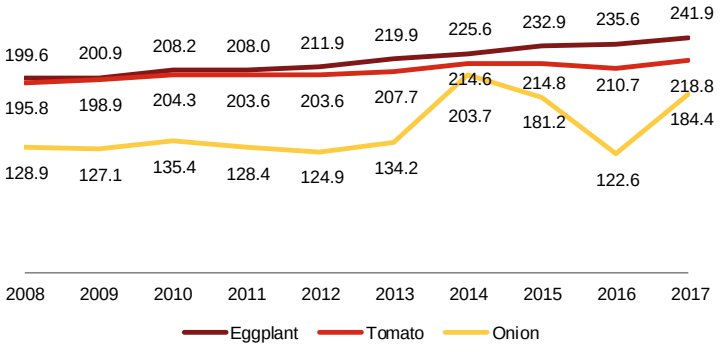
Source: Office of the Provincial Agriculturist of Benguet

Figure 4.2.2 Annual production volume of select highland vegetables in Benguet in thousand metric tons

The cyclical nature of pricing also to some extent influences the production of vegetables. Farmers tend to produce less if they feel that the past price is not profitably attractive and expects that this will continue in the next cropping cycle. However, when the price is high like what happened in 2018, they tend to expand their production expecting that the good price will be carried over the succeeding year. In some instances, it results to overproduction and lower prices as what happened this year.

Currently, farmers in Benguet are experiencing over production of vegetables as farmers increased their production volume. According to the general manager of Benguet Farmers Marketing Cooperative, the average daily vegetables traded in LTVTP reached around 3,500 MT for the first week of 2019. Normally, the daily trade volume was only at about 1,200MT/day. This was primarily due to the spillover of harvest due to the late planting of farmers after their seedlings were destroyed by the typhoons in 2018[24]. The farmers have no choice but to discard their excess produce or sell at the lowest price with this oversupply of about 300 percent.

The production and supply of lowland vegetables show a rising trend as demonstrated by the demands for eggplant, tomato and onion. The growth in demand for these types of vegetables is more sensitive to the improvement of the economy and population growth. There are more areas available for growing these vegetables and can be multi-cropped with coconut, corn, papaya and other crops. It could also be used for crop rotation with rice, tobacco, cassava and corn.



Source: Philippine Statistics Authority

Figure 4.2.3 Annual production volume of target lowland vegetables in the Philippines in thousand metric tons

[24] Sun Star Baguio, 10 January 2019

Because of a larger pool of agricultural land lowland vegetables could easily respond to the increase in demand. Moreover, these vegetable types are easier to grow than highland vegetables and can be grown in wider range of growing conditions. For example, tomato, eggplant, bitter gourd, bottle gourd, string beans could easily be grown in both lowland and midland conditions.

4.2.3. Equity

Equity in the value chain refer to the fairness in the distribution of profit margin to key players in the chain. This differs between highland and lowland among various types of vegetables and marketing channels. Since most of the players practice discriminatory pricing, margins vary with each type of buyers in a given market segment. Underlying this is the fairness in margin distribution.

Highland

The profit margin analysis for highland vegetables used the carrots and white potato value chains. For the carrot value chain, the farmer has the highest profit margin at 50.1 percent. However, upon analysis of the cost and profit share, the farmer also shoulders the majority of the cost at 60.9 percent while getting only 15.7 percent of the profit. The distribution of the profit is skewed favorably to the wholesaler at 34.4 percent, followed by the retailer at 30.6 percent. Of all the players, the wholesaler 1 benefits the most with a low cost share of 13.1 percent and high profit share and profit margin of 34.4 percent and 49.7 percent, respectively.

Table 4.2.13 Profit margins of carrot value chain players for one kilogram

Value chain players	Costs				Profit		Margins		
In Php/kg	Added unit cost	%share to cost	Total unit cost	Selling price	Unit profit	%share of profit	Price difference	%added to Price	Profit margin*
Farmer	7.5	60.9%	7.5	15.0	7.5	15.7%	15.0	27.3%	50.1%
Wholesaler 1 (WS 1)	1.6	13.1%	16.6	33.0	16.4	34.4%	18.0	32.7%	49.7%
Retailer 1 served by WS 1	0.5	4.1%	33.5	38.0	4.5	9.4%	5.0	9.1%	11.8%
Wholesaler 2 (WS 2)	0.3	2.3%	33.3	38.0	4.7	9.9%	-	0.0%	12.4%
Retailer 2 served by WS 2	2.4	19.6%	40.4	55.0	14.6	30.6%	17.0	30.9%	26.5%
Total	**12.3**				**48**		**55**		

Source: Bureau of Postharvest Research and Extension, 2009
**PwC calculation*

In the potato value chain, there is more or less equitable sharing of profit except for the disposer. The disposer is a market agent that transacts in behalf of the farmer and does not add value to the vegetable. Note that as the value chain gets shorter there is better distribution of profit among market players.

Table 4.2.14 Profit margins of potato value chain players for one kilogram

Value chain players	Costs				Profit		Margins		
In Php/kg	Added unit cost	%share to cost	Total unit cost	Selling price	Unit profit	%share of profit	Price difference	%added to price	Profit margin*
Input supplier		-	8.1	8.1	-	-	8.1	17.2%	-
Farmer	5.5	40.9%	13.6	18.0	4.4	17.3%	9.9	21.1%	24.4%
Disposer	1.0	7.4%	19.0	22.0	3.0	11.8%	4.0	8.5%	13.6%
Wholesaler	5.0	37.0%	27.0	35.0	8.0	31.5%	13.0	27.7%	22.9%
Retailer	2.0	14.8%	37.0	47.0	10.0	39.4%	12.0	25.5%	21.3%
Total	**13.5**				**25.4**		**47.0**		

Source: Philippine Rural Development Project, 2017
**PwC calculation*

In terms of the profit margin, the farmer has the highest margin at 24.4 percent, followed by the wholesaler at 22.9 percent and the retailer at 21.3 percent. However, the retailer benefits the most with a low cost share of 14.8 percent and the highest profit share at 39.4 percent.

Lowland

For lowland vegetables, the distribution of profit margin is somewhat equitable but with the farmers having the most share. Farmers also have the better profit share among the value chain players. With a shorter chain, access to market information, and proximity to market centers, lowland farmers are better able to set their prices and maximize their profits. According to the Benchmark Studies on Postharvest

Handling System of Eggplant (2015), the farmer and the retailer are at a disadvantage. Primarily, the overall income of farmers are dependent and limited to the volume of their produce, which are vulnerable to losses caused by pest and diseases and the farmgate price set by traders. On the other hand, retailers also bear the quality deterioration and reduction of weight due to physiological processes. This is seen in the high cost shares shouldered by the farmer and retailer at 42.0 percent, and 42.5 percent, respectively. The traders and wholesalers are at a better position to increase their income by maximizing their volume of transactions. They have low cost shares at 7.1 percent and 8.4 percent, respectively with high profit shares at 24.8 percent and 23.7 percent, respectively.

Table 4.2.15 Profit margins of eggplant value chain players for one kilogram

Value chain players	Costs				Profit		Margins		
In Php/kg	Added unit cost	%share to cost	Total unit cost	Selling price	Unit profit	%share of profit	Price difference	%added to Price	Profit margin*
Farmer	5.9	42.0%	5.9	10.0	4.1	25.3%	10.0	33.1%	41.0%
Trader	1.0	7.1%	11.0	15.0	4.0	24.8%	5.0	16.6%	26.7%
Wholesaler	1.2	8.4%	16.2	20.0	3.8	23.7%	5.0	16.6%	19.1%
Retailer	6.0	42.5%	26.0	30.2	4.3	26.3%	10.2	33.8%	14.1%
Total	**14.1**				**16.2**		**30.2**		

Source: Philippine Center for Postharvest Development and Mechanization, 2016
**PwC calculation*

In the tomato value chain, farmers have the highest profit margin at 70.3 percent. Yet they also bear most of the cost at 40.9 percent. The wholesalers in the trading post and terminal market collectively account for 44.3 percent of the cost. According to the tomato value chain analysis by the Philippine Rural Development in 2015, the cost of the wholesalers comprise of activities needed (e.g. sorting, grading and classification, cleaning, storage, transportation, display and handling) to bring the tomatoes from trading posts to the terminal wholesale market in Metro Manila. On the other hand, the retailer accounts for the least addition to cost at 14.8 percent.

Table 4.2.16 Profit margins of tomato value chain players for one kilogram

Value chain players	Costs				Profit		Margins		
In Php/kg	Added Unit Cost	%share to cost	Total Unit Cost	Selling price	Unit profit	%share of profit	Price difference	%added to Price	Profit margin*
Farmer	4.2	40.9%	4.2	14.0	9.8	34.1%	14.0	35.9%	70.3%
Wholesaler - Trading Post	2.5	24.6%	16.5	24.0	7.5	26.0%	10.0	25.6%	31.3%
Wholesaler - Terminal Market	2.0	19.7%	26.0	32.0	6.0	20.8%	8.0	20.5%	18.8%
Retailer	1.5	14.8%	33.5	39.0	5.5	19.1%	7.0	17.9%	14.1%
Total	**10.2**				**28.8**		**39.0**		

Source: Philippine Rural Development Project, 2015
**PwC calculation*

For red creole onion, the total cost to produce and distribute one kilo in the wet market amounts to Php29.5, with the cost of the farmer accounting for 54.4 percent at Php16/kg. This is followed by the assembler's cost, which includes storage fee, at 29.7 percent of the total cost. The remaining costs borne by the trader, wholesaler, and retailer are primarily on hauling and transportation costs. On the other hand, the total profit earned in the production and sale amounts to Php10.5, of which the farmer has the highest profit share at 37.7 percent. However, this is lower than his cost contribution. On the contrary, the other players have contributed lower costs yet gained higher profit shares. This indicates a need for farmers to improve their productivity. The long value chain results to profit being thinly distributed among the players.

Table 4.2.17 Profit margins of red creole onion value chain players for one kilogram

Value chain players	Costs				Profit		Margins		
In Php/kg	Added Unit Cost	%share to cost	Total Unit Cost	Selling price	Unit Profit	%share of profit	Price difference	%added to Price	Profit margin*
Farmer (fresh)	16.0	54.4%	16.0	20.0	4.0	37.7%	20.0	50.0%	19.9%
Trader (fresh)	2.7	9.2%	22.7	24.0	1.3	12.4%	4.0	10.0%	5.4%
Assembler (cold storage)	8.8	29.7%	32.8	36.0	3.3	30.9%	12.0	30.0%	9.0%
Wholesaler (cold storage)	0.5	1.7%	36.5	37.5	1.0	9.5%	1.5	3.8%	2.7%
Retailer	1.5	5.1%	39.0	40.0	1.0	9.5%	2.5	6.3%	2.5%
Total	**29.5**				**10.5**		**40.0**		

Source: Philippine Rural Development Project, 2014
**PwC calculation*

Unlike other vegetable types, onion can be inventoried for more than six months in cold storage without deterioration of quality and significant reduction in weight. Farmers, therefore could store their product and wait for a better price before selling to maximize their profit.

Chapter 5. Constraints in the value chain

Analyzing the current status of the value chain shows that there are relevant issues and constraints that need to be addressed. This section highlights major concerns observed in each of the value chain, starting from input procurement to production, processing, marketing, logistics, and even support systems.

5.1. Input node

5.1.1. High cost of inputs

One of the major cost components for farming is the expenditure for farming inputs. Foremost of these are for seeds and seedlings. Normally, most of the seeds are sourced from agriculture suppliers who import these seeds from abroad, resulting to higher prices of inputs, as in the case for onions. Some farmers have shared that in times of calamity, there is delay in the distribution of seeds and seedling assistance due to the procurement and distribution process. In addition, the application of fertilizer and pesticide is also vital in vegetable production, but these also incur a significant cost. With the deterioration of farming areas due to excessive use of chemicals and the increase of infestation, farmers also incur more cost to maintain their land and produce quality vegetables. Since most farmers buy their inputs individually and lack economies of scale, they cannot avail of discounts from bulk purchases. As shown in the previous discussion on margin distribution and equity in the value chain, the farmer incurs the largest share of the cost and bears the majority of the risks of production. This discourages farmers from producing quality vegetables.

5.1.2. Lack of access to improved production inputs

With the unpredictability of weather changes and the effects of climate change, farmers experience production losses through pest and disease infestation and natural calamities such as typhoons, drought, and frost. The government offers seeds and seedlings assistance, but these often arrive too late, or are not the quality and quantity needed by the farmers. Consequently, farmers need to have increased access to quality plant varieties and production inputs that are sufficient for their needs when they require it, especially in times of calamity.

5.1.3. Lack of private sector involvement in improving agricultural inputs

Agriculture innovation, a driver of industry growth, is based on the dynamic interaction among the key players involved in the growing, processing, packaging, distribution, and consumption of agricultural products. In the current situation, there is still much room for the improvement of the production processes in the vegetable value chain such as mechanical irrigation systems (e.g. drip and sprinkler systems), protective growing structures, controlled environment structures, and the use of IT (e.g. drones and smart farming technologies) in cultural management processes to improve its performance. This can be supplemented by strengthening and promoting agriculture welfare and development through partnerships with private stakeholders.

5.2. Production

5.2.1. Organizational and management failures

Farmer organizations are not utilized to provide full benefits to farmer-members. Although formed as cooperatives and farmer associations, operations are not integrated to achieve economies of scale and marketing leverage. These farmer organizations are focused on production only and are not utilized to give farmers increased access to a stable market, agricultural credit, input procurement, and corporate accounts. Furthermore, although farmers are members of associations, it can be noted that the more advanced farmers are being prioritized in the distribution of freebies provided by institutions, while the marginalized farmers remain on their own. In addition, the small scale farming is also a constraint. For example, in Buguias, farms are relatively small and far from trading posts resulting to farmers depending on traders for financing and marketing of their produce.

5.2.2. Improper traditional farm practices

Farmers implement outdated traditional practices in the production, transport, and handling of produce, causing significant mechanical damage and food loss. These can be seen in the lack of sorting and proper packaging at the farm level to the inadequate packaging used in the transport of the produce. They also have inadequate knowledge on value-adding farm management practices with low adoption of mechanization and production technology.

Due to the lack of economies of scale and financial constraints, farmers cannot avail of advanced production technologies. In most cases, they under-apply inputs like fertilizers and pesticides to save costs. This results to lower productivity leading to less competitive prices and lower farmer income.

5.2.3. Lack of hands-on training and provision of needed materials

Farmers mentioned that although there are seminars conducted on GAP and organic farming, these often lack actual demonstration of the required practices. They also have a hard time applying these to their farms since they are financially incapable of complying with the requirements for certification. Moreover, the market does not pay a premium price for certified GAP-grown vegetables so there is no incentive for farmers to comply.

5.2.4. Seasonal price fluctuation of produce

Most farmers select the crops to plant depending on their expertise and the previous market prices. When certain crops fetch a high price, farmers simultaneously plant the same crop in the next production period, resulting to oversupply and lower prices. Farmers lack the knowledge on the benefits of crop programming in monitoring the supply and stabilizing the price of produce in the market. On the other hand, the seasonality of some crops also contribute to the price fluctuation during the year. These farmers lack the necessary technology and infrastructures, such as irrigation systems, greenhouses, early/late maturing varieties, and advanced farm machineries and equipment. As such, they are unable to maximize their production yield and capacity and plant for the whole year.

5.3. Processing

5.3.1. Non-integration of vegetable processing in the vegetable value chain

Although some R&D has been implemented, there is a lack of integration to meet the market demand. This is exemplified in the processing technology for squash canton noodles given to Sentrong Pamilihan by DOST. An R&D initiative should have been included in order to optimize the squash noodle production to cater to the consumer preferences. In the end, the processed squash canton noodles were not marketable since it was not as competitive as the commercially-produced noodles. Alternative processing of produce need the support of a market study and a strong business plan to ensure that it will be viable.

5.3.2. Lack of processing technology and research prioritization

Local vegetable processing industry in the Philippines is not well developed due to the lack of technology and facilities. In the highland, there is a high demand for processed potato variety due to the increase in fast-food chains. This is an opportunity for potato stakeholders to gain access to a stable market, but currently potato farmers are unable to produce the quantity and quality needed. Also, most farmers produce the table variety of potatoes rather than the variety for potato chip production. This may be due to the lack of access to institutional buyers who are the primary customers for potato processing, lack of suitable potato variety for processing, and inadequate production technology for growing such type of potato. Currently, micro entrepreneurs in La Trinidad are processing some vegetables into chips. These are sold in the local stores. However, most of the processing for institutional buyers are done by large-scale companies. This processing of highland vegetables is minimal even though it is a value-adding activity that increases the income of farmers and provides an alternative use for excess harvest and rejects.

5.4. Marketing

5.4.1. Lack of direct market access

Farming is seen to be a gamble for farmers as they are not sure whether or not they have a market to sell their produce. Due to this, farmers depend on intermediaries (e.g. traders, wholesaler-retailers) to sell their produce. However, the more intermediaries in the value chain, the higher is the inefficiency of the vegetable flow. As the marketing layers increase, incremental costs and losses are incurred as the produce pass from one intermediary to another. Small fragmented vegetable farms, information asymmetry, and distance from markets are other factors that constrain farmers in directly accessing markets.

5.4.2. Lack of access to market information

Since farmers are not knowledgeable on the dynamics of the supply and demand in the market, the vegetable prices are dictated by the traders and intermediaries with whom they transact with. The lack of knowledge on the market requirements and prevailing vegetable prices partnered with the information asymmetry along the value chain put the farmers at a disadvantage when dealing with traders.

5.5. Logistics

5.5.1. Constraints in the farm-to-market roads

Logistics constraints are split into two phases: the farm-to-trading post transport and the transport from the consolidation center to the retailers and other consumers. In the farm to trading post, inadequate transport infrastructure is a major constraint. Farms, especially those on the slopes that are inaccessible by road, move the harvested vegetables from the farm to the collection points manually using human couriers. Although the DA through PhilMech has provided tram lines, these are not sufficient. Moreover, some of the tramlines are not commercially feasible.

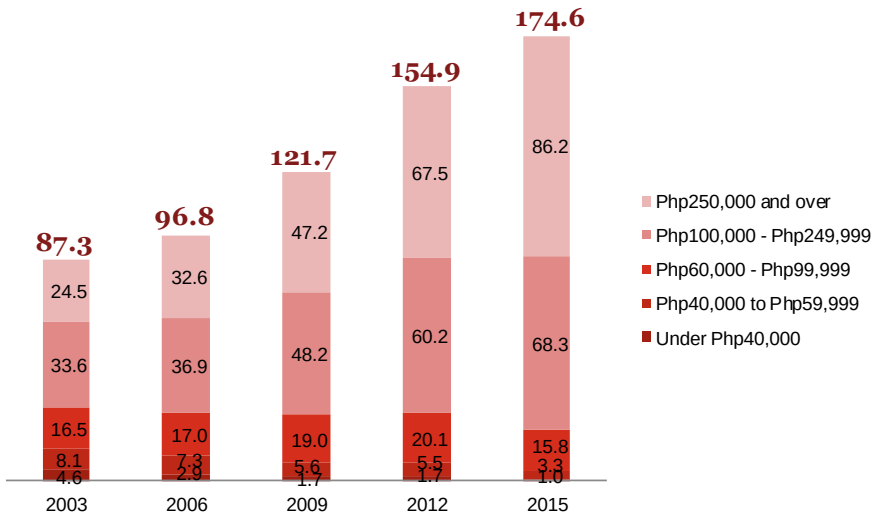
The improper handling and transport with inadequate packaging of produce also contribute to additional quantitative and qualitative losses due to mechanical damages. This is seen in the “buhos” system where vegetables are piled bare packed in the truck to maximize transport capacity.

5.5.2. Constraints in the transport to other markets

In the transport from consolidation centers to other markets, farmers cannot utilize cold chain facilities due to financial constraints. Additionally, the trading posts, such as BAPTC, lack facilities to improve vegetable handling. The trading bays are not equipped for sorting and grading the vegetables which is the original design of the facility. Transport vehicles are not subject to cleaning and other food safety protocols to prevent bacterial and foreign material contamination. In conclusion, the distance between the production areas and the consumer causes inefficiency and additional costs and losses in the delivery of produce.

5.6. Consumers

According to the Family Income and Expenditure Surveys conducted by the PSA, the annual family expenditures on fruits and vegetables have shown an increasing trend. It has doubled in amount from Php87.3 billion in 2003 to 174.6 billion in the latest survey last 2015. It can be observed that the upper class with annual income of Php100,000 and above show an increasing trend, from Php58.1 billion in 2003 to Php154.5 billion in 2015. On the other hand, those on the lower income brackets have displayed a decreasing expenditure, from Php29.2 billion to Php20.1 billion over the same period. This indicates that those with higher incomes are more likely to spend on fruits and vegetables. On the other hand, the survey also revealed that all regions have shown increases in the average annual family income, with families from NCR staying at the top with Php425.0 thousand followed by CALABARZON and Central Luzon at Php312.0 thousand and Php299.0 thousand, respectively. The growing urban population and the increase in economic stability of the country drive the demand for fruits and vegetables.



Source: Philippine Statistics Authority - Family Income and Expenditure Survey

Figure 5.6.1 Family disbursements for fruits and vegetables by income class in Php billions

However, due to the many layers in the vegetable value chain and inadequate value chain governance, the consumers lack consistent access to safe, fresh, and reasonably priced vegetables in the markets. Moreover, because of arbitrary adoption of quality standards, consumers are not aware if they are getting the right value for their money when they buy vegetables. On the other hand, per capita consumption of vegetables lags behind other countries such as China, Taiwan, and Vietnam and is below the recommended consumption rate of the WHO. This could be attributed to inadequate government policy in promoting awareness and higher consumption of vegetables.

5.7. Support systems

This section highlights the concerns and issues raised in the one-day workshop and over the course of the study in relation to agricultural programs and activities integral to the vegetable value chain.

5.7.1. Government policies and programs

Inadequate government support for vegetable production. The government budget allocated for vegetables is insufficient to cover the different needs for each vegetable. According to Senator Cynthia Villar, chair of the Committee on Agriculture and Food, DA proposes to earmark Php15.7 billion for programs and Php15.0 billion for projects for 2019. Foremost programs proposed is the National Rice program at Php7.4 billion and the National Corn program at Php1.5 billion. The fund for the National High Value Crops amounted to Php1.5 billion. Considering that high value crops under the High Value Crops Development Program comprises of vegetable, fruits, industrial crops, and alternative food staple crops, this budget is significantly insufficient to cater to the unique issues faced by each crop.

Other funds highlighted are the Php10 billion fund allocated for the Rice Fund as a component of the rice tariffication bill and another Php10 billion for the Coconut Farmers and Industry Development Fund. These highlights the crops mainly supported by the government, with vegetables being one of the least prioritized.

However, under the 2019 national budget, DA was only allocated a total of Php49.8 billion, a decline of 1.7 percent from its 2018 budget of Php50.7 billion. This comprises only 1.3 percent of the total national budget of Php3.8 trillion for 2019. In addition, DA's budget is distributed to its various agencies, with the Bureau of Fisheries and Aquatic Resources receiving Php5.8 billion and the Agricultural Credit Policy Council with Php3.5 billion. DA Secretary Emmanuel Piñol stated that the agency needs higher budgetary support to boost agricultural growth, but the Department of Budget and

Management Secretary Benjamin Diokno countered that the performance of the sector has little to do with their budget, but more on their policy strategy and implementation.

Experiences in other countries show that government intervention and support are necessary to uplift the agricultural sector. In China, the government has been focusing on sustainable agriculture development in maximizing the limited land to supply a growing population. The 13th five-year plan of China promotes this through R&D in improving agriculture productivity and creation of farming land. In Korea, the key initiative that enabled them to rise from rural poverty was through the *Saemal Undong* Movement. This was a community-driven development program that stressed the values of diligence, self-help, and cooperation. This started from upgrading the basic rural infrastructure of the country, then worked towards the overall social and economic development of the rural villages and multiplying the initiative to more beneficiaries. In Japan, the promotion of agriculture structural reform involved consolidation of farmland operations, strengthening business farmers, and developing agricultural production infrastructure.

Innovation is important in driving the growth and development of the vegetable industry. In the Philippines, however, technological innovation and R&D are concentrated in the private sector. The government has little policy on long term and more integrated research programs. This is evident on the current researches which are focused on short to medium terms hence creating less impact in forwarding innovation in the industry.

Insufficient assistance during typhoon and calamity. Due to its geographical location, the Philippines is vulnerable to cyclonic storms and floods, with the islands of Luzon and Visayas as the most adversely affected by typhoons. These extreme weather conditions have significant effects on the agriculture production of the country, particularly for small-scale farmers who do not have sufficient safeguards against natural calamities. In response, the government provides production input assistance, such as seeds and seedlings to help the affected farmers. However, farmers mentioned that these aid are often delayed or insufficient to supply their needs.

Another calamity faced by farmers is the occurrence of extreme pestilence and disease. Onion farmers in Bongabon stated that they have been experiencing losses for the past three years due to the infestation of Anthracnose. In response, the municipal agriculture office has provided fertilizers and pesticides but these were not enough to improve the land condition of the farmers. Financial assistance through easy access loans were also given to affected farmers, but there was delay in the disbursements so farmers were not able to use it for the intended purpose of planting onions.

The increase in production risks is driven by changing weather patterns which result to the instability of production. Planting is delayed due to the prolonged dry season, while productivity and quality of harvested crops are affected by the growing frequency of typhoons and the intensifying rainfall density. Under these situations, government support is needed to mitigate the adverse effects of climate change and help farmers continue planting in the succeeding cropping cycles. However, the government does not have an integrated calamity mitigating program and initiative intended for this purpose.

Lack of assistance in GAP certification. To improve farm productivity, the government promotes the implementation of GAP and organic farming through trainings and seminars to farmers and farmer organizations. However, major constraints prevent the adoption of GAP and organic farming. There are four major constraints, namely: 1) inadequate knowledge, 2) relatively high cost, 3) stringent processes, and 4) unattractive rewards/incentives.

Farmers display a lack of awareness on the process and benefits of GAP and organic farming. They tend to rely on traditional conventional farm practices which are often outdated and harmful to their health and the environment. Some farmers were able to attend GAP seminars conducted by DA, however, they expressed that these lacked hands-on training and assistance.

There is a high cost involved in applying for certification and complying with the requirements. The government offers assistance, such as subsidized soil testing and processing, but these are not sufficient to cover major expenses.

Stringent requirements for certification is strenuous for farmers. They experienced delay in the processing of their application with some failing to get certifications after one year. A farmer organization in Buguias shared that they were helped by the government in applying for GAP certification in 2015 but until now they are not yet certified. This entails additional cost as examination processes need to be repeated. In organic certification, strict and costly requirements discourage farmers from applying.

Farmers are also not keen on adopting and getting GAP certification because the market does not pay premium for GAP grown vegetables. They expressed that the market is indifferent as to whether or not the produce are planted applying GAP.

In organic farming, farmers have difficulty in marketing their produce due to the small market size as this is still a niche market in its early development stage. Only the supermarkets segregate organically and conventionally grown vegetables. But organic vegetable growers need to acquire certification first before they can label their produce as organic. This leads to another problem which is the difficulty in being certified due to the costly process and the strict requirements.

The practice of GAP and organic farming can significantly improve the health of farmers and the quality of their produce. Organic growing is also one way of differentiating vegetable products. This is done by a few farms who promote their vegetables as certified organically grown. However, there is generally a substantial lack of support in the promotion and implementation of organic vegetable farming.

Lack of assistance in compliance with government agricultural loans. Currently, DA is planning to gradually remove the government's agriculture subsidy to farmers and replace it with the easy access loan programs. One of its subsidy programs include free seedlings and fertilizers distributed to farmers, but these were faced with complaints such as low quality of the seedlings, corruption of funds, delay in distribution, and insufficiency of supply. However, a major issue with credit programs is the difficulty that farmers encounter in complying with the loan requirements. According to an interview with some farmers, ACPC is willing to offer loans to farmers, but these require substantiation due to previous experiences where farmers form dummy cooperatives or use the loaned funds for different purposes (e.g. for dairy instead of for onion production). As such, some farmers have a difficult time in accessing these loans. In addition, some mentioned that there is delay in the release of agricultural loan funds (e.g. PLEA, SURE).

In addition, small scale farmers are not well organized to access agricultural and agribusiness loans from the government and private financial institutions. Most of the financial programs are intended for farmer cooperatives and associations (with legal personality) and farmers with large landholdings operating as an enterprise. This leaves marginalized and subsistence farmers to depend on informal financial credit providers such as traders to finance their production and marketing operation.

In the latest State of the Nation Address held last 22 July 2019, the President threatened to shut down the Land Bank of the Philippines unless it returns to its primary purpose of financing agricultural enterprises and endeavours. In response, Land Bank reiterated its steadfast pursuit of helping small farmers and the agricultural sector in general. It plans to strengthen partnerships with cooperatives, farmer organizations, government agencies, and LGUs. It also seeks to reach out to the unbanked and unserved rural areas through rolling out information caravans and partnering with DAR to cover more

beneficiaries. Recently, it turned over a total of 354,783 hectares of land to DAR for distribution to agrarian reform beneficiaries[25].

Lack of MIS. Inadequate MIS in the value chain causes dysfunctionality in the coordination of the various processes. Coordinating supply and demand, which comprises of production and market requirements, is important in achieving profitability. Currently, a major issue faced by farmers is the problem of overproduction. Because of inadequate market information, farmers tend to plant depending on their perception of market opportunities and seasonality of crops, which results to planting of the same crops at the same time. This causes oversupply in the market leading to lower prices and lesser income for the farmers.

The one-day workshop identified the lack of an MIS that will monitor and relay market information such as production volume of key vegetable production areas as well as the type of vegetables and the volume traded. Another issue raised was the adverse effect of smuggled vegetables, particularly onion. These are sold at a cheaper price, causing local prices to drop. This results to a supply glut as local production volume is supplemented by additional supply in the market.

5.7.2. Research, development, and extension

Inadequate R&D in improving input. In the one-day workshop, one of the major concerns raised was the insufficient R&D in varietal improvement. Stakeholders believe that more effort and initiatives should be implemented in enhancing pest and disease resistance and improving productivity such as high yielding varieties and better responsiveness to fertilization. It was also mentioned that there is a lack of R&D in fertilizer formulation specific for each type of crop to significantly improve cost efficiency.

Lack of integration in the R&D projects of government agencies. Government institutions are compartmentalized in technology generation resulting to research programs that are not integrated to complement and support each other. This was discussed in the one-day workshop where DOST-PCAARRD developed plant varieties that were rejected by the farmers due to its incompatibility with the market. In some cases, government officials who finished graduate studies abroad, such as in USA, Germany and Australia, tend to propose high level technology researches applicable only in the first world but not applicable to the Philippines due to factors of climate and local conditions. An example of this is the research on machine vision for quality determination of agricultural products which will require equipment and capabilities that are not affordable for farmers and farmer organizations.

Insufficient budget for R&D for agriculture. Foremost in the implementation of R&D is the need for sufficient funds to support its implementation and dissemination. Generally, the vegetable sub-sector relies on government for research, development, and extension activities. During the one-day workshop, it was mentioned that currently only 0.14 percent of the country's GDP is spent for R&D on agriculture, but the target is 0.4-0.5 percent. The Census of Philippine Business and Industry of 2012, however, reports a much lower figure of 0.03 percent for agriculture, hunting, forestry and fishing. Industries had 0.06 percent R&D intensity which is double that of agriculture. By industry, the R&D expenditure for agriculture was at 0.70 percent while that for manufacturing was the highest at 62 percent. The country's R&D intensity pales in comparison with the world's average expenditure of 2.23 percent (2016)[26]. This highlights a gap between the actual expenditure and the needed support for agricultural R&D.

Lack of R&D in food processing. In addition to R&D in improving production inputs, there is a lack of research studies on food processing for vegetables as seen in the low adoption of processing technology in both the highland and lowland. Currently there are several SUCs who conduct postharvest and processing studies. These include BSU and Nueva Vizcaya State University for the highland and

[25] https://www.landbank.com/node/4334
[26] https://data.worldbank.org

the UPLB and Southern Luzon State University (SLSU) for the lowland. However, these SUCs lack support and facilities to effectively carry out and disseminate their studies.

Food processing is a means of value addition, generating more employment and income to chain players and increasing food security. Lack of a strategic R&D in product and process development can be observed in this part of the vegetable value chain. This is in contrast with other countries where vegetables such as broccoli and carrots are utilized as ingredients in vegetable-food beverage manufacturing.

Lack of agriculture extension work. Another concern raised in the workshop is the lack of workers implementing agriculture extension. In some areas, MAO officers are not agriculturists and cannot give concrete agricultural programs to DA. In others, designating MAOs are not prioritized by the LGU. There is a lack of agriculturists and researchers who will go to the farmers to train and guide them to implement better practices adapted in their farm lands.

5.7.3. Financing and insurance

Lack of access to information on financing assistance and insurance. In general, farmers lack awareness on the assistance available for them in terms of crop insurance and agricultural credit/loan. Since some farmers reside on distant rural areas, they have no access to the information needed to avail of these assistance. In addition, they also have difficulty complying with the requirements needed for the assistance and insurance. Although the PCIC is active in the promotion and information dissemination of crop insurance, farmers find it a hassle to apply for insurance and still do not consider the benefits of having crop insurance. Similarly, even though there are rural banks and microfinance institutions who offer agricultural loans, farmers need assistance in complying with the requirements for credit.

Strict agricultural loan requirements. Although banks are mandated by law to allocate funds for loans to farmers and fisher folk, these banks often do not grant easy access to farmers due to the credit policies implemented. Instead of directly lending to the agricultural sector, banks would rather pay the penalty for non-compliance. Over the years, banks were given alternatives to compliance such as through investments in the local government and Home Development Mutual Fund bonds, extension of socialized low-cost housing loans, and extension of loans to barangay microbusiness enterprises. However, these did not provide direct benefits to the farmers. On the other hand, farmers cannot avail of loans as they would have to provide collateral and prove their eligibility to repay the loans. This is particularly difficult as some marginalized farmers do not have a title to their land and are vulnerable to many risks such as production failures due to typhoons and pest and disease infestations.

Difficulty in claiming insurance and insufficiency of insurance for damages. Since the agriculture sector is particularly vulnerable to typhoons and calamities, the protection granted by crop insurance is needed by farmers to quickly recover from losses incurred. However, an interview with some farmers revealed that they perceive insurance policies and requirements as insufficient for their crops and the weather condition changes. This is particularly true for onions which are easily affected by rain. Another issue is the strict requirements needed for claiming damages under the insurance. Certain documents and procedures must be followed under a limited period of time in order to claim the pay-out. In some areas, farmers have difficulty in complying with these requirements. Lastly, farmers expressed that the claimable damage is less than cost of production incurred in planting their crops. Some farmers would rather borrow from informal lenders and continue planting with what they have than be bothered with following the procedures of claiming the insurance.

5.7.4. Industry associations

Lack of partnership with related private sectors. In the Philippines, farmers and farmer organizations have a weak partnership with agricultural technology generators and suppliers. Small scale farmers often cannot afford farm equipment and technology. In this, there is a lack of cooperation with related private sectors to assist and aid farmers in improving their technology adoption. Another major problem encountered is the increasing cost of production inputs due to dependence on imported seeds and

seedlings, particularly for onions. There is little partnership with agricultural suppliers in developing quality inputs to be tested and distributed to farmers.

Most industry associations mainly function for policy advocacy and are not meant to initiate value chain performance enhancement. For this reason, value chain competitiveness is not strengthened and issues that constrain chain performance are not addressed adequately and promptly. Unlike in other countries such as Thailand, partnerships between industry associations and academic and government research institutions are very active in developing innovative products, improving manufacturing processes, and producing solutions to value chain problems.

5.7.5. Food logistics services

Lack of partnership with third-party logistics services. Small scale farmers often cannot afford to rent transport and storage facilities that comply with food safety protocols, much more that of cold chain services, such as reefer vans and cold storage. These facilities are often dominated by institutional buyers, major traders, and importers, with little to no space for local farmers. Farmers lack the connection and assistance that would give them access to these facilities.

Chapter 6. Practical solutions to value chain constraints per node

6.1. Input node

6.1.1. Improve R&D on production inputs

An avenue for improving input procurement for production is through the increase of support to R&D of improved plant varieties and organic fertilizers and pesticides, among others. This can be done through financial support and dispatch of agriculture experts and researchers. The government should increase R&D intensity and partner with the private sector in conducting strategic researches as well as short to medium term researches to address pressing issues in the value chain. An R&D roadmap should be initiated by DA in partnership with other government agencies (e.g. DTI, DOST, PhilMech), academic R&D institutions (e.g. Institute of Plant Breeding, Agricultural Machinery Testing Center, Postharvest Research and Testing Center, and Food Science Technology of the UPLB), private input supplier enterprises (e.g. East-West, Allied Botanical), and with the participation of value chain key stakeholders such as farmers, processors and logistics service providers. Other support institutions such as finance and industry should also be involved. Government R&D organizations could also go into collaborative programs with international research organizations such as the World Vegetable Center in Taiwan and other foreign research institutions. Collaborative researches strengthen R&D resources and facilitate focused innovations.

6.1.2. Develop local input production

One of the factors driving the increase of production inputs is the reliance on importation of seeds and seedlings, as in the case of onions. During the focus group discussion, farmers suggested to implement local production of quality seeds and seedlings to lower costs and to increase access to these inputs. This can also help in expediting the distribution of seeds and seedlings during calamities. In addition, the quality of the inputs can be assured as these are locally produced and regulated.
Currently, there are a number of seed companies that supply vegetable seeds and develop superior performing varieties. However, their output is not sufficient for the growing need for planting materials to meet the demand for vegetables. The government should offer incentives for more private sector companies to invest in planting materials development and supply.

This should also be done with inorganic and organic fertilizers to reduce cost as well as improve productivity. The production of organic fertilizer using coco coir dust which is being promoted by the Philippine Coconut Authority should be explored for both organic and conventional vegetable production. Another is the formulation of special fertilizers specific to a particular type of vegetables. This could improve productivity and lower production cost. In line with this is the establishment of soil testing laboratories by the DA to provide soil analysis and other tests relevant to vegetable and other agricultural crops production. These tests will aid farmers assess the health of their soil and the appropriateness of their farming practices. This will facilitate the monitoring of the crop production and data gathering to guide farmers on what crops to plant and how to plant these effectively and efficiently as may be suited to their farms.

Partnership with private companies for mechanical irrigation like drip and sprinkler systems should be done to improve the irrigation capabilities of farmers. The adoption of productivity enhancing technologies such as fertigation, shallow tube wells, solar pumps, and drip system could be facilitated through collaborative projects.

6.1.3. Strengthen public-private partnership

Government initiatives in the agriculture sector display low effectiveness and sustainability primarily due to lack of funding, weak policy implementation, and limited scope of the project. Partnerships with interested private sector companies will lead to better synergies due to complementary abilities, skills, and additional resources. This will also promote the development and poverty reduction of small-scale farmers by giving them access to knowledge and advanced technologies. The farmer organization plays a critical role in this initiative as it provides a structure wherein smallholder farmers are coordinated,

regulated, and managed. It will then be easier to connect them to private companies, such as seed and agriculture input companies, restaurants, and fast-food chain companies. Partnerships between farmer organizations and agriculture-related entities (e.g. East-West Seed, Ramgo, and Condor) can be strengthened to provide farmers with better access to quality agricultural inputs. Due to pooled acquisition and funding, farmer organizations can also access quality inputs at more affordable prices.

Public-private partnerships are initiated in several phases. First, there must be a common interest. In the case of restaurants and fast-food chains, there is a demand for fresh crops while farmers need a market for their produce. For seed companies, research initiatives need the expertise of farmers for the adaptation and development of better varieties, while farmers need quality inputs to improve productivity. Leveraging on these will promote coordination and mutual benefits for both parties and have the potential to significantly improve the value chain.

Currently, East-West Seed Co., Inc. has a Knowledge Transfer Program throughout several countries, including the Philippines. This focuses on providing quality seeds and production inputs as well as trainings and capability building workshops for farmers. This is a model program that the government can partner with and promote to other agriculture-related companies in developing and distributing quality inputs to relevant farmer organizations.

The *Sustainable Potato Program* collaboration between the Universal Robina Corporation (URC) and the DA is another example of a partnership that aims to increase farm productivity and profitability. This will help develop local potato farmers through the provision of quality inputs and connection to a market through the sister company of URC, Robinsons Supermarket. Under this program, URC will provide high quality imported Granola potato seeds to select farmer organizations in Benguet, Mountain Province, Bukidnon, and Davao del Sur. In support, DA's attached agencies and select SUCs will provide capacity-building seminars and training sessions to the farmers to improve the production quality and commercial value of potato.[27] This shows that partnerships with private sector companies are possible and can be beneficial for all stakeholders.

6.2. Production

6.2.1. Strengthen farmer organizations

To improve production, one of the key intervention is to strengthen the farmer cooperatives to implement pooled procurement of superior production inputs such as fertilizer and pesticide and increase access of farmers to farm tools and equipment through leasing at a competitive rate. These established farmer organizations can coordinate with government agencies and development grant organizations to improve not only the bargaining power of farmers but also their access to agricultural financing and assistance.

Effectively organized farmers could establish a vegetable production enterprise that could be integrated into processing and marketing. Forward integration improves the income of farmers as they participate in value addition in main stream markets of vegetables.

6.2.2. Strengthen partnership with local channels

Key informant interviews with private sectors who worked with farmers revealed that the best way to develop farmers is through the "peer-to-peer training" method. There is a more effective and efficient transfer of knowledge and skills when farmers see the benefits directly from fellow farmers and locals, who teach and show them how to improve their farm management and productivity. A model program is seen in the FEP implemented by the JGF. In this, JGF works with local partners in the target area (e.g. LGU, cooperatives, microfinance institutions or non-government organizations), who train, monitor, and support the local farmers. Through the success of the partner farmers, other neighboring

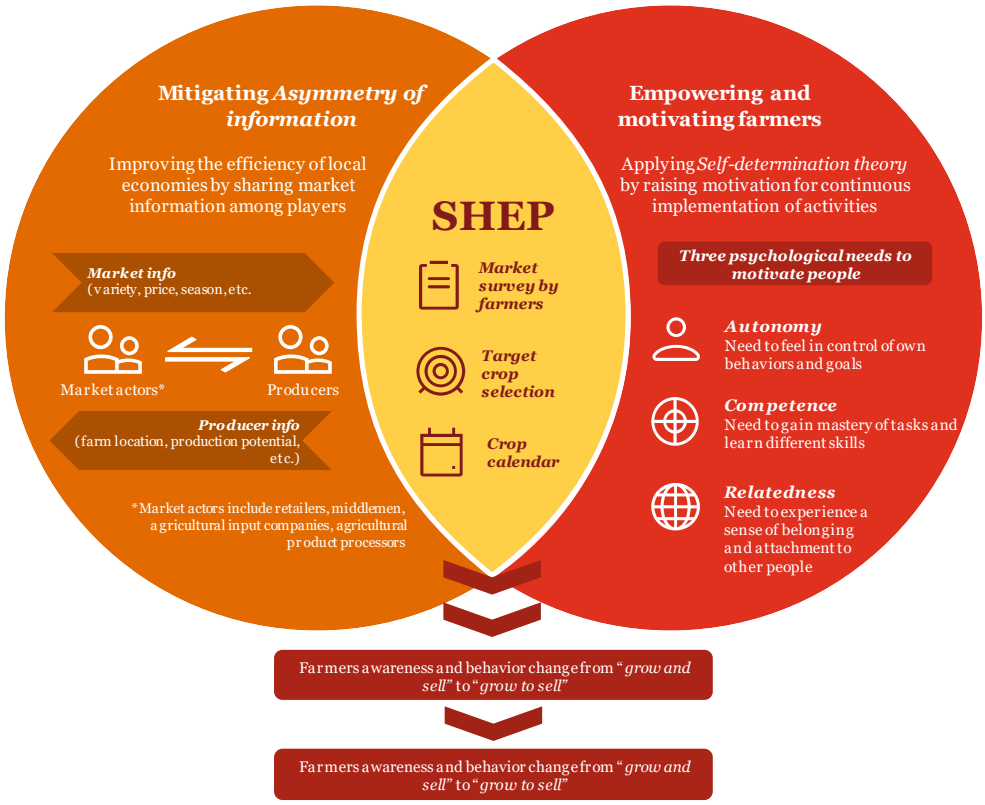
[27] https://www.jgsummit.com.ph/news/urc-partners-with-department-of-agriculture-to-help-support-local-potato-farmers-20181109

farmers were encouraged to join the program and adopt improved farm practices.

6.2.3. Implementation of crop programming

The programming of vegetable production is anchored on the necessity of producing only what is needed and demanded by the market. This stabilizes the prices and ensures that farmers profit from their harvest. To do this, production data is needed to monitor the plants and farming areas of the farmers. Plotting out the production areas and the crops produced enables the governing agencies to forecast which areas would have excess supply and which ones are in need. Additionally, production experts can guide farmers on what crop rotation pattern is most suitable for their farming areas. This produces benefits in reducing land and water pollution, improving soil structure, and controlling pest and diseases. This ultimately leads to higher crop yields and a healthier environment through reduced chemical usage.

A successful model for crop programming implementation was developed in a technical cooperation between Kenya and Japan. This was called the "Smallholder Horticulture Empowerment and Promotion (SHEP) Approach." The project aims to empower small-scale farmers to undertake farming in a sustainable and marketable manner by equipping them with the needed marketing and production skills. This was supported by two theories: the economic theory called "Markets with asymmetric information" and the psychological theory called "Self-determination theory."



Source: Japan International Cooperation Agency

Figure 6.2.1 Two pillars of SHEP

The first theory deals with the imbalanced information among the value chain players. This leads to an inefficient local economy which results to farmers being at a disadvantage in market transactions. Based on this theory, SHEP aided farmers in filling up the information gap by training them how to conduct market surveys and helping them establish business linkages with market players. The second theory underscores the need to implement activities that will drive farmers toward a market-oriented agriculture mind-set. These activities are rooted in fulfilling three psychological needs that will ensure the sustainability of the project. For instance, when farmers are trained to conduct the market survey on

their own, they feel in control of their own action which supports their need for autonomy. After this, the success of the market surveys develop the skills and mastery of the farmers. Finally, when the farmer representatives share the results to their farmer groups, the sense of belonging and attachment to the group members is reinforced which contributes to the need for relatedness.[28] A similar model can be adapted and implemented with target farmers in the Philippines.

On the other hand, crop programming can also be possible through contract supply or growing arrangements that specify the type of vegetables to be grown, the quality standards, prices, and the production schedule. Since farmers have the incentives of a stable market and a known price for their produce, they are able to plan their production. Farmers could also program their production to target off-season productions to take advantage of higher prices. This could be supported through the production of improved technology such as superior hybrids, protective greenhouse facilities, and use of efficient irrigation systems (e.g. impact and drip systems).

6.2.4. Supplement training and capability-building of farmers

Concurrent to strengthening the farmer organizations is the need to improve the knowledge and skills of the farmers. This can be done through comprehensive and hands-on educational programs where farmers are exposed to improved farm management processes, smart productivity techniques, and effective marketing of their produce.

6.2.5. Provision of materials and tools required

Small-scale farmers often cannot afford the additional costs inherent in incorporating improved farm practices such as GAP and organic farming. In line with this, assistance can be given through subsidized provision of needed materials and farm tools. Benefits can be given through the form of monetary or nonmonetary rewards. Assistance can also be given in the registration and continuing compliance with requirements through regular training.

6.3. Processing

6.3.1. Promote comprehensive processing plans

Development of vegetable processing can be implemented through partnerships between government research agencies, SUCs, and relevant value chain stakeholders. Government research agencies and SUCs can integrate their studies and complement their findings. These results can then be distributed and implemented by trading posts and processing centers. An example would be giving assistance to the Postharvest Training Center under the College of Agriculture and Food Science and the College of Economics and Management of the UPLB in conducting feasibility studies on vegetable processing and marketing. Market linkage and support can then be given in partnership with the DTI to supplement the marketing and profitability of the processed goods. Additionally, coordination with the DA can be implemented to train and support farmers in supplying the requirements of processing companies.

A model example of this is the Federation of Aritao Rural Improvement Clubs, Inc. which was able to integrate the development of tomato products and sell it to markets in the Cagayan valley. Currently, the scale of the tomato processing plant is still on a livelihood scale. This can be scaled up through assistance in improving the products offered and provision of advanced processing facilities.

6.3.2. Develop a processing center for vegetables

A practical solution in supplementing the processing of vegetables is to enhance the FTI facility with processing technology to be able to segregate, grade, and pack fresh and partially processed vegetables through the provision of individually quick-frozen technology facilities, and the like. Assistance can

[28] Japan International Cooperation Agency. (2018). A Practical Guide to the Implementation of the SHEP Approach. Retrieved from https://www.jica.go.jp/activities/issues/agricul/approach/shep/ ku57pq00001zwgkc-att/shep_handbook_en.pdf

also be given to farmers who need processing through educational programs, trainings, and other support so as to encourage them to incorporate vegetable processing.

6.3.3. Strengthen and promote partnership with processing corporations

In Ilocos Norte, the Northern Foods Corporation is a government owned and controlled corporation which manufactures tomato paste and sources out its raw materials from about 3,000 Ilocano farmers who annually enter into contract growing agreements with the company. The current processing capacity amounts to 500 tons of fresh fruit per day and produces about 4,000 metric tons of tomato paste every processing season of January to April annually. The company supplies tomato paste to leading fast food chains, fish canners, and tomato sauce manufacturers in the country. Currently, the partnership with farmers are only implemented for the tomato production season of January to April, since these farmers cannot plant tomatoes during dry season. With the additional support in providing the appropriate irrigation facilities, the tomato production and processing can be operated for the whole year. In addition, this arrangement serves as a model project that can be implemented in other production areas as well.

6.4. Marketing

6.4.1. Utilize innovative platforms to increase market access

To improve marketing, several innovative approaches can be implemented. One of these is to directly connect farmers and consumers through online platforms that incorporate delivery and marketing of products. Online delivery platforms (e.g. *Mober*) increases efficiency in delivering the produce to the target market. Concurrently, an online marketing platform can be utilized such as through applications like *Krops*, which is a mobile application enabling buyers and sellers to make transactions through its platform.

6.4.2. Strengthen contract supply agreements

Another solution is through the implementation of contract supply agreements with targeted buyers. These contracts include not only the type, volume, and price of vegetables but also set the delivery schedules and extend embedded business development services to aid farmers meet the requirements. In addition, the pricing and margin in these contracts should be negotiated based on the production cost provided by the farmers to ensure that there is equitable distribution of profit.

6.4.3. Enhance market information transparency

Another approach is to establish a management information system in trading posts. This will connect buyers and other key players of the value chain such as farmer producers and logistics transport service providers for direct access and coordination. This can be extended to support marketing in consolidation and distribution centers. In addition, this can be utilized for proper dissemination of the vegetable quality standards to promote a uniform understanding across the value chain players. The MIS can also be used in gathering vegetable trading data to inform farmers on the market situation and generate a proper crop programming schedule.

6.5. Logistics

6.5.1. Develop a distribution center

To increase the efficiency of transport to major markets in the Metro Manila, a distribution center can be developed in partnership with the FTI at Taguig City. This facility can offer cross-docking, sorting, grading, packing, and storage to increase the efficiency of delivery to targeted buyers.

The FTI is a government owned and controlled corporation currently operating as a provider of industrial and commercial lots for medium-to-long term leases, and industrial buildings with standard-sized stalls ideal for office, warehouse or small-scale processing operations. It was originally known as the Greater Manila Terminal Food Market with the vision of becoming the primary trade/market for food and agriculture in Metro Manila. Its operations started with small and medium scale industries

from direct trading of commodities, storage, and food processing to retailing, transport services, and real estate leasing. This was later on converted into an Agro-Industrial Commercial Estate, and was given a new corporate name of FTI on 27 March 1974.

In the 1970's, the major activities of the company included warehousing, food processing, research and quality control, marketing services, and trading. The FTI engaged in the wholesale of selected commodities to provide assistance to food producers and exporters. However, its food trading and processing operations were suspended in 1989 due to conflict with free trade market forces. Currently, it promotes agro-industrial commercial estate by providing leasable facilities and buildings for food producers, manufacturers, exporters, and other sectors in the food industry.

The corporate life of FTI has recently been renewed and now it intends to be a strategic partner of the government's program on food security and promotion of the welfare of farmers through its Regional Food Terminal project. This project aims to establish food terminals in regions/provinces of the country to improve the agriculture sector. This will provide storage and processing facilities to the producers. The DA also plans to utilize the remaining property of FTI as a consolidation area for agricultural and fisheries products. When completed, the new FTI will have receiving and processing facilities that will enable farmers and fishermen to sell directly to consumers and vendor associations. In addition, logistics facilities will be acquired to facilitate the movement of products from the Regional Food Terminals to the market.

The FTI is the most suitable partner for a distribution center due to various factors. First, it is strategically located relative to its markets in the Metro Manila and the supply bases of lowland vegetables from CALABARZON and Central Luzon and highland vegetables from Benguet. Second, it is to be developed by DA as a consolidation center and already has several connections to regional trading hubs in different production areas. Lastly, its corporate vision is aligned with the purpose of improving the agriculture sector and providing an avenue for farmers to have better access to the market. In support, assistance can be given through provision of needed facilities as well as capacity building programs for relevant stakeholders, such as farmers, traders, and agribusiness enterprises. This could be a pilot project that could be scaled up to include the regional food terminals affiliated with FTI. The facility also has a refrigeration system that could be modified and improved to provide better quality vegetables to target customers.

An alternative would be partnering with private companies offering logistics, warehousing, and cold storage facilities. Another distribution center could be established at the northern side of the NCR, preferably at Bulacan. This could be through a leased privately owned cold storage facility.

6.5.2. Promote and monitor proper handling and transport of produce

Training programs for farmers, traders, and workers should be conducted to promote the practice of proper postharvest handling, transport, and storage of fresh vegetables. It is also suggested that metal, wooden or bamboo dividers be placed in the trucks to carry the load of the upper parts to prevent losses due to physical bruising during transport. Guidelines on transport cleanliness and food safety protocols may be converted to food safety standards and be monitored for compliance, in coordination with the DA. In support, the implementation of the vegetable standards promotes quality-based pricing which would provide incentives for value chain players to prioritize food safety and quality preservation practices.

6.5.3. Supplement the needed logistics and facilities

Since individual farmers are financially constrained, farmer organizations can be given subsidies, preferential interest credit, or government lease in the acquisition of proper cold chain and transport facilities (e.g. refrigerated and bulk type transport trucks and third party logistics service providers). These organizations can then lease out the facilities to member-farmers at a lower cost. With the main goal of providing more fresh vegetables to the consumer, a full cold chain facility can be incorporated starting with pre-cooling in the field after harvesting, proper packaging in the farm, cold transport from

the farm to the market, cold storage at the trading post level, and a central packing and storage facility in the market centers. This will ensure the quality of the vegetables from farm to plate. This can be carried out by providing cold chain facilities to farmers and trading posts and supplementing with training programs to increase awareness and application. In this, farmer organizations can consolidate their produce and lower the individual costs shouldered by the farmers.

In the highlands, the construction of tramlines must be evaluated and improved before installation in elevated areas. Provision of expertise and assistance in installing and operating these tramlines can be an avenue of improvement.

6.6. Consumer

On the consumer side, key interventions include the promotion of nutrition education through seminars and health awareness campaigns in Metro Manila and neighboring regions. Education programs can also be implemented for young students to raise awareness on the importance of vegetable consumption and a healthier lifestyle. This program can include home economics classes or food education to children. This will influence families to incorporate a more nutritious diet in their homes.

6.7. Support systems

Some of the issues raised in this section has already been addressed in the nodal recommendations. The succeeding recommendations are practical solutions to the identified constraints.

6.7.1. Government policies and programs

Supplement agricultural support. To address the lack of government support and the insufficient calamity assistance, supplemental provision can be given through monetary or nonmonetary assistance of needed production inputs. These support can be through monetary aid, provision of quality production inputs, or through the dispatch of agriculture experts in assisting the government implement efficient and effective government programs.

Increase awareness and assistance for farm certification. Even though the government promotes GAP and organic farming, some farmers do not implement nor apply for the certification either due to the cost constraint or because they are unaware of the benefits of doing so. On this, two solutions can be implemented. First, assistance can be given through the provision of needed farm materials and tools. Second, farmer awareness and knowledge can be increased through educational trainings and workshops.

Increase agricultural loan access. To support farmers in accessing agricultural credit, farmers must be educated on the requirements, assisted in their compliance, and supported in their operations to ensure that they can pay their loans. First, the government can review the policies and requirements for agricultural loans to ensure that these are appropriate and feasible for the farmers. Second, additional assistance can be provided to enable farmers to fully comply with the requirements. Lastly, capability building workshops and proper monitoring of farmers can enable them to improve their operations, profitability, and credit-worthiness. These activities can be implemented in coordination with the DA, ACPC, Land Bank, and LGUs, among others. Also, an innovative solution can be through the use of crowdfunding platforms, such as *Cropital* and *AGRI* (Accelerated Growth and Rural Inclusion). Through these, farmers can be connected to interested investors and donors who would want to finance and support them in their production.

Implement farmer profiling and geo-tagging to support crop programming. One of the initiatives of the private sector is the farmer profiling and geo-tagging of the Grameen Foundation. In this program, basic information were gathered from the farmers, and their farms were geo-tagged in order to provide them with an early warning system that informs them when there is an incoming calamity and also sends them bi-monthly text messages on GAP to improve their productivity. This system can address two problems, namely, the farmer profile can serve as supplementary documentation for credit scoring of rural banks, and the geo-tagging of farms can serve as a monitoring tool to trace the sources of crop

production. These can be used for the documentation of the volume of crops produced and incorporated with the trading data from the trading posts to implement an effective crop programming calendar for the farmers.

6.7.2. Research, development, and extension

Provision of technology and expertise for R&D. To address the issues in the lack of research, development, and extension, support can be given through provision of agriculture processing experts and capacity-building of local researchers through training and workshops and provision of needed technology and facilities. Additional dispatch of intensive agricultural immersion and extension manpower in production areas can also be supported to ensure that farmers are trained and monitored in their farm operations.

Integration of R&D. There must be a link between the agriculture industry players (e.g. farmers and farmer organizations) and the SUCs and government agency researchers such that the industry players will define the research thrusts based on the current needs and issues. Additional support can be given through the dispatch of agriculture experts in supplementing the R&D initiatives.

The College of Agriculture and Food Science of the UPLB can spearhead the research in the field of food processing with the regional universities taking care of the research agenda for crops that are grown in their respective areas or regions. These research initiatives can then be supported through the provision of needed facilities and technology or through the dispatch of related experts.

6.7.3. Financing and insurance

Increase financial access and awareness. Another application of the farmer profiling and geo-tagging is providing supporting data as documentation for the credit scoring of farmers. Also, through the text messages, farmers can have increased awareness on the financial assistance available to them. These will be implemented concurrently with increased educational programs and promotions to raise the financial awareness and knowledge of farmers.

6.7.4. Industry associations

Strengthen partnerships with industry associations. In coordination with the DA, DTI, and related private sector entities, promotional activities can be conducted to support partnership with agricultural technology generators and suppliers. Partnerships with farmer organizations can also be facilitated to increase access to quality production inputs and technology.

6.7.5. Food logistics services

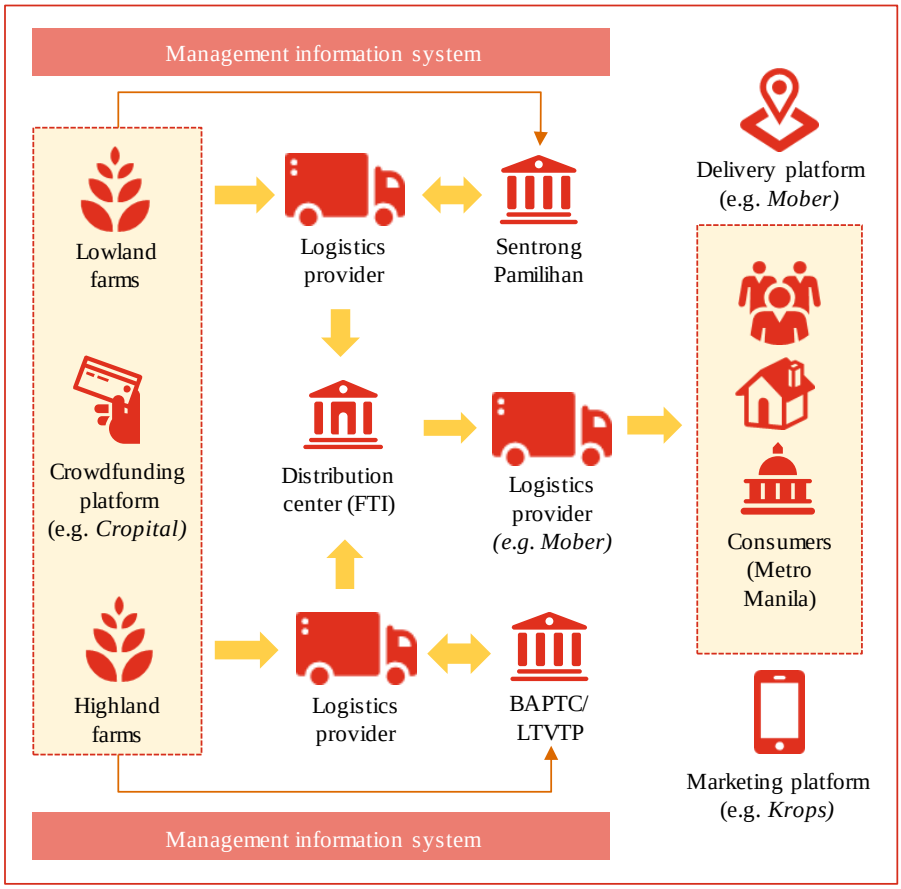
Develop partnerships with logistics services. Assistance can be given to small-scale farmers to enable them to have improved access to logistics services such as reefer vans and cold storage. Partnerships with logistics services can be strengthened so as to increase the efficiency of the vegetable value chain.

Chapter 7. Comprehensive recommendations for the vegetable value chain

7.1. Vertically integrated vegetable value chain

In order to comprehensively address the various issues in the vegetable value chain such that farmers' income is improved and consumers have greater access to fresh and reasonably priced vegetables, there is a need to effectively connect the farmers to the target consumers and set up an efficient value chain.

The integrated vegetable value chain illustrated below highlights the key players and platforms that can be utilized to facilitate the vegetable value chain. Trading posts (e.g. Sentrong Pamilihan, BAPTC, LTVTP) will be enhanced as consolidation centers of produce from highland and lowland production areas. In addition, the FTI can be developed as a common distribution center to improve efficient delivery to consumers in Metro Manila. This will be supported by partnerships with innovative platforms such as *Krops*, *Mober*, *AGRI*, and *Cropital*. *Krops* or other similar online market platforms, facilitates direct access to buyers. *Mober* or other similar transport applications, aids in the direct delivery to the target market. The Accelerated Growth and Rural Inclusion (*AGRI)* is an end-to-end farm to market digital agricultural value chain platform which also includes digital financial and logistics services. On the other hand, *Cropital* or other crowdfunding initiatives, can provide farmers with an alternative source of financing.



Source: PwC analysis

Figure 7.1.1 Overview of the integrated vegetable value chain

The key activities needed to implement the integrated vegetable value chain are the following:

7.1.1. Strengthen farmer organizations

The farmer organization could either be a cooperative, federation of cooperatives, or an association with legal personality. Proper training and support must be given to these farmer organizations to enable them to cater to the market needs. These include comprehensive agri-entrepreneurship trainings and the

provision of needed support and assistance. The former will educate farmers on improved farm management skills and agricultural practices and the latter will enable them to apply what they have learned through the provision of quality inputs and production technology. These farmer organizations can partner with agricultural input providers and technology suppliers for support in production and consolidated procurement for economies of scale.

7.1.2. Establish contract supply agreements with targeted buyers

With the assistance of DA and DTI, farmer organizations will be connected to targeted buyers through contract supply agreements that include the type, volume, and price of vegetables as well as the delivery schedules and extension of embedded business development services. The pricing and margin should be negotiated based on the production cost incurred by the farmers. This allows farmers to have a stable market and a set price for their produce so that they can properly plan their production. This ensures the equitable distribution of income along the value chain.

7.1.3. Support marketing through effective consolidation and distribution centers

In order to facilitate the efficient delivery of the produce, there is a need to establish consolidation centers in the production areas and a distribution center near the major markets. In the highland, BAPTC can be utilized, while in the lowland, the Sentrong Pamilihan can be enhanced as a central consolidation, packing, and storage center for the produce. The distribution center is a facility that is used for receipt, temporary storage, and redistribution of goods according to the customer orders as they are received. This can be established by developing the FTI at Taguig City, in coordination with the DA. This will incorporate cross-docking, sorting, grading, bulk-breaking, packing, and storing to improve the efficiency of delivery to consumers and support direct market linkage with consumers in Metro Manila.

7.1.4. Establish a management information system in the consolidation centers

This MIS will connect buyers and other key players of the value chain such as farmer producers and logistics transport service providers for direct access and coordination. With this type of MIS, the distribution centre will have the capability to deliver both retail packs and wholesale packs on a timely basis.

7.1.5. Employ online platforms for direct access to consumers

Direct marketing platforms such as business-to-business and business-to-consumer should be incorporated to support the direct access to the market. This can be established through partnership with ***Krops*** (or other similar platforms), which is a mobile application enabling buyers and sellers to make transactions through its platform. Instant access to the app helps users to search for livestock, vegetables, fruits, rice and other agricultural products. It also serves as venue for the marketing of the produce to reach a wider range of consumers through the internet and online advertising.

An online delivery service platform can also be utilized for the efficient delivery of produce. An example of this is ***Mober***, which is a Filipino startup cargo-sharing mobile application that allows users to book the nearest available cargo vans and trucks and lets them track the status of the delivery.

On the other hand, the use of crowdfunding can also be an innovative way of connecting farmers to consumers. This is illustrated by ***Cropital*** which enables interested investors to choose a farm to fund and gain profit once the produce has been harvested and sold. This provides dual support by raising awareness on the plight of farmers and at the same time, empowering them through the provision of financing support. Additionally, the ***AGRI*** platform of FINTQnologies Corp. provides small farmers better access to affordable financing while connecting producers to consumers. This supports farmers through digital financial services via the “Lendr” platform, digital commerce, and cost-effective logistics infrastructure management.

Appendix

i. Highland production volume

Table i.i Volume of production for cabbage by region in metric tons

Region	2014	2015	2016	2017	2018
PHILIPPINES Total	*127,986.5*	*125,752.4*	*123,080.0*	*122,474.1*	*120,655.7*
CAR	99,520.1	97,306.8	94,727.8	94,233.0	93,032.5
Ilocos Region	3,215.1	3,257.1	3,265.2	3,300.3	3,125.9
Cagayan Valley	1,188.7	1,537.2	1,611.7	1,665.2	1,476.5
Central Luzon	-	-	0.1	0.1	0.1
CALABARZON	828.3	760.5	696.0	615.9	488.3
MIMAROPA	29.7	32.6	32.9	33.0	26.8
Bicol Region	186.8	112.4	113.6	111.9	106.7
Western Visayas	440.7	484.0	449.6	487.0	528.0
Central Visayas	8,687.9	8,500.2	8,641.9	8,340.5	8,111.2
Eastern Visayas	132.8	138.1	136.9	116.5	79.0
Zamboanga Peninsula	773.0	792.7	821.1	789.8	774.3
Northern Mindanao	6,709.7	6,672.4	6,523.7	6,806.6	6,958.9
Davao Region	4,246.7	4,265.9	4,210.2	4,253.1	4,386.8
SOCCSKSARGEN	1,563.7	1,430.4	1,384.9	1,292.4	1,252.7
Caraga	3.8	3.0	2.8	3.1	3.7
ARMM	459.7	459.2	461.8	425.7	304.3
Luzon Production (%)	**82.0%**	**81.9%**	**81.6%**	**81.6%**	**81.4%**

Source: Philippine Statistics Authority

Table i.ii Volume of production for carrot by region in metric tons

Region	2014	2015	2016	2017	2018
PHILIPPINES Total	*68,342.1*	*67,037.0*	*65,986.9*	*65,219.4*	*64,895.7*
CAR	60,507.3	59,526.8	58,695.0	58,319.4	57,779.4
Ilocos Region	1.2	0.3	-	-	-
Cagayan Valley	584.6	594.9	575.2	596.7	618.7
Central Luzon	-	-	0.1	0.1	0.1
CALABARZON	33.3	31.1	30.3	24.7	23.1
MIMAROPA	3.0	2.5	2.4	2.4	2.4
Bicol Region	22.0	22.3	18.0	16.6	13.3
Western Visayas	143.7	139.5	150.1	149.2	157.7
Central Visayas	3,632.3	3,351.4	3,211.9	2,766.2	2,885.5
Eastern Visayas	11.9	11.9	11.9	4.0	1.6
Zamboanga Peninsula	314.9	309.8	313.3	309.2	310.4
Northern Mindanao	1,263.8	1,231.8	1,226.5	1,246.9	1,258.7
Davao Region	1,308.8	1,279.5	1,240.8	1,261.9	1,323.4
SOCCSKSARGEN	514.1	535.2	511.5	522.2	520.9
Caraga	1.3	-	-	-	0.7
ARMM	-	-	-	-	-
Luzon Production (%)	**89.5%**	**89.8%**	**89.9%**	**90.4%**	**90.0%**

Source: Philippine Statistics Authority

Table i.iii Volume of production for white/irish potato by region in metric tons

Region	2014	2015	2016	2017	2018
PHILIPPINES Total	*119,140.0*	*118,479.3*	*116,783.5*	*117,637.3*	*117,422.5*
CAR	102,255.2	101,828.5	99,980.9	100,422.7	99,200.8
Ilocos Region	-	-	-	-	-
Cagayan Valley	448.3	419.9	459.6	466.2	468.8
Central Luzon	-	-	-	-	-
CALABARZON	-	-	-	-	-
MIMAROPA	-	-	-	-	-
Bicol Region	-	-	-	-	-
Western Visayas	-	-	-	-	-
Central Visayas	7.2	3.7	5.4	0.7	1.2
Eastern Visayas	-	-	-	-	-
Zamboanga Peninsula	-	-	-	-	-
Northern Mindanao	6,145.0	5,810.0	5,879.2	6,034.2	6,142.1
Davao Region	9,633.8	9,801.2	9,846.2	10,044.0	10,926.5
SOCCSKSARGEN	650.6	616.1	612.2	669.6	683.0
Caraga	-	-	-	-	-
ARMM	-	-	-	-	-
Luzon Production (%)	**86.2%**	**86.3%**	**86.0%**	**85.8%**	**84.9%**

Source: Philippine Statistics Authority

ii. Lowland production volume

Table ii.i Volume of production for eggplant by region in metric tons

Region	2014	2015	2016	2017	2018
PHILIPPINES Total	*225,578.7*	*232,864.5*	*235,626.2*	*241,900.9*	*244,838.3*
CAR	956.7	974.7	946.3	992.7	963.7
Ilocos Region	79,399.6	81,941.5	87,222.1	90,078.2	93,192.8
Cagayan Valley	19,722.5	20,842.4	18,366.7	20,277.8	18,764.7
Central Luzon	20,917.9	23,774.4	23,447.3	26,375.6	26,988.1
CALABARZON	36,872.1	38,332.0	36,688.3	33,081.4	32,689.9
MIMAROPA	3,767.9	4,022.8	4,191.0	5,475.1	5,564.5
Bicol Region	7,114.6	6,746.3	6,636.1	6,885.0	6,819.9
Western Visayas	17,021.7	16,986.8	17,730.6	17,136.7	17,793.7
Central Visayas	9,550.6	9,445.3	9,203.1	9,869.4	9,162.2
Eastern Visayas	2,006.8	2,117.2	2,030.4	2,014.0	2,021.7
Zamboanga Peninsula	4,491.9	4,587.9	4,536.2	4,581.5	4,694.6
Northern Mindanao	4,778.8	4,701.9	4,763.3	4,965.4	5,193.4
Davao Region	7,059.3	7,014.2	6,522.8	6,515.7	6,698.5
SOCCSKSARGEN	7,308.2	6,734.2	6,669.4	6,994.5	6,847.9
Caraga	3,945.6	3,970.2	5,984.6	5,946.5	6,685.1
ARMM	664.4	672.8	688.1	711.6	757.8
Luzon Production (%)	**74.8%**	**75.9%**	**75.3%**	**75.7%**	**75.6%**

Source: Philippine Statistics Authority

Table ii.ii Volume of production for tomato by region in metric tons

Region	2014	2015	2016	2017	2018
PHILIPPINES Total	*214,572.9*	*214,774.0*	*210,719.5*	*218,793.1*	*220,824.7*
CAR	3,984.0	3,911.5	3,724.5	3,656.8	3,283.3
Ilocos Region	72,510.9	72,484.2	68,760.7	72,375.6	72,130.3
Cagayan Valley	9,903.3	10,389.2	10,713.1	10,895.1	11,056.0
Central Luzon	23,831.7	24,040.2	25,288.3	27,738.8	27,941.8
CALABARZON	19,299.3	19,670.1	17,774.5	16,958.9	17,323.3
MIMAROPA	1,797.9	1,951.3	2,049.8	2,867.4	2,947.7
Bicol Region	3,372.0	3,665.3	3,890.9	3,718.3	3,703.5
Western Visayas	9,733.9	10,462.4	10,807.4	11,515.9	12,341.2
Central Visayas	6,027.4	5,768.0	4,868.7	5,099.3	5,365.0
Eastern Visayas	596.2	618.1	617.1	575.5	569.0
Zamboanga Peninsula	5,761.4	5,895.6	5,927.8	5,874.3	6,006.4
Northern Mindanao	47,922.9	45,999.7	46,213.2	47,395.4	47,991.0
Davao Region	4,030.8	4,090.6	3,935.3	4,043.3	4,087.5
SOCCSKSARGEN	5,139.1	5,173.5	5,303.1	5,161.3	5,151.9
Caraga	248.2	241.4	433.0	500.9	492.7
ARMM	413.8	412.7	412.2	416.3	433.9
Luzon Production (%)	**62.8%**	**63.4%**	**62.7%**	**63.2%**	**62.7%**

Source: Philippine Statistics Authority

Table ii.iii Volume of production for onion (matured bulb) by region in metric tons

Region	2014	2015	2016	2017	2018
PHILIPPINES Total	*203,651.4*	*181,207.8*	*122,594.0*	*184,427.0*	*172,666.0*
CAR	-	-	-	-	-
Ilocos Region	39,727.4	40,048.3	38,471.6	40,292.2	38,319.9
Cagayan Valley	7,628.2	7,018.8	7,837.8	8,663.9	8,854.2
Central Luzon	142,344.0	115,907.5	61,075.4	115,553.4	106,254.9
CALABARZON	372.5	298.1	214.8	170.8	155.9
MIMAROPA	13,333.9	17,579.3	14,664.6	19,405.3	18,701.5
Bicol Region	-	-	-	-	-
Western Visayas	170.1	296.7	278.0	307.0	359.6
Central Visayas	16.7	3.6	6.1	4.8	3.6
Eastern Visayas	-	-	-	-	-
Zamboanga Peninsula	1.7	1.6	1.4	1.1	-
Northern Mindanao	-	-	-	-	-
Davao Region	-	-	-	-	-
SOCCSKSARGEN	56.8	52.7	44.4	27.9	16.4
Caraga	-	1.2	-	0.6	-
ARMM	-	-	-	-	-
Luzon Production (%)	**99.9%**	**99.8%**	**99.7%**	**99.8%**	**99.8%**

Source: Philippine Statistics Authority

REPUBLIC OF THE PHILIPPINES

ANNEX

Survey on Issue Analysis of Food Value Chain in the Philippines

August 2019

PwC Philippines

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i. Concept note – Integrated highland vegetable value chain

Project title: Comprehensive Highland Vegetable Value Chain (HVVC) Improvement Project in Benguet

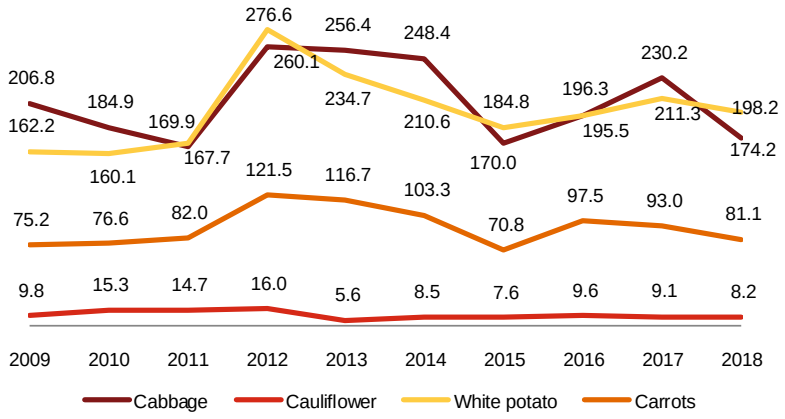
Subject: Agricultural Development

Term of Cooperation: 5 years

Project Site: Benguet

Implementing Agencies:
Department of Agriculture - Agribusiness and Marketing Assistance Service (DA-AMAS)
Department of Agriculture - High Value Crops and Agricultural Credit Program (HVC-ACP)
Department of Agriculture - Philippine Crop Insurance Corporation (PCIC)
Department of Trade and Industry (DTI)
Department of Science and Technology (DOST)
Department of Health - National Nutrition Council (NNC)

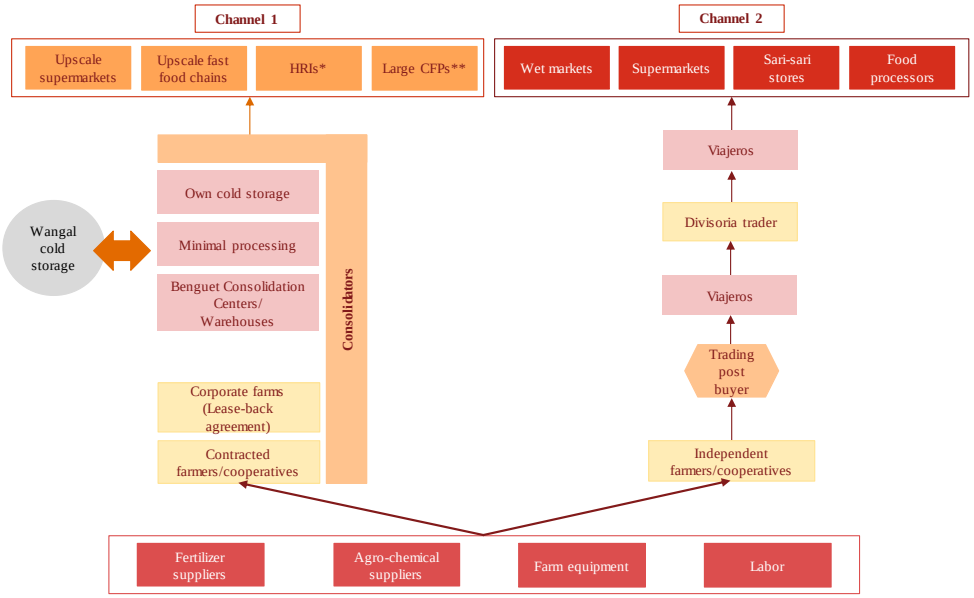
Background
In 2016, the Cordillera Administrative Region (CAR) contributed the biggest share in the production of cabbage, carrot, and potato at 82.9 percent or 253,404 metric tons. Among the provinces of CAR, Benguet is the largest production site. It has the widest farming area for these three crops and has a temperate weather suitable for the production of highland vegetable crops.



Source: Office of the Provincial Agriculturist, Benguet

Figure i.i Annual production volume of target highland crops in Benguet in thousand metric tons

In Benguet, there is a decreasing trend in the production of certain crops. This may be attributed to the decrease in area planted and harvested over the same period, which may be due to the variability of profit in the agriculture industry. The younger generation are less inclined to do farming due to other job opportunities offered. Other factors include vulnerability towards extreme weather events (drought and typhoons), pest and disease infestations, and poor adoption of high-yielding varieties by farmers.
The highland vegetable value chain is illustrated by the Benguet vegetable value chain which has two marketing channels, one for the corporate vegetables consolidators and the other for the layers of traders and consolidators for wet markets, low end supermarkets and low end restaurants.



Hotel, Restaurant, and Institutional buyers
**Commercial Food Processors*

Source: Costales, 2018

Figure i.ii Marketing channels of the Benguet highland vegetables

The first marketing channel consists of Dizon Farm, Diamond Star, UBM Corporation, Farmville Agriculture Service Team, and Happy Vegies Fruits and Vegetables supplier, among others.

The other marketing channel consists of traders and consolidators who supply to open markets such as the wet markets of Divisoria and Balintawak in Metro Manila and other neighboring urban markets such as those in CALABARZON (Region IV-A) and Central Luzon (Region III) regions. In the Balintawak and Divisoria market, major sources of highland vegetables were Baguio and Nueva Vizcaya in Cagayan Valley Region. Incoming viajeros/assembler-wholesalers procured agricultural commodities from farmers, trading centers, and other assembler-wholesalers, and sold them to wholesalers in the mentioned markets. These wholesale prices vary according to source and volume procured. In the Balintawak market, cabbage price from viajero is at Php40, but it can double at Php80 for wholesale. The same occurs for carrots at Php35 in the trading center and reaching Php70 for the wholesale price.The supply of highland vegetables plays an important role not only in supporting food security but also in generating employment, improving the income of farmers and contributing to the economic development of the province. More than 60,000 farmers depend on vegetable farming for their income in Benguet and thousands more depend on the subsector for direct and indirect employment.

The subsector faces several challenges that constrain the performance of its VC and retards its growth. These include inadequate productivity, relatively high postharvest (PH) losses, fluctuating prices, many layers in the VC, limited access to planting materials, and inadequate infrastructure. Small scale farmers lack assistance in improving productivity and profitability. There is a need therefore, for interventions to address these constraints. To improve the value chain of highland vegetables, Benguet is a must in terms of production volume and potential impacts on neighboring areas. The distance from Metro Manila and number of intermediaries in the value chain result to higher losses and costs incurred within each node. The impact of Benguet farming improvement is significantly beneficial to the Philippine vegetable industry.

Purpose (Overall Goal/Project Purpose)
Overall goal: To enhance the HVVC in Benguet for the benefit of the consumers and all key players of each node
Project purpose: For the HVVC to respond adequately to the requirements of the market
Objectives:

1. To enhance the performance of Benguet's HVVC to adequately respond to the requirements of the market in general and consumers in particular
2. To develop farmers' organizations (i.e. coops and associations) as production clusters capable of producing the right volume, quality and competitively priced vegetables
3. To develop a vertically integrated farmer organization value chain
4. To use available technological platforms to provide logistics support and direct linkage between the farmers and the market

Output:
The outputs of the project will be:

1. **Output 1**: *Support food security and access to fresh, safe and affordable vegetables by consumers.*
    a. Increase access to fresh and safe highland vegetables at a reasonable price through a vertically integrated farmer organization value chain
    b. Enhance Benguet Agri-Pinoy Trading Center (BAPTC) to comply with food safety requirements and given supporting marketing and processing facilities.
    c. Link trading posts in the consolidation and supply of fresh and processed lowland vegetables (LLVs).
    d. Develop the Food Terminal Inc. (FTI) complex in Taguig as a distribution center for vertically integrated farmer organizations to be able to sell their produce directly to targeted market segments in Metro Manila
2. **Output 2**: *Improve productivity and increase the income of farmers in Benguet*
    a. Organize farmers into production clusters and incorporate into a vertically integrated vegetable value chain.
    b. Strengthen farmer organizations through agro-entrepreneurship trainings and vertical integration to directly market to buyers.
    c. Technical skills of farmers and postharvest processing workers will be enhanced resulting in improved postharvest handling and packaging of produce.
    d. Quality and productivity will be improved through better access to key inputs, adoption of productivity enhancing technologies, and improved postharvest practices and technology.
3. **Output 3**: *Equitable distribution of income along the value chain.*
    a. Establish a management information system in BAPTC for supply-demand coordination, market and production information dissemination, and technical advisory diffusion
    b. Connect the farmer organizations to the buyers through online marketing platforms (e.g. Krops) and support these platforms through partnerships with logistics providers (e.g. Mober) for efficient delivery of the produce.
    c. Develop a vertically integrated agribusiness value chain to access direct buyers and facilitate transactions

Project Activities: Develop vertically integrated farmers' organization VC

1. **Marketing**
   a. **Current issues**

There are two major market failures in the vegetable value chain: (1) lack of direct market access, and (2) inefficiency. Farmers are heavily dependent on traders, wholesaler-retailers, and other intermediaries to sell their produce to consumers. The value chain inefficiency occurs when the produce pass from one middleman to another, resulting to additional costs and losses before reaching the consumers. These intermediaries dictate the vegetable prices and the lack of access to market and information put the farmers at a disadvantage when dealing with traders. The lack of a stable market and limited access to market information along the value chain results to fluctuation in supply and demand which drive price variability. Given that farmers incur increasing costs of production, the variability of prices directly affects the profitability of farmers.

   b. **Potential activities**

The market failures can be addressed by increasing direct access to markets through the integration of farmers into a vertically integrated value chain through the following activities:

i. Establish contract supply agreement with targeted buyers
With the assistance of DA-AMAS and DTI, farmer organizations will be connected with targeted buyers through contract supply agreements that include the type, volume, and price of vegetables as well as the delivery schedules and extension of embedded business development services (BDS). The pricing and margin should be negotiated based on the production cost provided by the farmers.

ii. Support marketing through effective consolidation and distribution centers
In Benguet, BAPTC can be utilized and enhanced as a central consolidation, packing, and storage center. A distribution center can also be established by developing the Food Terminal Inc. (FTI) at Taguig City, in coordination with DA. This will incorporate cross-docking, sorting, grading, packing, and storing to improve the efficiency of delivery to consumers and will support direct market linkage with consumers in Metro Manila.

iii. Establish a management information system in BAPTC
This management information system will connect buyers and other key players of the value chain such as farmer producers and logistics transport service providers for direct access and coordination.

iv. Utilize online platforms for direct access to consumers
Incorporate direct marketing platforms such as business-to-business (B2B) and business-to-consumer (B2C) to increase access to the market. This can be established through partnership with ***Krops*** (or other similar platforms), which is a mobile application enabling buyers and sellers to make transactions through its platform. Instant access to the app helps users to search for livestock, vegetables, fruits, rice and other agricultural products.

2. **Processing**
    a. **Current issues**

In the country, one of the major root vegetable processed is potato. However, most of the potato used for processing is imported because of the inability of growers to supply the requirements of fast-food chains and other institutional buyers.

In 2017, the country imported 121,652 metric tons of pre-processed fries, which is equivalent to 243,304 metric tons of fresh potatoes. This demand is an opportunity for potato stakeholders to gain access to a stable market. But additional support is needed for local farmers to meet this demand.

Currently, there may be small scale potato processing but most of the processing for institutional buyers are done by private companies. The processing of highland vegetables is not prioritized even though it is a value-adding activity that increases the income of farmers and provides an alternative use for excess harvest and rejects. Consequently, there is a lack of vegetable processing research and development, technology, and facilities for highland vegetables. Other than the technological developments, there is also a need for a good marketing business plan for the processed goods to be profitable.

    b. **Potential activities**

To address the demand for processing potato variety, partnerships with seed companies (e.g. East West Seed), academic research institutions (e.g. Benguet State University), DA, DOST, and farmer organizations can be implemented for the research, development, and propagation of improved potato varieties.
Superior potato varieties can be developed and distributed, farmers can be trained to produce potato for processing, and partnership with the target market can be strengthened.

Similarly, development of highland vegetable processing can be addressed through collaboration with DOST and academic research institutions for research and development, DTI for market linkage and support, and DA for partnership with farmer organizations. These developments are to provide an alternative use for excess production and rejects in the market. For this, the BAPTC can be enhanced as a processing center and given marketing support to sustain the profitability of the processed products.

3. **Trading post**
    a. **Current issues**

One of the major issues is that BAPTC is not fully operational. It only operates at about 20% of its designed capacity. Cold storage rooms are not working and the trading bays are not equipped for sorting and grading the vegetables which is the original design of the facility. In fact, while La Trinidad Trading Post has long lines of vegetable trucks waiting to unload or pick up their produce, BAPTC has spaces to be utilized for the trade.

    b. **Potential activities**

One of the potential interventions is to enhance and utilize the BAPTC as the consolidation center for highland vegetables. The existing cold storage facilities can be enhanced to provide a space for farmers and farmer organizations to store their vegetables, while the trading bays and areas can be enhanced to provide farmers with additional space for grading, sorting, and operations. In support, the Benguet cold storage facility can be incorporated to provide the cold chain services and improved through the installation of preservation

technology such as the individually quick-frozen (IQF) facilities. This is in partnership with the DA and the Benguet LGU.

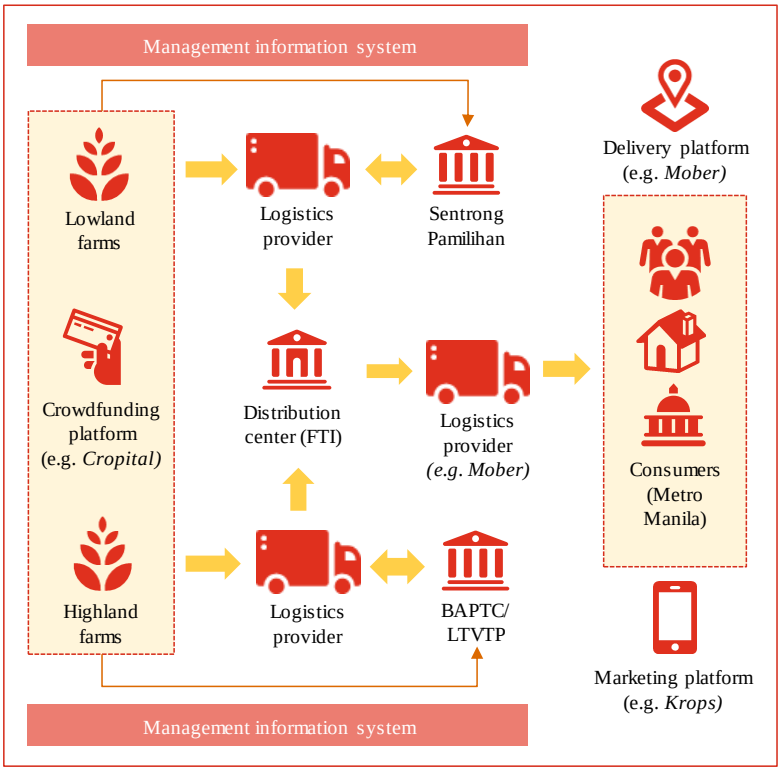
4. Logistics

a. Current issues

One of the major issues exists in transporting vegetables from farms to trading post. The elevated areas and poor farm-to-market access roads prevent some farms from bringing their produce to their destinations. Farmers sometimes have to manually carry to collection center, because of lack of tramline or proper equipment. This entails additional cost to the farmer as well as longer time in bringing the produce to the market. In addition, inappropriate transport and handling leads to unnecessarily high postharvest losses and higher risk of contamination.

b. Potential activities

One of the potential interventions is to develop, improve and commercialize the tramline to improve vegetable transport in areas that are not accessible by road. Sloping farmlands in Benguet are to be developed through installation of mechanized transport facilities such as tramline. This is in collaboration with PhilMech regarding the site selection. To support the efficient delivery of produce to consumers, there is a need to develop, operate, and manage a distribution center in partnership with the Food Terminal Inc. (FTI) at Taguig City. This distribution center will offer cross-docking, sorting, grading, packing, and storage to increase the efficiency of delivery to targeted buyers. When farmers are able to consolidate their produce, they can share the costs among themselves and partner with online delivery platforms to arrange discounted costs. An example would be partnership with ***Mober***, a Filipino startup cargo-sharing mobile application that allows users to book the nearest available cargo vans and trucks and lets them track the status of the delivery.



Source: PwC analysis

Figure i. iii Marketing channels of the Benguet highland vegetables

The integrated vegetable value chain highlights the key players and platforms that can be utilized to facilitate the vegetable value chain. Trading posts (e.g. Sentrong Pamilihan, BAPTC) will be enhanced as consolidation centers of produce from highland and lowland production areas. FTI will be developed as a common distribution center to improve efficient delivery to consumers in Metro Manila. Partnership with ***Krops*** and ***Mober*** will strengthen market access, with the former providing consumers with direct access to farmers and the latter providing delivery services. On the other hand, crowdsourcing platforms like ***Cropital*** can help supplement financing for farmers.

5. **Farmers' cooperatives**
    a. **Current issues**

    Aside from market failures, farmers face nonmarket challenges such as organizational and production management failures. Although there are farmer organizations (e.g. cooperatives and associations), they fail to provide full benefits to their farmer members. This situation is found in Buguias, one of the major highland vegetable producing municipality of Benguet. Since it is at far from trading posts and farmers have relatively small land areas, farmers lack economies of scale and have difficulty in marketing their produce. This leads farmers to depend on traders for financing and marketing of their produce. Farmers also subscribe to improper traditional practices in the production, transport, and handling of produce, causing significant mechanical damage and food loss. In this, there is significant potential for productivity and postharvest transport and handling improvement.

    b. **Potential activities**

    Strengthening the vegetable farmer organizations is a key intervention as it addresses crucial needs of the farmers. These organizations can implement pooled procurement of superior production inputs and buy farm tools and equipment at a competitive rate for lease to farmers. Access to agricultural financing and assistance can be improved through the coordination of these established farmer organizations with government agencies and development grant organizations. With the partnership of DA, DTI, private entities (e.g. East-West Seed, Jollibee Group Foundation), and farmer organizations, farmers can access capacity building programs in production, postharvest handling, and processing, as well as a stable market to sell their produce. Through these cooperatives, the farmers can improve their bargaining power.

6. **Consumer health awareness**
    a. **Current issues**

    In the Philippines, there is a lack of promotion and awareness of vegetable consumption benefits evidenced by the low vegetable consumption of Filipinos. In 2015, the Philippine vegetable consumption per capita comprising of green, leafy and yellow vegetables and other vegetables amounted to 116 grams per day representing 13.8 percent of the total intake. However, as compared to the global vegetable consumption of 208.8 grams per day in 2010 and the World Health Organization (WHO) recommendation of 400 grams per day vegetable and fruit consumption, Filipinos consume significantly lesser vegetables and fruits. This may result to various health complications and risk of disease.

    b. **Potential activities**

    One of the potential interventions is to promote nutrition education through seminars and health awareness campaigns in Metro Manila and neighboring regions. This can help encourage Filipinos to have healthier eating habits. In addition, education programs can be implemented on the importance of

vegetable consumption for young students to promote vegetable consumption among the youth.

Input Summary by Japanese Side

1. **Dispatch of Japanese experts**
    a. Chief Advisor/ Founder of farmer cooperative
    b. Chief Advisor/ Trading post operation
    c. Chief Advisor/ Cold chain and processing facility management
    d. Chief Advisor/ Food nutrition specialist
2. **Training of Filipino counterpart**
    a. Chairman of the association for farmer cooperatives
    b. Specialist in digital marketing platform development from Philippine Government
3. **Provision of equipment and facilities**
    a. Machinery, equipment, and other materials may be provided by JICA for the implementation of the Project within the budgetary limitations

Input Summary by the Philippine Side

1. Services of the counterpart personnel and administrative personnel
2. Suitable office space with necessary equipment

ⅱ.Concept note – Integrated lowland vegetable value chain

Project title: Comprehensive Lowland Vegetable Value Chain (LVVC) Improvement Project in the Quezon Province

Subject: Agricultural Development

Term of Cooperation: 5 years

Project Site: Sariaya, Quezon

Implementing Agencies:
Department of Agriculture - Agribusiness and Marketing Assistance Service (DA-AMAS)
Department of Agriculture - High Value Crops and Agricultural Credit Program (HVC-ACP)
Department of Trade and Industry (DTI)
Philippine Crop Insurance Corporation (PCIC)
Department of Science and Technology (DOST)
Department of Health - National Nutrition Council (NNC)

Background
Quezon lowland value chain overview
The province of Quezon remains as one of the top agricultural producing province of different crops in the CALABARZON region (Region IV-A), comprising of the other provinces of Cavite, Laguna, Batangas, and Rizal. It is a prime area for technical cooperation as it is nearer to Metro Manila and to other cities like San Pablo and Lucena. It also serves as a gateway to cities in Bicol such as Naga and Legazpi. Hence, enhancing the vegetable value chain of Quezon can improve the access of nearby regions to the Metro Manila market as well.

In 2017, the eggplant production of Quezon was at 26,331 metric tons and tomato at 8,150 metric tons. According to the provincial administrator, the Quezon Province's share in the region's rice production is at 42 percent, with corn production at 75 percent, fruits at 26 percent, coconut at 86 percent, and ***vegetables at 62 percent***. This means that the vast farmlands of Quezon are suitable for production of vegetables and other produce. Consequently, strengthening the farmers and farmer organizations, improving yield and quality of harvest, and effectively and efficiently connecting them to have direct market linkage will have a greater impact on the consumers, due to its relative proximity to the Metro Manila market and other cities. Farmers will have a stable market to sell their produce and reduce the problem of overproduction and price variability, while consumers would have improved access to fresh and quality vegetables.

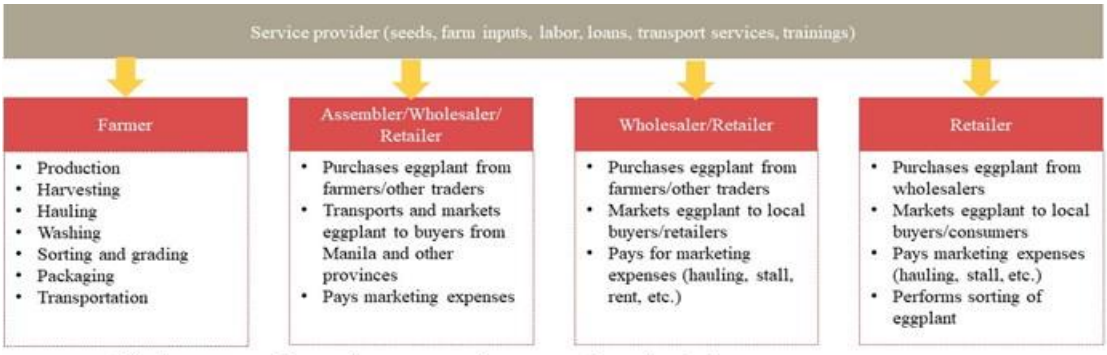
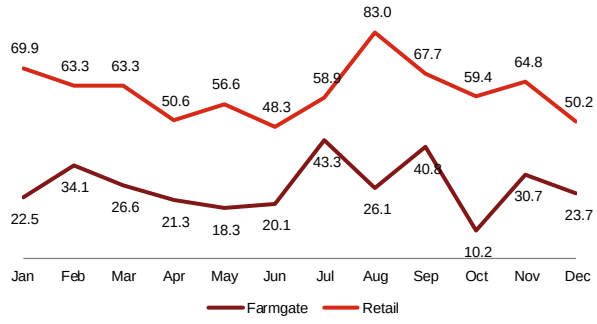


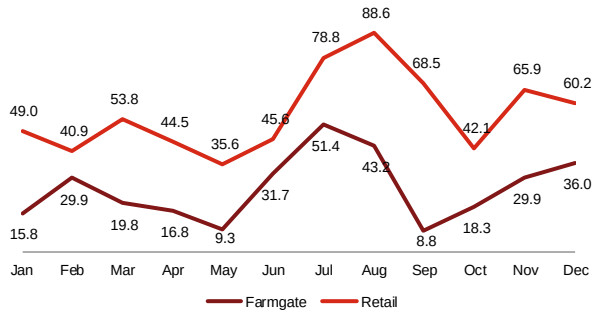
Figure ii.i Players and processes in the eggplant value chain

The market flow of lowland vegetables in Quezon can be shown by the commodity flow of eggplant from the farm to the market. In the Divisoria and Balintawak markets, major sources of lowland vegetables are Central and Southern Luzon regions, specifically from the provinces of Nueva Ecija, Bulacan, Pampanga, Laguna, and Batangas. From the farm, the eggplants are brought by the assembler-wholesaler-retailer or the farmers to the Sentrong Pamilihan ng Panlalawigang Agrikultura ng Quezon Foundation, Inc. (Sentrong Pamilihan) or to the Tanauan City market in Batangas. From here, viajeros or assembler-wholesalers procure agricultural commodities from farmers, trading centers, and other assembler-wholesalers, and sell them to wholesalers in Balintawak and Divisoria Markets. Wholesalers, either stall owners or ambulant vendors, are those who operate in Balintawak and Divisoria Market. They procure the commodities from incoming viajeros or assembler-wholesalers and then sell them to outgoing viajeros or wholesaler-retailers. Retailers in these markets purchase eggplant in Divisoria and sell it to household consumers.



Source: Philippine Statistics Authority

Figure ii.ii Eggplant monthly farmgate and retail prices in Quezon during 2018 in Php per kg



Source: Philippine Statistics Authority

Figure ii.iii Tomato monthly farmgate and retail prices in Quezon during 2018 in Php per kg

These layers of intermediaries add costs and increases postharvest losses, which unnecessarily increases the price to consumers. Studies of postharvest losses of vegetables reveal losses ranging from 20 to 40 percent. In addition, there is a significant gap between farm gate and retail prices, as layers of intermediaries increase the inefficiency of the value chain. In Quezon, farm gate prices for eggplant and tomato went as low as Php10.2 and Php8.8, respectively in 2018. On the other hand, retail prices increased up to Php83.0 and Php88.6, respectively, in the same period. According to the survey conducted in the Balintawak and Divisoria market, fluctuation in price largely depends on the current supply in the market. But generally, farm gate and wholesale prices have an average price difference of about Php2-5 per kilogram and/or Php5-10 per plastic bag. Wholesale prices in the market vary according to source and volume procured. It even fluctuates within the day as a bargaining method for wholesalers to sell their commodities immediately. Due to the lack of a stable market, farmers depend on these traders and wholesalers leading to price fluctuations and wastage.

Purpose (Overall Goal/Project Purpose)

Overall goal: To enhance the LVVC in Quezon for the benefit of the consumers and all key players of each node

Project purpose: For the LVVC structure to respond adequately to the requirements of the market

Objectives:

1. To enhance the vegetable value chain structure to adequately respond to the requirements of the markets in general and consumers in particular
2. To develop and strengthen farmer organizations (i.e. cooperatives and associations) as production clusters capable of producing the right volume , quality and competitively priced vegetables

3. To develop a vertically integrated farmer organization value chain (FOVC) with a common distribution center at Metro Manila both for the highland and the lowland vegetables
4. To use available technological platforms to provide logistics support and direct linkage between the farmers and the market

Output
The outputs of the project will be:

1. **Output 1**: *Support food security and access to fresh, safe and affordable vegetables by consumers.*
    a. Increase access to fresh lowland vegetables
    b. Enhance Sentrong Pamilihan, a trading post in Sariaya, Quezon, to comply with food safety requirements and given supporting marketing and postharvest facilities.
    c. Link trading posts in the consolidation and supply of fresh and processed lowland vegetables (LLVs).
    d. Develop an integrated packing and distribution center at the Food Terminal Inc. (FTI) facility in Taguig City
    e. Establish a management information system for supply-demand coordination, market and production information dissemination, and technical advisory diffusion
    f. Establish partnerships between existing online platforms for logistics (e.g. Mober) and marketing (e.g. Krops) to support farmers in direct market linkage
2. **Output 2**: *Enhance performance of lowland vegetable farmers' value chain and increase the income of farmers in Quezon*
    a. Strengthen farmer organizations through agro-entrepreneurship trainings and vertical integration to directly market to buyers.
    b. Enhance technical skills of farmers and postharvest processing workers to improve postharvest handling and packaging of lowland vegetables.
    c. Improve quality and yield of harvest through introduction of advanced farm mechanization and adoption of productivity enhancing technologies.
3. **Output 3**: *Equitable distribution of income along the value chain.*
    a. Connect farmer organizations to direct consumers to lessen unnecessary cost increases along the value chain
    b. Implement capacity building of Sentrong Pamilihan to improve efficiency of the value chain

Project Activities: Develop vertically integrated farmers' organization VC

1. Marketing

a. Current issues

Due to the seasonality of produce, farmers tend to plant at the same time and the lack of a stable market results to overproduction and significantly lower prices. For the marketing and selling of their produce, farmers depend on traders who dictate the price and quality of produce. These traders sell to wholesaler-retailers, who sell to retailers, and other market players. With these intermediaries, costs and losses are incurred in each node, further increasing the price for the consumers.

b. Potential activities

In order to enhance the lowland vegetable value chain performance, increase farmer income, and distribute profit equitably along the value chain, there is a need to connect farmers to a stable market and implement the needed marketing support to respond to the market demand. This can be done through implementing contract supply agreements with targeted buyers, with the assistance of DA-AMAS and DTI. These contracts include not only the type, volume and price of vegetables but also set the delivery schedules, extend

embedded business development services (BDS), and conduct organization and human resource capability building through trainings and exposures. In addition, installation of a management information system (MIS) that connects the farmers with buyers and other key players of the value chain such as farmer producers and logistics transport service providers will provide an avenue for direct access and coordination. Direct marketing platforms such as business-to-business (B2B) and business-to-consumer (B2C), will augment the value chain. This can be established through partnership with ***Krops*** (or other similar online/mobile platforms), which is a mobile application enabling buyers and sellers to make transactions through its platform. Instant access to the app helps users to search for livestock, vegetables, fruits, rice and other agricultural products.

2. Processing

a. Current issues

In Sentrong Pamilihan, a squash canton noodles processing facility was given as an avenue for providing additional income to the farmers. However, this technology was not as competitive as the commercially-produced noodles and there was difficulty in marketing the products. Some farmers process tomato into tomato jam, but this is not developed and there is limited processing implemented. In summary, there is a lack of technology and research and development on postharvest processing of lowland vegetables. In addition to the technology, there is also a need for a good marketing business plan for the processed goods to be profitable.

b. Potential activities

In order to strengthen processing and product development, research and development (R&D) and commercialization can be implemented through coordination with DOST, DTI, and academic research institutions. In addition, the FTI facility as a distribution center can be improved for processing to be able to segregate, grade, and pack fresh and partially processed vegetables. This can be done through the provision of individually quick-frozen (IQF) technology facilities to preserve the quality of produce in the market and significantly lengthen shelf life. Also, assistance can be given to the Postharvest Training Center and the Food Science and Technology department of the University of the Philippines – Los Baños in conducting feasibility studies on vegetable processing and marketing. Market linkage and support can be given in partnership with DTI to supplement the marketing and profitability of the processed goods.

3. Trading post

a. Current issues

Trading posts are important intermediaries in the vegetable value chain. Also known as “Bagsakan,” this acts as the consolidation center of all the produce. In Sentrong Pamilihan, there are existing cold storage facilities utilized by some institutional buyers but farmers are discouraged from storing their produce due to the high storage cost. In addition, there is a lack of facilities and equipment for proper handling and transport of produce.

b. Potential activities

Improvements in the trading post include enhancing the Sentrong Pamilihan facility as the central packing center for lowland vegetables in partnership with DA and the Quezon LGU. The increase in market linkage between farmer organizations and institutional buyers will need the use of cold storage to retain freshness of their produce. These farmer organizations can coordinate and pool together their produce for storage to lessen cost incurred in storage. Additional equipment can also be provided such as forklift for proper handling of produce, conveyor belt, and plastic crates to cater to institutional buyer requirements.

4. Logistics

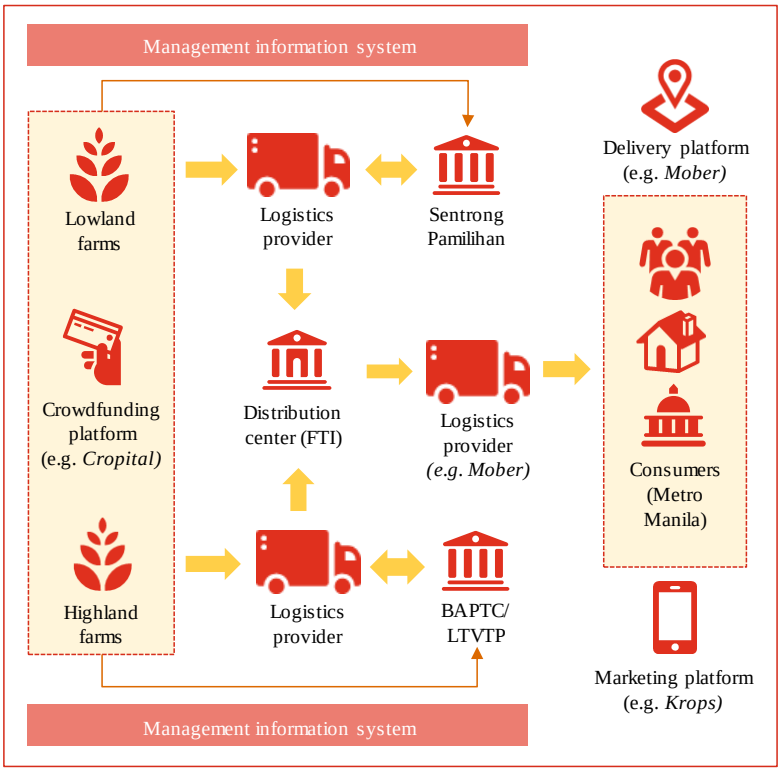
a. Current issues

With the practice of the "buhos system", vegetables are piled bare packed in the truck to maximize transport capacity resulting to quantitative and qualitative losses. Transportation costs can be high unless the farmers work as an organized group to transport the right volume and spread the cost. Farmers also lack access to preservation technology such as cold chain storage and facilities, while the transport vehicles are not subject to cleaning and food safety protocols, increasing the risk for contamination and food loss. Apart from these issues, there is inefficiency and additional costs and losses in the delivery of produce to the consumers due to the distance of the production areas to the market, with postharvest losses reaching up to 40 percent. There is a need to improve the vegetable value chain by reducing the unnecessary intermediaries and reducing the gap between the farmers and the consumers.

b. Potential activities

Farmers, traders, and workers should be trained and monitored in implementing proper postharvest handling, transport, and storage of fresh vegetables. In support, proper cold chain and transport facilities can be provided through refrigerated and bulk type transport trucks and third party logistics service providers with the capacity and number depending on the daily volume transactions and type of vegetables. This may be implemented through partnership with Mober Technology PTE Inc. (or other similar mobile logistics applications), a Filipino startup cargo-sharing mobile application that allows users to book the nearest available cargo vans and trucks and lets them track the status of the delivery through the ***Mober*** application. In addition, guidelines on transport cleanliness and food safety protocols may be converted to food safety standards and be monitored for compliance, in coordination with DA. Lastly, to support the efficient delivery of produce to consumers, there is a need to develop, operate, and manage a distribution center in partnership with the Food Terminal Inc. (FTI) at Taguig City. This distribution center will offer cross-docking, sorting, grading, packing, and storage to increase the efficiency of delivery to targeted buyers.

The integrated vegetable value chain is illustrated below which highlights the key players and platforms that can be utilized to facilitate the vegetable value chain. Trading posts (e.g. Sentrong Pamilihan, BAPTC, LTVTP) will be enhanced as consolidation centers of produce from highland and lowland production areas. In addition, FTI will be developed as a common distribution center to improve efficient delivery to consumers in Metro Manila. In addition, partnership with ***Krops*** and ***Mober*** will strengthen market access, with the former providing consumers with direct access to farmers and the latter providing delivery services. On the other hand, crowdsourcing platforms like ***Cropital*** can help supplement financing for farmers.



Source: PwC analysis

Figure ii.iv Overview of the integrated vegetable value chain

5. Farmer cooperatives

a. Current issues

In Quezon, vegetable farmers have weak farmer organizations which are created more for policy advocacy and accessing grants from the government and other development organizations. Moreover, since farmers buy agricultural inputs individually and lack economies of scale, cost of production is increasing. In addition, partnerships with technology generators and suppliers are weak. There is low adoption of mechanization and production technology and farmers have inadequate knowledge on value-adding farm management practices. With regard to financing, there is a lack of access to agricultural credit due to difficulty in complying with bank requirements. In agricultural insurance, the government offers prepaid crop insurance but vegetable farmers are either unaware of the benefits of insurance or have difficulty in complying with the insurance application.

b. Potential activities

Strengthening the vegetable farmer organizations is a key intervention as it addresses crucial needs of the farmers. These organizations can implement pooled procurement of superior production inputs and buy farm tools and equipment at a competitive rate for lease to farmers. Access to agricultural financing and assistance can be improved through the coordination of these established farmer organizations with government agencies and development grant organizations. With the partnership of DA, DTI, private entities (e.g. East-West Seed, Jollibee Group Foundation), and farmer organizations, farmers can access capacity building programs in production, postharvest handling, and processing, as well as a stable market to sell their produce. DA, along with other government agencies, can provide trainings with technology generators and suppliers to produce proper seeds and seedlings and strengthen partnership with farmer cooperatives. In financing, DA can support smaller

farmers in terms of assistance in complying with financing requirements. Lastly, education on the benefits and assistance in availing crop insurance as well as improvement in the crop insurance scheme and the application process can be implemented in coordination with PCIC.

6. Consumer health awareness

a. Current issues

In the Philippines, there is a lack of promotion and awareness of vegetable consumption benefits evidenced by the low vegetable consumption of Filipinos. In 2015, the Philippine vegetable consumption per capita comprising of green, leafy and yellow vegetables and other vegetables amounted to 116 grams per day representing 13.8 percent of the total intake. However, as compared to the global vegetable consumption of 208.8 grams per day in 2010 and the World Health Organization (WHO) recommendation of 400 grams per day vegetable and fruit consumption, Filipinos consume significantly lesser vegetables and fruits. This may result to various health complications and risk of disease.

b. Potential activities

Promote nutrition education through seminars and health awareness campaigns in Metro Manila and neighboring regions, in partnership with DOH-NNC. In addition, implement education programs on the importance of vegetable consumption for young students so as to promote health awareness and nutrition.

Input Summary by Japanese Side

a. Dispatch of Japanese experts

i. Chief Advisor/ Founder of farmer cooperative
ii. Chief Advisor/ Trading post operation
iii. Chief Advisor/ Cold chain and processing facility management
iv. Chief Advisor/ Agricultural financing specialist
v. Chief Advisor/ Food nutrition specialist

b. Training of Filipino counterpart

i. Chairman of the association for farmer cooperatives
ii. Specialist in digital marketing platform development from Philippine Government

c. Provision of equipment and facilities

i. Machinery, equipment, and other materials may be provided by JICA for the implementation of the Project within the budgetary limitations

Input Summary by the Philippine Side

a. Services of the counterpart personnel and administrative personnel
b. Suitable office space with necessary equipment

iii. Additional production data

Table iii.i Volume of production for bittergourd by region in metric tons

In metric tons	2014	2015	2016	2017	2018
PHILIPPINES Total	***90,110.8***	***88,917.5***	***87,459.9***	***89,459.7***	***87,395.2***
CAR	471.3	475.0	442.3	453.8	419.9
Ilocos Region	9,941.7	9,991.8	9,622.4	10,028.6	10,004.8
Cagayan Valley	6,571.8	6,233.8	5,714.1	5,751.5	5,177.7
Central Luzon	25,304.5	25,553.6	25,112.3	25,717.2	24,514.2
CALABARZON	22,315.3	21,272.2	21,322.6	20,878.4	20,229.9
MIMAROPA	1,047.8	1,163.5	1,239.6	1,655.7	1,646.2
Bicol Region	2,746.2	2,695.4	2,798.2	2,900.0	3,002.2
Western Visayas	2,725.8	2,808.7	2,851.4	3,043.4	3,082.9
Central Visayas	4,119.1	3,970.7	3,716.9	3,852.5	3,881.7
Eastern Visayas	1,083.4	1,119.3	1,112.9	1,101.8	1,090.0
Zamboanga Peninsula	5,294.4	5,248.3	5,180.1	5,083.7	5,238.6
Northern Mindanao	2,922.0	2,882.3	2,899.2	3,023.3	3,118.9
Davao Region	2,802.8	2,802.1	2,725.8	2,835.1	2,820.7
SOCCSKSARGEN	1,599.5	1,511.0	1,389.8	1,362.1	1,366.7
Caraga	866.0	885.1	1,026.7	1,461.5	1,471.6
ARMM	299.3	304.7	305.7	311.1	329.1
Luzon Production (%)	**75.9%**	**75.8%**	**75.8%**	**75.3%**	**74.4%**

Source: Philippine Statistics Authority

Table iii.ii Volume of production for broccoli by region in metric tons

In metric tons	2014	2015	2016	2017	2018
PHILIPPINES Total	***3,064.3***	***2,911.1***	***2,859.0***	***3,159.1***	***2,905.6***
CAR	1,984.1	1,890.1	1,820.6	2,077.0	1,790.6
Ilocos Region	-	-	-	-	-
Cagayan Valley	16.1	16.1	16.7	22.2	22.3
Central Luzon	-	-	0.5	0.6	0.5
CALABARZON	6.8	0.5	0.2	-	-
MIMAROPA	-	-	-	-	-
Bicol Region	-	-	-	-	-
Western Visayas	6.8	11.5	10.4	9.2	10.8
Central Visayas	167.1	169.3	168.2	151.0	147.8
Eastern Visayas	-	-	-	-	0.2
Zamboanga Peninsula	-	-	-	-	-
Northern Mindanao	872.0	812.0	827.5	876.7	909.7
Davao Region	9.7	9.7	12.5	18.2	18.1
SOCCSKSARGEN	1.8	1.9	2.5	4.3	5.8
Caraga	-	-	-	-	-
ARMM	-	-	-	-	-
Luzon Production (%)	**65.5%**	**65.5%**	**64.3%**	**66.5%**	**62.4%**

Source: Philippine Statistics Authority

Table iii.iii Volume of production for cauliflower by region in metric tons

In metric tons	2014	2015	2016	2017	2018
PHILIPPINES Total	***11,738.8***	***11,864.8***	***11,641.5***	***12,061.0***	***11,328.3***
CAR	5,144.1	5,178.7	5,045.7	5,432.5	4,866.6
Ilocos Region	4,803.1	4,911.3	4,868.2	4,859.7	4,655.3
Cagayan Valley	236.3	232.4	235.2	242.4	241.6
Central Luzon	24.7	24.0	0.1	0.1	0.1
CALABARZON	13.5	0.5	0.3	-	-
MIMAROPA	3.1	2.7	2.5	2.5	2.5
Bicol Region	-	-	-	-	-
Western Visayas	64.3	87.0	77.6	84.0	92.5
Central Visayas	134.8	127.7	125.2	123.3	121.7
Eastern Visayas	-	-	-	-	0.2
Zamboanga Peninsula	7.0	7.3	7.1	7.1	7.2
Northern Mindanao	1,051.0	1,032.2	1,032.5	1,081.8	1,113.6
Davao Region	90.0	86.2	77.0	74.3	86.6
SOCCSKSARGEN	166.7	174.6	169.8	153.1	140.6
Caraga	0.2	0.2	0.3	0.2	-
ARMM	-	-	-	-	-
Luzon Production (%)	**87.1%**	**87.2%**	**87.2%**	**87.4%**	**86.2%**

Source: Philippine Statistics Authority

Table iii.iv Volume of production for okra by region in metric tons

In metric tons	2014	2015	2016	2017	2018
PHILIPPINES Total	***30,274.2***	***30,638.4***	***30,528.9***	***31,378.6***	***31,277.2***
CAR	49.8	50.0	45.9	48.9	42.8
Ilocos Region	1,738.1	1,763.5	1,816.2	1,914.5	1,925.6
Cagayan Valley	5,181.2	5,220.7	4,970.7	5,253.1	5,039.7
Central Luzon	10,897.9	11,032.8	11,300.2	11,183.5	11,173.0
CALABARZON	1,665.0	1,836.3	1,652.9	1,679.8	1,595.2
MIMAROPA	298.0	326.9	367.6	460.8	474.2
Bicol Region	1,808.7	1,795.8	1,779.4	1,859.2	1,876.1
Western Visayas	1,679.4	1,687.9	1,773.7	1,930.6	2,086.7
Central Visayas	1,658.8	1,571.1	1,489.5	1,585.1	1,500.5
Eastern Visayas	861.6	893.1	888.2	823.7	809.5
Zamboanga Peninsula	792.0	799.5	783.8	793.9	826.1
Northern Mindanao	1,857.9	1,823.3	1,813.4	1,884.5	1,955.4
Davao Region	612.2	611.2	625.4	674.8	682.5
SOCCSKSARGEN	557.8	558.2	569.9	588.6	579.4
Caraga	577.7	628.8	612.7	656.4	662.7
ARMM	38.4	39.3	39.6	41.2	47.8
Luzon Production (%)	**71.5%**	**71.9%**	**71.8%**	**71.4%**	**70.7%**

Source: Philippine Statistics Authority

Table iii.v Volume of production for squash by region in metric tons

In metric tons	2014	2015	2016	2017	2018
PHILIPPINES Total	***222,206.9***	***217,908.1***	***214,146.7***	***206,023.5***	***202,229.1***
CAR	5,891.2	5,830.6	4,759.4	4,842.1	4,699.4
Ilocos Region	17,408.2	16,886.3	16,863.7	17,701.8	17,400.2
Cagayan Valley	34,095.6	32,959.8	33,474.2	31,019.2	29,546.9
Central Luzon	23,805.4	23,546.5	22,908.2	18,028.4	17,493.6
CALABARZON	40,281.5	41,902.0	39,408.9	35,348.4	34,615.0
MIMAROPA	1,880.5	2,004.2	2,254.6	3,032.1	2,985.0
Bicol Region	33,948.7	33,001.8	33,179.3	31,660.8	31,761.6
Western Visayas	14,176.4	13,944.5	14,049.6	14,444.4	14,639.5
Central Visayas	11,518.3	9,020.7	7,654.4	7,597.5	7,481.2
Eastern Visayas	2,019.2	2,052.9	2,035.4	1,992.1	1,934.4
Zamboanga Peninsula	6,676.7	6,500.3	6,337.3	6,078.9	6,090.4
Northern Mindanao	16,414.8	16,219.4	16,120.1	16,498.9	16,775.7
Davao Region	6,464.9	6,508.3	6,490.6	6,517.9	6,521.3
SOCCSKSARGEN	2,846.6	2,793.3	2,743.8	2,987.5	3,029.9
Caraga	3,233.2	3,202.4	4,346.6	6,721.6	5,647.0
ARMM	1,545.6	1,535.2	1,520.5	1,552.2	1,608.0
Luzon Production (%)	**70.8%**	**71.6%**	**71.4%**	**68.7%**	**68.5%**

Source: Philippine Statistics Authority

Table iii.vi Annual production volume of select highland vegetables in metric tons

Crop In metric tons	Location	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Potato	Philippines	121,311	119,159	124,671	120,574	119,570	117,722	119,140	118,479	116,783	117,637
	CAR	103,303	101,061	107,182	103,135	102,434	100,758	102,255	101,828	99,981	100,423
Cabbage	Philippines	128,865	124,712	128,964	125,309	126,381	127,463	127,986	125,752	123,080	122,474
	CAR	102,894	99,155	102,344	98,943	99,362	99,958	99,520	97,307	94,728	94,233
Carrot	Philippines	68,366	68,328	72,109	67,162	68,454	68,111	68,342	67,037	65,987	65,219
	CAR	60,303	59,024	63,353	58,766	60,126	60,038	60,507	59,527	58,695	58,319

Source: Philippine Statistics Authority

Table iii.vii Annual production area of select highland vegetables in hectares

Crop In hectares	Location	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Potato	Philippines	7,994	7,904	8,129	8,171	8,096	7,890	7,868	7,843	7,744	7,793
	CAR	5,932	5,824	6,069	6,116	6,083	5,892	5,885	5,894	5,788	5,820
Cabbage	Philippines	8,596	8,483	8,561	8,550	8,531	8,414	8,310	8,179	8,018	7,912
	CAR	5,536	5,435	5,436	5,444	5,442	5,402	5,316	5,274	5,137	5,117
Carrot	Philippines	5,075	5,080	5,115	4,947	4,923	4,820	4,760	4,673	4,607	4,606
	CAR	3,382	3,373	3,453	3,359	3,356	3,328	3,318	3,277	3,244	3,257

Source: Philippine Statistics Authority

Table iii.viii Annual production volume of select lowland vegetables in metric tons

Crop In metric tons	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Eggplant	199,579	200,942	208,242	207,994	211,885	219,911	225,579	232,864	235,626	241,901
Tomato	195,810	198,948	204,272	203,582	203,593	207,668	214,573	214,774	210,720	218,793
Onion	128,923	127,055	135,377	128,387	124,890	134,239	203,651	181,208	122,594	184,427

Source: Philippine Statistics Authority

Table iii.ix Annual production area of select lowland vegetables in hectares

Crop In hectares	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Eggplant	21,299	21,170	21,423	21,377	21,485	21,239	21,159	21,008	21,038	21,446
Tomato	17,646	17,656	17,663	17,556	17,345	17,231	16,742	16,165	16,197	16,491
Onion	14,579	14,526	15,169	14,641	15,012	15,437	15,844	14,861	12,988	18,259

Source: Philippine Statistics Authority

Table iii.x Annual production data of select highland vegetables in Benguet

Cabbage										
Area planted (in ha)	8,559.4	8,097.8	7,798.1	11,935.9	11,709.1	12,028.5	9,581.2	9,999.0	11,269.6	9,962.8
Area harvested (in ha)	8,993.6	7,925.8	7,529.5	11,297.8	11,315.7	11,918.7	8,826.0	9,904.3	11,025.5	9,324.0
Production (in MT)	206,766.3	184,880.0	167,662.8	260,086.5	256,356.7	248,416.5	170,017.7	196,306.3	230,170.3	174,171.3
Productivity (in MT/ha)	23.0	23.3	22.3	23.0	22.7	20.8	19.3	19.8	20.9	18.7
Cauliflower										
Area planted (in ha)	721.0	716.4	917.5	865.8	475.0	677.6	622.4	785.1	821.7	827.5
Area harvested (in ha)	692.9	768.2	784.9	918.6	423.0	645.5	629.9	757.4	715.1	766.4
Production (in MT)	9,787.9	15,340.8	14,696.8	15,954.5	5,637.4	8,520.8	7,608.6	9,584.3	9,107.7	8,229.7
Productivity (in MT/ha)	14.1	20.0	18.7	17.4	13.3	13.2	12.1	12.7	12.7	10.7
Tomato										
Area planted (in ha)	284.4	341.7	371.6	386.6	265.4	286.4	466.2	457.6	639.8	654.5
Area harvested (in ha)	253.5	350.6	359.2	410.3	276.1	446.3	468.5	483.8	564.0	551.5
Production (in MT)	3,485.0	5,112.9	5,231.3	5,775.6	3,841.9	6,741.5	7,737.6	6,511.7	7,944.1	6,637.5
Productivity (in MT/ha)	13.8	14.6	14.6	14.1	13.9	15.1	16.5	13.5	14.1	12.0
White potato										
Area planted (in ha)	9,920.1	9,141.5	9,574.8	14,820.7	13,078.2	11,749.1	10,198.0	11,468.5	11,329.0	11,039.4
Area harvested (in ha)	9,529.9	8,821.1	9,326.1	14,025.2	12,471.0	11,008.7	10,152.5	10,682.1	11,096.6	10,484.0
Production (in MT)	162,239.8	160,062.2	169,921.5	276,578.3	234,730.4	210,550.6	184,771.0	195,519.9	211,322.6	198,203.1
Productivity (in MT/ha)	17.0	18.1	18.2	19.7	18.8	19.1	18.2	18.3	19.0	18.9
Carrots										
Area planted (in ha)	5,385.6	4,519.5	5,217.6	7,811.9	8,099.0	6,354.2	4,588.5	6,623.1	6,197.5	5,440.7
Area harvested (in ha)	4,959.4	4,684.8	4,991.9	7,003.9	7,179.5	6,523.9	4,595.0	6,443.7	5,895.6	5,313.0
Production (in MT)	75,206.1	76,574.1	81,954.1	121,453.4	116,722.6	103,302.0	70,787.6	97,491.5	92,990.4	81,101.8
Productivity (in MT/ha)	15.2	16.3	16.4	17.3	16.3	15.8	15.4	15.1	15.8	15.3

Source: Provincial Agricultural Office of Benguet

Table iii.xi Monthly price data of select lowland vegetables in Quezon during 2018 in Php/kg

Farm-gate prices

In Php/kg	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Eggplant	22.5	34.1	26.6	21.3	18.3	20.1	43.3	26.1	40.8	10.2	30.7	23.7
Tomato	15.8	29.9	19.8	16.8	9.3	31.7	51.4	43.2	8.8	18.3	29.9	36.0

Retail prices

In Php/kg	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Eggplant	69.9	63.3	63.3	50.6	56.6	48.3	58.9	83.0	67.7	59.4	64.8	50.2
Tomato	49.0	40.9	53.8	44.5	35.6	45.6	78.8	88.6	68.5	42.1	65.9	60.2

Source: Philippine Statistics Authority

Table iii.xii Monthly wholesale farmgate prices select highland vegetables in LTVTP during 2018 in Php/kg

Lowest price

In Php/kg	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Cabbage	11.8	17.2	19.1	19.4	28.3	32.0	28.2	41.8	80.8	37.4	35.9	17.5
Broccoli	22.0	29.0	24.6	12.6	23.4	29.5	29.0	63.9	72.8	57.6	33.4	19.9
Cauliflower	12.0	27.7	27.4	12.6	15.2	32.4	31.4	64.8	66.0	63.0	40.8	8.3
Potato	41.3	39.3	29.2	24.1	18.8	20.8	20.9	26.3	34.4	41.2	68.8	48.7
Carrots	19.1	21.0	22.5	14.5	15.0	17.7	30.4	73.0	97.0	46.8	30.1	24.0

Highest price

In Php/kg	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Cabbage	16.0	21.5	23.2	23.5	32.6	36.2	25.0	45.8	87.0	41.9	40.8	21.8
Broccoli	26.9	34.0	29.4	17.3	30.7	39.4	38.3	75.1	89.0	71.5	43.8	25.9
Cauliflower	16.9	33.2	32.4	17.0	20.3	39.0	39.3	73.9	74.5	74.8	48.9	12.3
Potato	45.3	43.3	33.5	28.1	22.8	24.8	25.0	30.4	38.4	44.8	73.8	52.9
Carrots	23.1	25.1	26.9	18.6	19.0	22.2	34.5	79.3	113.5	55.3	36.1	28.3

Source: La Trinidad Vegetable Trading Post

Table iii.xiii Monthly prices of select lowland vegetables in Sentrong Pamilihan during 2018 in Php/kg

Crop In Php/kg	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Eggplant	48.4	42.3	29.2	23.3	57.2	31.4	40.3	46.0	40.8	27.6	45.8	45.8
Tomato	24.4	20.4	28.0	25.5	17.6	33.0	60.6	50.6	39.5	20.5	34.0	34.0
Onion (red)	106.5	79.6	65.2	73.3	73.4	77.5	78.4	86.5	87.7	76.9	76.0	76.0
Onion (white)	74.8	58.6	58.7	60.3	63.7	68.2	64.5	104.8	79.8	65.8	67.0	67.0

Source: Sentrong Pamilihan ng Produktong Agrikultura sa Quezon Foundation, Inc.

Table iii.xiv Monthly minimum and maximum prices of select lowland vegetables in APTC-Urdaneta during 2018 in Php/kg

Minimum prices In Php/kg	Jan	Feb	Mar	Apr	May	Jun	Aug	Sept	Oct	Nov	Dec
Eggplant	30.8	25.0	18.0	14.7	15.6	21.7	44.4	39.3	32.0	43.9	20.7
Tomato	12.0	8.4	15.5	19.0	10.2	20.0	38.2	28.8	13.0	19.3	19.5

Maximum prices In Php/kg	Jan	Feb	Mar	Apr	May	Jun	Aug	Sept	Oct	Nov	Dec
Eggplant	38.7	32.5	24.5	21.4	26.9	36.3	56.7	52.6	42.7	56.4	30.1
Tomato	18.1	15.3	23.6	28.5	35.6	35.6	58.8	48.1	23.7	33.0	35.5

Source: Pangasinan Agri-Pinoy Trading Center

iv. Cost and return data

Table iv.i Cost of production per hectare for cabbage in Benguet

Activity	Quantity	Unit cost	Value
Labor*	**Man-day**		
Land preparation			
Cleaning and weeding	37.0	200.0	7,400.0
Digging/plot preparation	50.0	200.0	10,000.0
Hole making and basal fertilizer application	31.0	200.0	6,200.0
Seedbed preparation and seedling production	10.0	200.0	2,000.0
Transplanting	15.0	200.0	3,000.0
Planting			
Irrigation	35.0	200.0	7,000.0
Thinning and weeding			
Hilling-up and side dressing	45.0	200.0	9,000.0
Pest and disease control management	20.0	200.0	4,000.0
Harvesting (picking, sorting, packing, hauling)	30.0	200.0	6,000.0
Subtotal	**273.0**		**54,600.0**
Farm supplies			
Seeds	0.5	16,000.0	8,000.0
Fertilizer			
Complete (14-14-14)	5.7	880.0	5,024.8
Ammophous phosphate (16-20-0)	3.0	805.0	2,415.0
Urea (46-0-0)	7.4	1,055.0	7,796.5
Chicken dung	200.0	130.0	26,000.0
Pesticides			
Insecticide	10.0	1,020.0	10,200.0
Fungicide	10.0	700.0	7,000.0
Subtotal			**66,436.3**
Fixed cost			
Land rental			20,000.0
Depreciation cost on tools and equipment			7,226.7
16 pcs sickles			
16 pcs grubhoes			
8 pcs japanese hoe			
8 pcs watering cans			
2 pcs knapsack sprayer			
4 rolls rubberized hose			
4 pcs sprinkler			
1 unit power sprayer			
Subtotal			**27,226.7**
Total cost of production			**148,262.9**
Average yield per hectare	20.0		
Cost of production per kg			7.4
Yield per sqm (kg)	2.5		
Seedling stage			10,000.0
Vegetative stage			100,936.3
Reproductive stage			115,036.3

Source: Provincial Agricultural Office of Benguet

Table iv.ii Cost of production per hectare for carrot in Benguet

Activity	Quantity	Unit cost	Value
Labor			
Land preparation			
Cleaning and weeding	37.0	200.0	7,400.0
Digging/plot preparation	50.0	200.0	10,000.0
Hole making and basal fertilizer application	31.0	200.0	6,200.0
Making shallow furrows	20.0	200.0	4,000.0
Planting	12.0	200.0	2,400.0
Irrigation	50.0	200.0	10,000.0
Thinning and weeding	30.0	200.0	6,000.0
Hilling-up and side dressing	45.0	200.0	9,000.0
Pest and disease control management	25.0	200.0	5,000.0
Harvesting (picking, sorting, packing, hauling)	45.0	200.0	9,000.0
Subtotal	**345.0**		**69,000.0**
Farm supplies			
Seeds	4.0	1,250.0	5,000.0
Fertilizer			
Complete (14-14-14)	8.6	880.0	7,541.6
Ammophous phosphate (16-20-0)	2.6	805.0	2,093.0
Urea (46-0-0)			
Chicken dung	200.0	130.0	26,000.0
Pesticides			
Insecticide	8.0	1,020.0	8,160.0
Fungicide	8.0	700.0	5,600.0
Subtotal			**54,394.6**
Fixed cost			
Land rental			20,000.0
Depreciation cost on tools and equipment			7,226.7
16 pcs sickles			
16 pcs grubhoes			
8 pcs japanese hoe			
8 pcs watering cans			
2 pcs knapsack sprayer			
4 rolls rubberized hose			
4 pcs sprinkler			
1 unit power sprayer			
Subtotal			**27,226.7**
Total cost of production			**150,621.3**
Average yield per hectare	16.0		
Cost of production per kg			9.4
Yield per sqm (kg)	2.0		
Seedling stage			61,000.0
Vegetative stage			100,014.6
Reproductive stage			114,394.6

Source: Provincial Agricultural Office of Benguet

Table iv.iii Cost of production per hectare for potato in Benguet

Activity	Quantity	Unit cost	Value
Labor			
Land preparation			
Cleaning and weeding	37.0	200.0	7,400.0
Digging/plot preparation	50.0	200.0	10,000.0
Hole making and basal fertilizer application	31.0	200.0	6,200.0
Preparation of seed pieces, planting and covering	40.0	200.0	8,000.0
Irrigation	30.0	200.0	6,000.0
Hilling-up and side dressing	45.0	200.0	9,000.0
Pest and disease control management	40.0	200.0	8,000.0
Harvesting (picking, sorting, packing, hauling)	50.0	200.0	10,000.0
Subtotal	**323.0**		**64,600.0**
Farm supplies			
Seeds	2,000.0	60.0	120,000.0
Fertilizer			
Complete (14-14-14)	7.1	880.0	6,283.2
Ammophous phosphate (16-20-0)	2.5	805.0	2,012.5
Urea (46-0-0)	2.0	1,055.0	2,057.3
Chicken dung	200.0	130.0	26,000.0
Pesticides			
Insecticide	10.0	1,020.0	10,200.0
Fungicide	20.0	700.0	14,000.0
Subtotal			**180,553.0**
Fixed cost			
Land rental			20,000.0
Depreciation cost on tools and equipment			7,226.7
16 pcs sickles			
16 pcs grubhoes			
8 pcs japanese hoe			
8 pcs watering cans			
2 pcs knapsack sprayer			
4 rolls rubberized hose			
4 pcs sprinkler			
1 unit power sprayer			
Subtotal			**27,226.7**
Total cost of production			**272,379.6**
Average yield per hectare	20.0		
Cost of production per kg			13.6
Yield per sqm (kg)	2.5		
Seedling stage/Early vegetative stage			177,600.0
Vegetative stage			216,053.0
Reproductive stage			235,153.0

Source: Provincial Agricultural Office of Benguet