

**VEGETABLE SUB-SECTOR GROWTH STRATEGY  
DOCUMENT FOR PAPUA  
September 2017**

BEING UPDATED

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## Abbreviations

AIP-PRISMA	Australia-Indonesia Partnership for Promoting Rural Income through Support for Markets in Agriculture
CSR	Corporate Social Responsibility
GDP	Gross Domestic Product
BPS	Badan Pusat Statistik (Statistics Central Agency)
MT	Metric Ton
ILAF	Intervention Logic Analysis Framework
EWINDO	East West Seed Indonesia
WHO	World Health Organization
KRPL	<i>Kawasan Rumah Pangan Lestari</i> -Regional Sustainable Home-Yard Food Garden
SL	<i>Sekolah Lapang</i> (Farmer Field School)

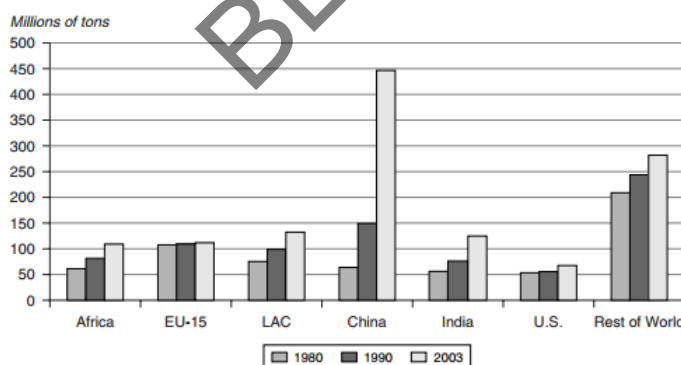
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## 1. Executive summary

**Global vegetable sector shows increasing trend lately due to extensive promotion of fruit and vegetable consumption, rising income and the expansion of the middle class worldwide.** WHO and FAO suggest the amount of 400 gr consumption of fruits and vegetable per day. Apart from that, worldwide per capita consumption is estimated to be 20 to 50 % short of that minimum daily recommendation level a day. Vegetables as the most important source for micronutrients, fibre, vitamins, and minerals are important for balance and healthy diet. Vegetable also the major income for small holder farmers. In most country, the production is too low than demanded with even the minimum intake required for a good health. Diet in most of developing countries are overloaded with more carbohydrates and fats, resulting in increased rate of obesity and its associated diseases. The production of vegetable need to be boost for fulfilling the demand of around 7.5 billion of world population.

**Global production of vegetables grew by 30% between 1980 and 1990 as showed by figure 1, and 56% between 1990 and 2003, reaching 1,274 million tons in 2003, then reaching 1,394 million tons in 2014<sup>1</sup>.** Much of this growth occurred in China with highest variance from 1990 to 2013. China is currently the world's largest producer of vegetables almost in all vegetables commodities around 32% of total global vegetables production in average for 2014. Vegetables in this analysis will be grouped into eight groups as follows: **Solanum** for Chili, Tomato, and Eggplant; **Allium** for Shallot, Onion, Garlic, and Leeks; **Brassica** for Cabbage, Broccoli, and Cauliflowers; **Leafy Vegetables** for Salad like lettuce, chicory, fresh vegetables, and spinach; **Legumes** for long beans, and string beans; **Cucurbit** for Cucumber, Squash, Luffa, Bottle gourd, and Bitter gourd; **Potato** and **Carrot**.<sup>2</sup> Allium group will slightly mentioned, but further elaboration is available in different document for Shallot GSD, while in this document elaborates more on seven other groups of vegetables. The data is processed from FAO Stat 2014, and for Indonesia data production, land and yield from Ministry of Agriculture 2015

Figure 1. Production Fruit and Vegetables by Region (millions of tons)



Source: United Nations Food and Agriculture Organization.

**Solanum for Chilli, Tomato and Eggplant highest production is in China around 28% of world production for about 98 million tons' production.** China has the biggest area also among all the nation for Solanum around 22% of the world acreage, 2.5 million ha. In terms of yield, Belgium is the highest with 460.3 ton/ha. The biggest exporter is Mexico for 2.3 million ton

<sup>1</sup> For Global production number data in 2014 is based on FAOSTAT 2014

<sup>2</sup> Based on PF1 Vegetable Workshop on 29<sup>th</sup>-30<sup>th</sup> April 2017, assisted by Joko Maryono, as vegetable expert.

in 2014, while the biggest importer of Solanum is USA with 2.5 million tons. Compared to Indonesia, the production of Solanum in Indonesia is only 0.95% of the world with value 351 million tons. This production is in 0.3 million ha, which is 3% of the world acreage for Solanum. The yield is far lower than Belgium as the highest yield in Solanum cultivation in the world. Although has produced 351 million tons of Solanum, it is not enough to fulfil the domestic demand, Indonesia still import 41,457 tons of Solanum, (chilli from India and China; tomato from China, USA and Italy; and there is no record for Eggplant imported). While export 18,770-ton Solanum (chilli to Saudi Arabian, Malaysia, and Nigeria; Tomato to Singapore, Canada, and Philippines; Eggplant to Japan, Singapore and Malaysia).

**Brassica for Cabbage, Broccoli, and Cauliflowers highest production is in China around 31% of world production for about 43 million tons' production.** China has the biggest area also among all the nation for Brassica around 28% of the world acreage, 1.4 million ha. In terms of yield, South Korea is the highest with 74.12 ton/ha. The biggest exporter is China for 0.6 million ton in 2014, uniquely the biggest importer also China with 0.6 million tons, where the value of export exceeding import. Compared to Indonesia, the production of Brassica in Indonesia is only 1.12% of the world with value 1.5 million tons. This production is in 0.074 million ha, which is 1.3% of the world acreage for Brassica. The yield is far lower than South Korea as the highest yield in Brassica cultivation in the world, which is 21.13 ton/ha. Indonesia has produced 1.5 million tons of Brassica, but same as Solanum, Indonesia still import 42,297 tons of Brassica, (Cauliflower, Cabbage, and Broccoli from China and Australia as the highest importer countries). While export more around 68,958-ton Brassica (Cauliflowers and Broccoli to Malaysia and Maldives; Cabbage to Taiwan, Malaysia and Singapore; and Chinese Cabbage to Singapore and Saudi Arabia).

**Leafy Vegetables highest production is in China around 42% of world production for about 35.7 million tons' production.** As well as the two-last groups, China has the biggest area also for Leafy Vegetables among all the nation for around 39% of the world acreage, 1.3 million ha. In terms of yield, Congo is the highest with 40.56 ton/ha. The biggest exporter is Spain for 0.7 million ton in 2014, while the biggest importer is Canada with 0.3 million tons. Compared to Indonesia, the production of Leafy Veggies in Indonesia is only 0.15% of the world with value 0.13 million tons. This production is in 0.045 million ha, which is 1.3% of the world acreage for Leafy Veggies. Indonesia's yield is 2.96 ton/ha, far lower than Congo. Indonesia still import 154-tons of Leafy Veggies (Lettuce from Australia and China, Chicory from USA, and Spinach from France). While export more, around 1,534-tons of Leafy Veggies (Lettuce to Singapore, Taiwan, and Brunei Darussalam; and Chicory to South Korea).

**Legumes highest production is in USA around 43% of world production for about 0.7 million tons' production.** Not all legume is calculated in this case, only for peas, long bean and string bean, USA become the only other country which is become biggest producer of vegetables other than China for 7 other groups of Vegetables. USA has the biggest area also for Legume among all the nation for around 46% of the world acreage, 0.09 million ha. In terms of yield, Morocco is the highest with 26 ton/ha. The biggest exporter is Morocco for 0.09 million ton in 2014, while the biggest importer is Spain with 0.1 million tons. Compared to Indonesia, the production, acreage and yield is not recorded in FAO data, for long and string bean, but Indonesia export import data from FAO mentioned export for string bean and long bean 82 tons, while import 16,216 tons. Based on data of Indonesian Ministry of Agriculture 2016 import of Pease from Canada and USA; while export of long bean to Qatar and Singapore; and Peas to

India and Kuwait.

**Cucurbit highest production is in China around 39% of world production for about 64.2 million tons' production.** China has the biggest area for Cucurbit among all the nation for around 27% of the world acreage, 1.5 million ha. In terms of yield, Iceland is the highest with 602.3 ton/ha. The biggest exporter is Mexico for 0.9 million ton in 2014, while the biggest importer is USA for 1 million tons. Compared to Indonesia, the production of cucurbit in Indonesia is only 0.5% of the world with value 0.8 million tons. This production is in 0.06 million ha, which is 1% of the world acreage for Cucurbit. Indonesia's yield is 14.3 ton/ha, far lower than Iceland. Indonesia still import 117-tons of Cucurbit (cucumber from Sri Lanka, India, and USA). While export more amount, around 8-tons of Cucurbit (cucumber to Singapore).

**Potato highest production is in China for 20% of world production for about 95.5 million tons' production.** China has the biggest area for Potato among all the nation for around 23% of the world acreage, 5.6 million ha. In terms of yield, Kuwait is the highest with 67.5 ton/ha. The biggest exporter is Netherland for 3.2 million ton in 2014, while the biggest importer is also Netherland for 1.7 million tons, with value for export greater than import. Compared to Indonesia, the production of potato in Indonesia is only 0.28% of the world with value 1.3 million tons. This production is in 0.07 million ha, which is 0.3% of the world acreage for potato. Indonesia's yield is 17.67 ton/ha, far lower than Kuwait. Indonesia is importing huge amount of potato for 106,229-tons from Germany, USA, and Netherland. While export, around 6,066-tons of potato to Singapore, Malaysia, and China.

**Carrot highest production is in China for 31% of world production for about 17.4 million tons' production.** China has the biggest area for Carrot among all the nation for around 23% of the world acreage, 0.4 million ha. In terms of yield, Iceland is the highest with 123.5 ton/ha. The biggest exporter is China for 0.5 million ton in 2014, while the biggest importer is Belgium for 0.2 million tons. Compared to Indonesia, the production of Carrot in Indonesia is not achieving 1%, around 0.88% of the world with value 0.4 million tons. This production is in 0.03 million ha, which is 1.7% of the world acreage for carrot. Indonesia's yield is 16.1 ton/ha, far lower than Iceland. Indonesia is importing huge amount of carrot for 42,666-tons from China and Australia. While export, around 5.7-tons of carrot to Malaysia and Singapore.

**In Southeast Asia, Indonesia is the biggest producer among the countries, as well as the acreage for planting vegetables.** However, for yields, Indonesia needs to improve its productivity so the large acreage for planting vegetables can deliver bigger amount of vegetables. Exception for carrot and legumes, since not all Southeast Asian countries have these commodities produced in their country, Indonesia is still having better yield.<sup>3</sup> Indonesia exports vegetables to neighboring Southeast Asia country such as Singapore for almost all vegetables commodities; Malaysia for almost all kinds of vegetables as well, except long bean; Philippines for chili, onion, and tomato only; East Timor for potato, tomato, onion, shallot, garlic, leafy vegetables, and chili; Brunei Darussalam for chili, leafy vegs, and tomato; Thailand for potato, shallot, leafy vegs, and chili; Vietnam for tomato, shallot, leafy vegs, eggplant and chili; Cambodia and Myanmar for chili. Indonesia import vegetables also from Southeast Asian country for Potato from Singapore, Malaysia, and Myanmar; tomato from Malaysia, Thailand, and Singapore; Onion from Thailand, Singapore, and Malaysia; Shallot from Malaysia; Garlic

<sup>3</sup> Data of Production, Acreage, and Yield for Southeast Asian Countries derived and processed from FAOSTAT Data 2014

from Malaysia; Carrot from Malaysia; Chinese Cabbage from Malaysia and Singapore; and Chili from Thailand and Singapore.<sup>4</sup>

**Based on the explanation above, Indonesian vegetable production, acreage, and yields compare to the world still left behind.** Many aspects are potentially to be improved, to maximize available land and come up with several strategies to improve Indonesian vegetable yields. Indonesia tend to export raw vegetables to the world and the neighboring country with lesser value of money compare to processed vegetable products Indonesia has imported from other countries. In some essential commodities, Indonesia is still struggling in doing self-sufficiency, and turning out of giving up to import mechanism due to unreasonable local production cost. This is applied to several strategic commodities like garlic mostly from China. However, the good news, compare to Indonesian neighboring countries in Southeast Asia, Indonesia's vegetable production and acreage in all groups are the biggest. The biggest with notes that the productivity do not say so, Indonesian vegetable productivity lags compare to our neighboring countries. It is a gap which need to be considered by the enabling environment in Indonesia for do not wasting the opportunities and revise the strategy to increase the productivity.

**Indonesia opportunity in vegetable is also laying down on its population buying behavior or on how market worked.** Vegetable is still perceived as secondary needs for mostly Indonesian people. The urgency of consuming vegetable is not as important as rice, meat, housing, clothes, as the primary needs, even left behind technology for some millennial generation (smartphone with Wi-Fi). This condition is also let vegetable farmers to choose planting only several potential crops which have higher values in the market for example chilli, garlic, and shallot. Other group of vegetable market is not as promising as these golden commodities, due to the ability of the golden commodities causing inflation. There is a levelling in vegetable group itself, firstly fast moving strategic commodities (the golden commodities mentioned before) and second one is slow moving, which if available is okay but not consuming that vegetables also not a big deal by some people, where they still can find the substitution in local vegetables (raw jack fruit, cassava leaves, pumpkin leaves, etc.). Therefore, the concern is high in fast moving vegetables showed by high demand on this kind of vegetable and low for the supporting vegetables with steady growth. Further explanation on Indonesian vegetable sector paradox will be elaborated more in sector profile both for Indonesian and respective province context.

**Realizing the facts in global and national vegetable sector for Indonesia, the vision of change is needed to improve access and growth for vegetable farmers, especially the poor farmers.** Five vision of changes is formulated for vegetable sector, which are: 1) Improving access of vegetable farmers to quality inputs; 2) Strengthening dissemination of agricultural knowledge (GAP) and information; 3) Promoting and improving post-harvest handling; 4) Promoting off season vegetables and technology; 5) Improving access to financial services. Through these visions are actuated into several interventions related to the needs of every province and its local conditions: 1) Addressing limited access to quality input and dissemination of GAP by working with seeds company, chemical company, and local agricultural input shops to open access of quality input with GAP to farmers; and create a platform to easily disseminate

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<sup>4</sup> Ministry of Agriculture Center Data and Information System, "Impor and Ekspor Komoditi Pertanian Subsektor Hortikultura (Segar & Olahan) 2016.



the information (ICT). 2) Collaborating with SAFIRA to overcome the barrier in accessing financial services. 3) Working on post-harvest by linking the farmers to the market. This sector is still finding an opportunity to promote off season vegetable, because of its potency to highly increase farmer's income.<sup>5</sup>

## 2. Background

The Australia-Indonesia Partnership for Promoting Rural Income through Support for Markets in Agriculture (AIP-PRISMA) is a multi-year program that is a part of the Government of Indonesia's midterm development strategy to accelerate poverty reduction through inclusive economic growth. With the support of the Government of Australia, the program aims to achieve a 30% increase in the net incomes of 300,000 male and female smallholder farmers in eastern Indonesia by end of 2018. PRISMA works in East Java, West Nusa Tenggara (NTB), East Nusa Tenggara (NTT), Papua, and West Papua.

This Sector Report aims to provide a logic and rationale for market-based interventions which can support the vegetable sector to the benefit of smallholder farmers in Papua.

## 3. Sector description

The sector profile provides information on the current status and potential of the target sector. This has been derived mainly from secondary data and literature relevant to the vegetable sector.

### 3.1 Sector Profile

#### 3.1.1 Overall context

**Vegetable is categorized under horticulture, together with fruits, decorative flowers, and medicinal plants.** In Indonesian government, it is managed under horticulture department in Ministry of Agriculture, but the grouping of horticulture in Indonesia compared to other countries might be different. In Indonesia maize, cassava, sweet potato, soybean and taro are belong to main crops, while in several other countries, they belong to horticulture. Baby corn, sweet corn and edamame belong to horticulture. So, horticulture in Indonesia generally characterized by commodity with high economic values and the cultivation process requires intensive process and skill. Indonesia land condition which are spreading and small size suitable to be planted by horticulture plants. In various country, horticulture has important role in increasing farmer income, creating job, and promoting investment in village level. Horticulture with spread and small size land, added with perishable condition of the products become a big challenge for farmers and trader in serving the customer. Pricing of horticulture product is high when its fresh and starting to be lower in a short time when the product no longer fresh and even become waste around 20-50% of mismanage and bad storing system.

**Indonesia position as the fourth largest market in the world with population 3.51% of world population, around 255 million people is a potential market to be supplied with local vegetable.** Although the number of vegetable consumption in Indonesia now is still lower than

<sup>5</sup> Based on discussion in PF1 Vegetable Workshop on 29<sup>th</sup>-30<sup>th</sup> April 2017, assisted by Joko Maryono, as vegetable expert.



400gr/capita/day required by WHO and FAO, Indonesia 57,7 gr/capita/day<sup>6</sup>, but progressively Indonesia is showing positive trend on vegetable consumption. Based on *Susenas (national economic census, BPS)* data March 2016, almost 97.29% Indonesian people consume vegetables in last a week when the survey is conducted. The conclusion is almost all Indonesian people consume vegetables, but still in low amount than suggested by WHO and FAO. The highest Indonesian vegetable consumptions are for spinach, water spinach, long bean, tomato and eggplant, vegetable soup/*capcay*, and mix vegetable (*lodeh* and *sayur asam*). *Susenas 2016* also mentioned the more income, higher number of vegetable consumes by the household, except for spinach and water spinach which has been largely consumed by less than IDR 150.000 income (medium to low income).<sup>7</sup> Increasing awareness of consuming more vegetables makes demand of vegetables is higher than supply. This fact is opening a potential market for farmers to improve their yields and other actors to maximize their role for not missing the opportunities and letting the demand satisfied by import products.

**The fact is progressive trend of Indonesian vegetable consumption not in line with Indonesian vegetable production for several kinds of vegetable.** Demand of several vegetable commodities outstrips supply, like mentioned in figure 2, for commodities like spinach, water spinach, long bean, eggplant, garlic, and cabbage. As mentioned previously, Indonesia is depending on imports to satisfy the demand for certain vegetables.<sup>8</sup> Vegetable consumption in Indonesia has its own pattern of consumption and variation per province and even per district. People in West Java is famous of their habit of consuming green vegetables in raw or steam, this is the reason behind high demand of leafy vegetables in West Java. West Java has the biggest vegetable overall production in Indonesia, and followed by Central Java, and East Java in the third place. The picture is shown by figure 3, where NTB production of vegetables dominated by *Solanum* and *Allium*; while NTT vegetables production is small in almost all of kinds of vegetables. Oversupply in Java Island is sent to neighbouring island. Indonesian people has its own local vegetable to satisfy the demand of vegetable, although the position of vegetable in Indonesian diet still in a low portion than suggested by FAO and WHO. The way mostly Indonesian processed their vegetable are also reducing its important vitamins and minerals of using coconut milk and cook them in high temperature and for a long time. For example, people in West Sumatera used to eat cassava leaf as their common consumed vegetable, this kind of vegetable is easily found and not expensive for people there, it is cooked as cassava leaf with coconut milk. The levelling of diet for majority of Indonesian people, rice as the most important, followed by protein from meat, soybean *tempe* and tofu, egg, fish, and the last one is vegetables and fruits. For Indonesian people, eating without vegetables and fruits is still fine. Recently, in middle income Indonesian people this behaviour has changed due to shifting in their lifestyle to healthier lifestyle. Therefore, in the future the consumption of vegetable in Indonesia lately increased.

<sup>6</sup> Indonesian vegetable consumption, accessed from <https://gaya.tempo.co/read/news/2017/01/24/060839202/penduduk-indonesia-ternyata-kurang-makan-sayur-dan-buah>.

<sup>7</sup> Consumption per capita household a year based on national economic census 2016 [http://aplikasi2.pertanian.go.id/konsumsi/tampil\\_susenas\\_kom\\_th.php](http://aplikasi2.pertanian.go.id/konsumsi/tampil_susenas_kom_th.php) and <http://gizi.depkes.go.id/wp-content/uploads/2017/01/Paparan-BPS-Konsumsi-Buah-Dan-Sayur.pdf>.

<sup>8</sup> Indonesian Population 2015 accessed from <https://www.bps.go.id/linkTabelStatis/view/id/1274> ; Production 2015 Accessed from MoA; and consumption 2015 from <http://gizi.depkes.go.id/wp-content/uploads/2017/01/Paparan-BPS-Konsumsi-Buah-Dan-Sayur.pdf>

Figure 1. Consumption and Production Comparison 2016 Vegetables Commodities

Vegetable Commodities	Unit	Consumption/capita/year Estimation Number*	Indonesian Population Number**	Estimation National Consumption	Vegetable Production (Kg)***	Production-Consumption
Spinach	Kg	4.03	255,461	1,029,507.83	150,085	(879,422.83)
Water Spinach	Kg	4.44	255,461	1,134,246.84	305,071	(829,175.84)
Green Mustard	Kg	2.09	255,461	533,913.49	600,188	66,274.51
String Bean	Kg	1.14	255,461	291,225.54	291,314	88.46
Long Bean	Kg	3.34	255,461	853,239.74	395,514	(457,725.74)
Tomato	Kg	0.417	255,461	106,527.24	877,792	771,264.76
Cassava Leaf	Kg	2.66	255,461	679,526.26	NA	NA
Eggplant	Kg	2.74	255,461	699,963.14	514,320	(185,643.14)
Bean Sprout	Kg	0.88	255,461	224,805.68	NA	NA
Mix Vegetable Soup/Capcay	Pack	8.3	255,461	2,120,326.30	NA	NA
Mix Vegetable Lodeh/Sayur Asam	Pack	5.26	255,461	1,343,724.86	NA	NA
Raw Jack fruit	Kg	0.55	255,461	140,503.55	NA	NA
Shallot	Kg	2.713	255,461	693,065.69	1,229,184	536,118.31
Garlic	Kg	1.749	255,461	446,801.29	20,295	(426,506.29)
Red Chilli	Kg	2.96	255,461	756,164.56	1,045,182	289,017.44
Rawit Chilli	Kg	2.96	255,461	756,164.56	869,938	113,773.44
Cabbage	Kg	1.356	255,461	346,405.12	118,388	(228,017.12)
Cucumber	Kg	1.616	255,461	412,824.98	447,677	34,852.02

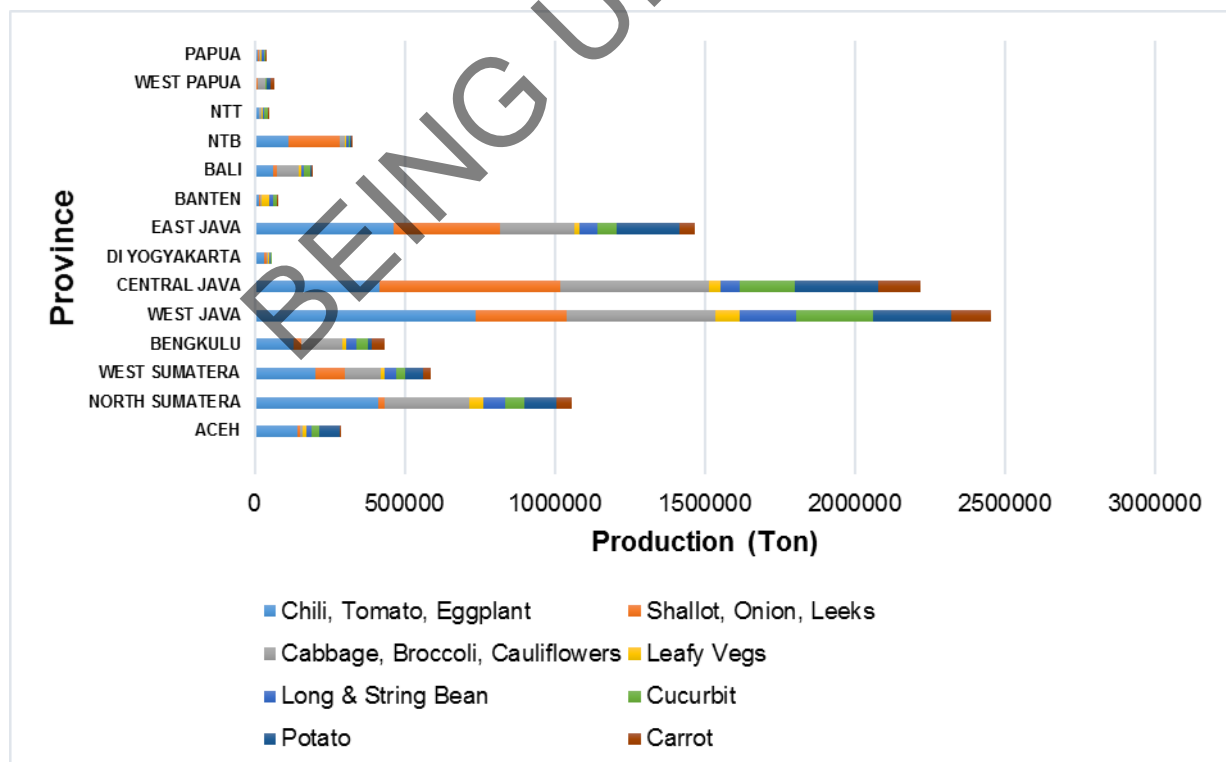
\*Consumption 2015 Susenas

\*\*Population 2015, BPS

\*\*\*Production 2015 MoA

Cabbage and Cucumber use data consumption 2014

Figure 2. National Vegetable Production By Province 2015<sup>9</sup>



<sup>9</sup> Processed from Ministry of Agriculture data 2015

**Challenge in Indonesian vegetable sector is in the ability to match the supply location with where the demand located by considering perishable status of vegetable.** Indonesian part where produce vegetables are spreading in all over Indonesia for smaller land size, with farmer behaviour tend to plant high value vegetable and not aware of their geographical and soil potency and condition, GAP, crop planning and post-harvest handling (GHP). Knowing that the price of Chilli is increasing, most of the farmer prefer to plant chilli, instead of other vegetables. As the consequence, too much supply on chilli, instead of getting high price, the price is become lower. Case in segmented vegetable like broccoli, pokchoy, leafy vegetables, most of the farmer still difficult in finding the market to sell their product other than local market so no incentive for them to plant these vegetables, push their production and increase yield. Accessing big demand in the city urges trader to have a proper post-harvest handling, so the vegetable condition is still fresh and people the city still willing to buy. Indonesian farmer has overwhelmed with the challenge in planting vegetables like finding good input materials, cultivate the land, waiting for harvest time, pest and disease, and hiring staffs. So, considering that, post-harvest handling and marketing their product is surpassing their capacity. There is collector and trader help the farmer to distribute their product. By not in charged with this, let the bargaining power of farmer become low, compare to their product cannot be sold, it's better for them getting low price at least their initial capital spent for planting vegetables break event. Helping vegetables farmer with this devil circle, assisting them to solve input and planting problem, prevent pest and disease, linked with fair market actor with fair buying price, help trader dealing with perishable condition of vegetables are the potential target of vegetable sector.

**Government of Indonesia keep on providing enabling environment by set regulation for import and export based on Indonesian local production capacity.** Farmer who grouped into farmer's group supported by giving subsidy for seeds, fertilizer, and tools. President Jokowi, under Ministry of Villages, Disadvantage Regions, and Transmigration developed BUMDes allocates government funding from ADD (Anggaran Dana Desa-Village Budget Fund) and APBD (regional funding) to be managed autonomically by the government in village level. BUMDes stands for village owned enterprise is a government initiative to let village owned an enterprise where all or part of the funding owned by villagers itself through government funding or from village owned income to manage the asset, village resources, and services for the sake of its people in the respective districts. This policy is based on UU No 6, 2014 about village governance. The purpose of BUM Des is to improve village economic condition, optimize village assets, increasing rural people participation to manage their potency, promoting collaboration with external parties, opening opportunity to let rural people get accessed to market exposure, public service, working opportunities, to increase their income. Funds managed under BUMDes is used to be spent for supporting agriculture as well, where become a chance for PRISMA's partner to supply their product and procured partner's product by village level government. The amount for agriculture in every district is different, the elaboration on how this policy worked in each province or district is elaborating in local context based on local information. This policy is made to help farmers with financial problems.

**Abundance problems faced by farmers, and actor along the long vegetable supply chain, with disparity of accessed available among province, different potency and geographical conditions.** Each province has their own specific characteristic of farmer and vegetable market. These are the potential target for AIP-PRISMA to explore the market-based intervention in vegetable sector with potency of 1,122,000 HH vegetable farmers in Eastern Indonesia: East Java 625.000 HH; NTB 58,000 HH; NTT 92,000 HH; Papua 300,000 HH; and West Papua 47,000 HH. By addressing the problem with custom solution based on each province

characteristics explored in this document, the aim of increasing 30% income of 300,000 Indonesian farmers will be achieved by 2018. The local context and market characteristics is elaborating further through local context, sector dynamics, analysis, and finally coming up with strategy for change.

### **3.1.2 Local context**

**Papua is considered a high-poverty area with a high level of regional disparity compared to other provinces in Indonesia Papua has two dominant economic sectors, agriculture and mining.** Around 39 percent of the population work at agriculture sector. The majority of indigenous farmers traditionally plant tubers, only few of them cultivate vegetable. While migrant farmers they are used to plant vegetables. Vegetable cultivation in Papua provides an excellent source of employment for both rural and urban dwellers as it is grown in many rural areas as well as in the outskirts of towns and cities to be supplied fresh to the markets. The industry has been found to have three distinct components-Commercial/market gardening, medium scale production for contractors/middlemen and small-scale domestic / backyard gardening. Most of the farmlands in Merauke, Jayapura, Keerom Districts are used for commercial cultivation of vegetables (tomatoes, chilies, cabbage, lettuce, etc). Still, vegetable consumption in Papua is still relatively small compared to others Province in Indonesia.

**Horticulture farming is the second largest agriculture business in Papua where 266,054 household worked in horticulture farming.** That number increased around 33,4% of 199,416 farmer households in 2003. Merauke (10.207 farmers), Jayapura (10.195 farmers), Keerom (3.839 farmers), and Mimika District (5.597 farmers) are among of the main vegetable producer in Papua. Some main vegetables in Papua are still imported from outside of Papua. Main vegetables, for example chilies and shallot are still imported from Surabaya, Makassar and Manado. Those vegetables are imported because the local production is small due to the low productivity which resulted from lack of skill in cultivating those vegetables, lack of use of good quality seed and less application of good agricultural practices. Migrant farmers cultivate more high-valued crops than indigenous do e.g. chilies, tomatoes, cabbage and shallots. Indigenous farmers tend to plant fast harvested vegetables like leafy vegetables. One of the major bottlenecks for the take-off of Papua's vegetable sector is low and knowledge of improved input include well-adapted seeds; fertilizers and pesticides. There are still many farmers use retained seed for chili, tomatoes, etc due to lack of information.

**Unawareness about GAP include fertilizer and pesticide use was found to be highest among the many smallholder farmers.** The majority of farmers are practicing preventive/calendar spraying with often too high dosages and mixing of several pesticides together. Most of the problems of excessive and improper use of fertilizer and pesticides results from the lack of knowledge or awareness among farmers, which in turn is a result of lack of sufficient training, advice and provision of information.

## **3.2 Sector dynamics**

### **3.2.1 Market overview**

Vegetable farming in Papua is characterized by low availability & knowledge of improved inputs, and also lack of knowledge in crop management. Even though there is availability of a large range

of chemicals and agriculture inputs in the retailer stores, smallholder farmers in some districts do not use pesticides and fertilizers. Furthermore, the limitation of farming techniques and knowledge contribute to poor management of vegetable farming in Papua.

Nevertheless, migrant farmers in some District in Papua such as in Merauke, Jayapura, Keerom, and Timika own or operate larger farming land and recognize vegetable farming as a profitable business and have started adopting it as their main livelihood. Compared to the indigenous farmers, migrant farmers have better understanding and knowledge about farming practices of vegetable cultivation techniques.

In Papua, most of the harvested vegetables are commonly sold directly after harvesting to the local market, with insufficient post-harvest handling practices. As a consequence, this practice has limited the farmer income due to less selling price and access to alternative market channels. These constrains are compounded by poor market outlook and assessment by farmers which has led to farmers growing similar crops at similar seasons leading to oversupply of crops and less profit.

Vegetable farming in Papua comprises of a value chain which involve input retailers, farmers, collectors, traders, and customers. The chain starts by farmers purchasing agriculture inputs, then they cultivate and harvest it. Farmers then sell the harvested crop to collectors or directly sell in the local market. The crops are then traded in traditional markets, while few quantities are traded to catering, supermarket, hotels and restaurants, also to another district

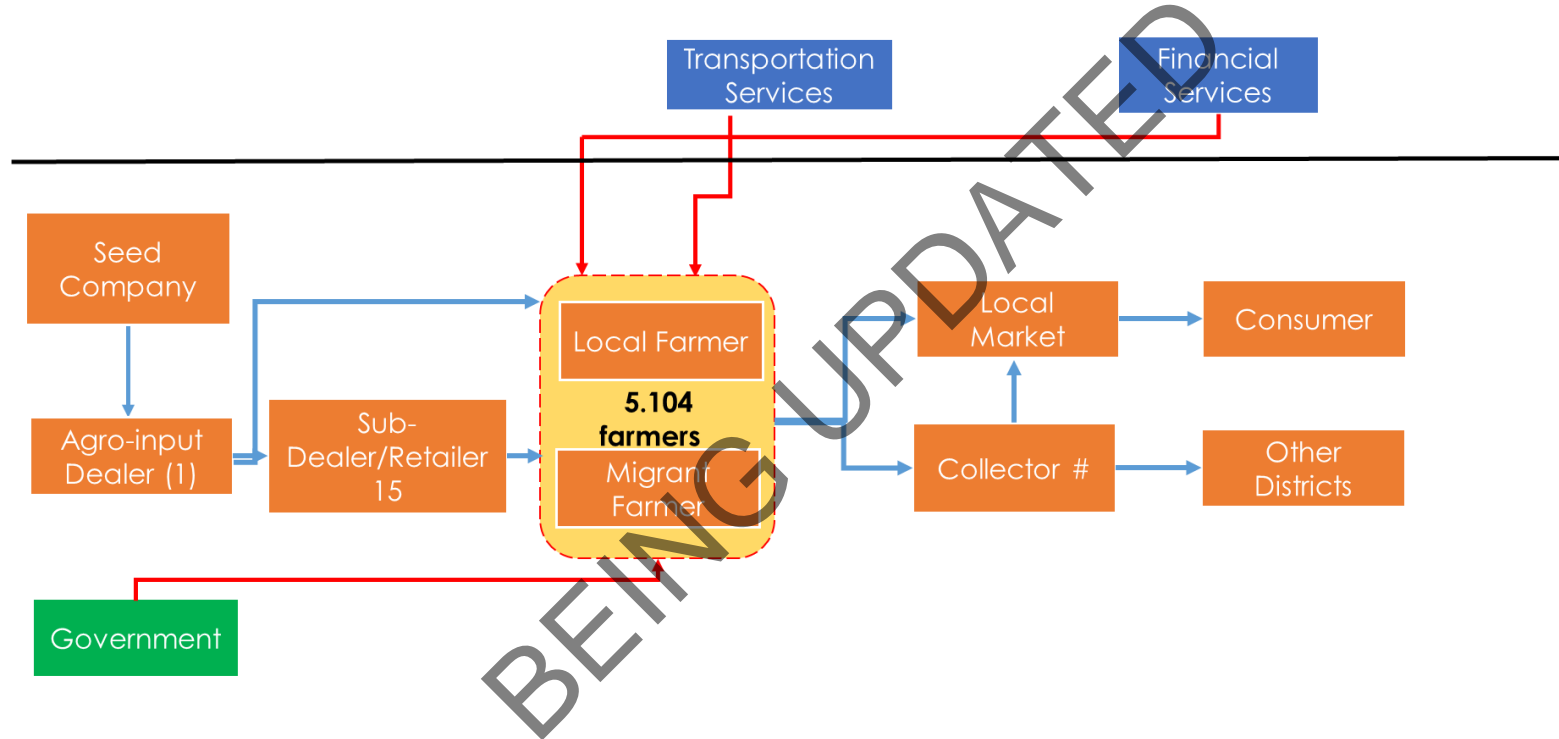
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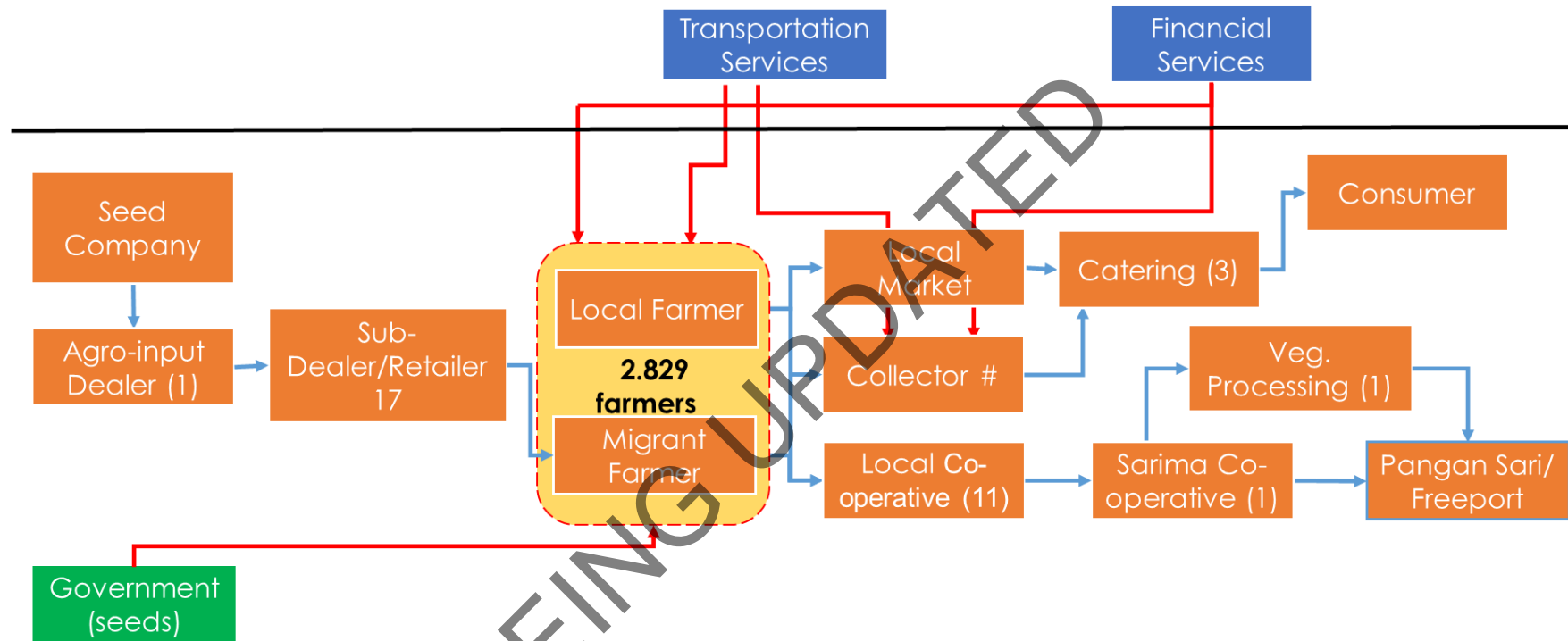


**3.2.2 Sector map**





TIMIKA



### 3.2.3 Core value chain

#### Inputs

**The main sources of planting material are from input retailers, and the majority of migrant farmers buy seed from input shop while others still use retained seed.** Various kind of seed brands are widely available in input distributors and smaller shops in sub-district areas. Most farmers in Papua have been using the same crop variety for many years, and this variety choice is mostly subjected to local market preference. Farmers in these areas are reluctant to adopt and try new varieties of crop seeds if its appearance is different from the common variety that are sold in market or not known to them. In the seed sector, there is currently an overdependence on a relatively low number of older open pollinating varieties (e.g. for tomato, chili, cabbage and shallot) while few new domestic and international varieties enter the market. The recent years some progress has been made thanks to the market entry of East-West Seeds Indonesia with seed brand *Cap Panah Merah*. *Cap Panah Merah* is the most trusted brand used by farmers in Papua. It offers a wide range of dry and wet season vegetables seeds with different types of varieties which is adoptable to low and highland conditions

**The other main inputs used by vegetables farmers are fertilizers and pesticides. Most farmers use subsidized fertilizers on their farms and will access other chemical inputs using the same network of private input retailers as other crops.** Most common fertilizers used by framers are subsidized NPK, SP 36, Urea, and ZA. However, as the enforcement of Ministry of Agricultural, subsidized fertilizer can only be distributed to cooperative member, that implies to the new administrative procedure which sometimes become burdensome to smallholder farmers. Some other farmers purchase unsubsidized fertilizers and few portion of farmers also utilize their livestock manure to be proceed become organic fertilizer. A number of chemical brands (including Syngenta, Bayer, GDW) are sold by the input distributors. Pesticides and other chemicals are generally purchased on cash payment.

**Although there are a few numbers of agricultural input shops in several districts in Papua who are selling quality seeds and other agricultural inputs, but the use of quality seed is still very limited.** It is because of the poor knowledge of farmers about good quality seed and its use. In general, each season, farmers in Merauke usually plant 2 to 4 vegetables in one area. 1 to 2 types of vegetables planted can be harvested at the end of the season in 3-4 months, while 3 to 4 other types of vegetables can be harvested more quickly, for example within a month or less.

#### Production

**The vegetable sector is dominated by small farms, with the vast majority of vegetable households owning around 0.25 – 1 hectares.** Land size that can be done by farmers basically depends on the ability of farmers. In the dry fields and non- irrigated lands farmers can plant vegetables in three seasons along a year. While in paddy fields farmers plant vegetables only one season, between or after two seasons where farmers plant rice and other crops.

**Farmers in Papua usually plant more than one type of vegetable even plant around 2 to 4 types of vegetables in one area.** Some farmers plant in one area but segregate land for each type of vegetable. But some others plant all the vegetables in a land without separation of land (inter-crops). This is done so that the farmers can harvest as frequent as possible for the

continuity of their income until the end of the harvest.

**Women and men are both actively engaged in vegetable production as either farmers or as laborers (sometimes both).** The use of family labor is a common practice, whereas hiring laborer to work in the field is very rare. In a most of the households, househusband usually perform the production tasks includes spraying pesticides, fertilizing, watering, and harvesting. Meanwhile, housewife take on the role of selling and negotiating prices in the market. Decisions regarding what agricultural practices to use are mainly made by male members of the household.

### **Harvesting & Trading**

**Most vegetables harvested in Papua are consumed fresh within the island. Vegetables are highly perishable and have a short shelf life, and therefore farmers sell their crop immediately after harvesting.** Farmer's lack sufficient post-harvest handling practices, and storing facilities for vegetables for longer periods of time in order to take advantage of higher prices when the demand is higher. Besides, vegetable processing enterprise are also not available in this area to absorb the local oversupply.

**Post-harvest handling practice of harvested vegetables is relatively poor.** Simple postharvest handling comprises washing, sorting, bundling, and packaging are applied before the harvested crop is collectively transported to the nearest traditional market. Meanwhile, there are a small number of farmers in the rural areas where difficult terrain hinder logistic access, farmers have their products collected from the roadside (by a collector) in an open truck before they take it to the markets. These farmers usually do not practice pre-sorting or packaging of harvested crop due to the limited awareness and knowledge or skills or resources to invest in these activities. Harvested crop such tomatoes and chili are stacked in baskets without any concealment material used for minimizing crop damage during transportation.

**Asymmetric information between farmers and buyer (collectors) commonly occur.** Farmers have a lack of market information such as the latest market price and availability of a commodity in the market. The purchase price at the collector level is not simply determined by the supply of vegetables from farmers in Merauke, Timika, Jayapura, Keerom, but sometimes also by the prices of vegetables brought in from other islands such as Surabaya, Makassar and Manado. This is because the high volume of vegetable imported from outside the island accompanied by lower prices. As the result, marginalized farmers have a lower bargaining power against collector, and they generally accept any price given by collector.

**The majority of vegetables are sold to local collectors in market.** Collectors or middleman come to villages collecting available harvest in farmer's land. Together with men, women take responsibility of vegetable selling. In some district in Papua like Merauke, Timika, Keerom and Jayapura, the vegetable buyers apply a kind of contract farming scheme, an informal agreement between buyers and vegetable producers, where by producers agree to produce and supply vegetable according to the agreed commodity, quality, quantity, quality and variety. The two parties will mutually agree on the pricing of product, either on a contract price or a market price. Usually, the buyers provide input (seed, fertilizer, and pesticide) to their farmers. This scheme is an intermediate production and marketing system which spreads the risk between the buyers and smallholders and addresses the key transaction costs. From smallholders farmers perspective, the primary welfare gains from contracting are in risk management and improved

access to markets.

### **3.2.4 Supporting Functions / Service**

**The underdeveloped economic condition of Papua makes only few private sectors investing in and operating there.** Some private sectors coming into Papua market initially supported government program as well as multi-national company's CSR program or as vendors for them. The main obstacle that makes not many private sector to Papua is the low demand and the expensive cost due to lack of infrastructure.

**Transportation becomes a major problem for the movement of goods and people in Papua. Poor infrastructure is the reason for high cost of transportation.** Transportation of agricultural products is still expensive, not only the cost of transporting agricultural products from farm to market in the city by land transport but also the cost of transporting agricultural products imported from outside the island. Vegetables produced in lowland can still bear the reasonable costs of transportation.

**Knowledge flows along the vegetable value chain are lacking, and smallholder farmers have few channels for obtaining information on new technologies or good cultivation practices in vegetable farming.** Farmers mainly get their information through farmer groups. However, sustainability of such interactions has generally been poor as farmer group often does not utilize these resources for agriculture management in vegetable farming. In addition, information from peer farmers is rare, since peer farmer are usually unwilling to share their knowledge. For instance, trust and willing to share among indigenous farmers are very uncommon.

**There were not many farmers who received extension services in Papua.** Currently, extension services just rely on public extension workers from government of which the number and the capacity are still low. Distant distribution of agricultural land and the few number of farmer in every agricultural center make the extension workers unable to access the area regularly. At the same time, input dealers and retailers also have limited knowledge about vegetable cultivation whereas local traders either lack new knowledge and capacity. In the absence of embedded service provision, business interactions between farmers and collectors are largely restricted to the sale of vegetable.

### **3.2.5 Supporting Rules and Regulations (Enabling Environment)**

**Agricultural policy in Indonesia focused for decades on achieving food self-sufficiency and price stability. The government used a wide variety of policy instruments in pursuing these goals, by providing subsidies to purchased inputs to farmers.** A typical example is a large subsidy for fertilizer, fuel, credit, tree planting materials, and pesticides provided by the government for farmers'. Indonesia's largest agriculture subsidy for many years has mostly only been fertilizer. Moreover, recently during the last 5 to 7 years, seeds subsidies are being provided by national as well as local governments (CHCG, 2012).

**Fertilizer subsidy policy is one of the important public policy instruments for improving farmer's production capacity.** The implementation of fertilizer subsidy is based on Regulation of the Ministry of Agriculture (Permentan) and Regulation of the Ministry of Trade (Permendag),

which are issued annually. The Permentan regulates the allocation and the Highest Retail Price (HET) of subsidized fertilizer for agricultural sector, while Permendag regulates the procurement and distribution of subsidized fertilizers. The subsidized fertilizers consist of Urea (nitrogen), ZA (nitrogen), SP-36 (phosphate), NPK (compound fertilizer) and organic fertilizers. The proposal of fertilizer needs by farmers uses *RDKK* (Definitive Plan of Group Needs) format proposed by the farmer's group. The farmers, as a member of the farmer's group, propose fertilizer need based on his/her land size. The proposal from farmer's group level is then compiled into proposal for the district, provinces, and finally at the national level.

**The Ministry of Agriculture has promoted a program called the Sustainable Home-Yard Food Garden Scheme Regional Sustainable Home-Yard Food Garden Scheme (KRPL, Kawasan Rumah Pangan Lestari).** KRPL aims to optimize land utilization of home-yards only. Under RPL, a house's residents engage in gardening activities in their yards by growing a variety of vegetables, which helps meet the household's demand for foods in the long run. KRPL aims to optimize use of spaces within the property, such as front, back, and side yards, the walls, roof, and basement, for food production purposes. KRPL extends space utilization to incorporate fences, community roads, and other public facilities (schools, mosques, etc.), and green open land. Plastic container pots are the standard gear to grow crops in RPL and KRPL. The KRPL program is carried out by groups of women with mentoring by government extension workers.

**The Ministry of Agriculture has promoted a program called Farmer Field School (SL-Sekolah Lapang).** Farmer field school is for all member of farmer groups which is guided by the govt agricultural extension officer with the material is in an integrated crop management are emphasized on pest control in certain crop such as chili and shallot. Field School participants gather once a week for one season (12-14 weeks) to follow and analyze the development of their crops, phase-by-phase. Simultaneously they explore various principles associated with the development of crops such as insect population dynamics, physiology and crop compensation, maintenance of soil fertility, water and weather influences, variety selection.

## 4. Analysis

### 4.1 Problems in the Core Function and underlying causes

The problems and underlying causes are specific to the poor target groups that AIP-PRISMA seeks to support through interventions in the vegetable market system in Papua. These problems have been identified through the Sector Dynamics section above and are also presented in the Intervention Logic Analysis Framework (ILAF) table. The two key problems can be summarized as:

- Farmers experience low productivity because they do not use good agriculture practice and good quality seed
- Farmers lack of information and knowledge of harvesting and post harvesting handling

**Farmers experience low productivity because they do not use good quality seed and poor understanding of GAP.** In general, farmers in Papua, and especially in the Merauke have been using the seeds bought from input retailer. Few farmers are using retained seed or bred independently of certain types of vegetables. However, most farmers still do not use good quality seed. There are different types and brands of seed supply in the market. Some of them are type seed from well-known brands e.g. Cap Panah Merah, Matahari, and Kapal Terbang.

Farmers generally do not know enough about the quality and brand of seed. They buy only based on their experiences and information from their neighboring farmers. While the seed sellers in kiosk do not provide sufficient information regarding variety of seeds, among others, planting locations, land suitability, intended vegetable varieties and the treatment of those seeds.

Vegetable farmers in Papua, mostly Papuan Farmers poor understanding of GAP practices related to crop production practices and in many instances it involves inputs which are not accessible and costly such as green leaf manure, poultry manure and crop mulching due to modernization of agriculture. Adoption of such practices require long term efforts from extension system through educational programs such as farmer field school for farmer experimentation and community action. Migrant farmers in Papua are more advance than Papuan Farmers in terms of GAP, Papuan farmers are characterized by planting tubers and they sell it directly to the market, only few who has skill to plant vegetables. Presently government extension services in Merauke, Jayapura, Timika, and Keerom have difficulties in reaching substantial numbers of farmers regularly and extension staff lacks regular (refresher) trainings on GAP.

**Farmers lack of market knowledge.** Currently, farmers do not know market demand of a certain type of vegetable. It could be any kind of vegetable is sold and whatever the quantity of vegetable are often sold. But it is not accompanied by information of vegetable market prices. So far, most farmers bring their harvest directly to market and sell them to big collector, while indigenous farmers sell directly to the consumers which sometime make them should wait for the vegetable sold up to three days. Some other farmers wait for collectors come to their farmland, then the collector bring the harvest to market. Payments will be made by the collector the following day based on the recent market price.

**Farmers lack of information and knowledge of harvest and post-harvest handling service.** Most farmers are experiencing low quality of vegetable caused by traditional farming techniques applied by farmers. The lack of farming know-how implies to minimal effort on maintaining vegetable crop which finally cause low quality of crop produced. Among the reasons that lead to the declining vegetable quality is the application of a poor harvest techniques.

Furthermore, insufficient post-harvest handling practice of harvested vegetables is one of constrains for getting better selling price in the modern market. Farmers usually do not practice pre-sorting or packaging of harvested crop due to the limited awareness and knowledge or skills or resources to invest in these activities. Therefor they only able to sell it to traditional market where price offered by collectors is generally accepted by farmers. Meanwhile, only business minded-farmers who has applied better post-harvest handling able to channel their harvested products to the modern market.



## 4.2 Weaknesses in Services and Rules/Regulations

There is number of services and enabling environment factors which affect the underlying causes of the problems highlighted above. To strengthen the market system, it is crucial that identified weaknesses in these services and enabling environment factors are the target of interventions. The key services weaknesses are include:

- Seed dealers and retailers do not promote the good quality seed of vegetable, meanwhile information of a good quality seed from seed producer do not reach small farmers
- Harvest and post-harvest handling information service is not available

**Seed dealer do not promote the good quality seed of vegetable, meanwhile information of a good quality seed from seed producer do not reach small farmers.** So far, farmers get information alone based on their experience and their neighboring farmers about the use of good quality seed. This is because those who should have an interest in providing information about the vegetable seeds do not yet provide information about the good seed to farmers. So far the provision of information about the seed to farmers is very limited both in terms of media and outreach. There is limited seed producers who have promoters or extension workers in some district in Papua to inform the use of a good seed, such as Cap Panah Merah who has product promotor in Merauke, Jayapura, and Mimika District. While the seed dealer does not have tools yet that could support seed kiosks/retailers to provide proper information about the use of seeds to farmers who buy in their kiosk. One the reasons emerged about the lack of provision of seed information to farmers is because seed dealer and seed retailers do not know yet the effectiveness of it and what incentives will be gained by them.

**Harvest and post-harvest handling information service is not available.** In order to be able to access modern market, one of essential key is fulfilling the quality standard required. However, farmers usually don't practice pre-sorting or packaging of harvested crop due to the limited awareness and knowledge of post-harvest handling. Hence, farmers cannot benefit better price from accessing the modern market.

On the other hand, most market actor who are supplying vegetables to the modern market are traders who have a wide network of local collectors and inter-island traders. When local supply is not adequately to fulfil the demand, the traders generally try to source vegetables from other islands. Furthermore, if post-harvest handling of local vegetable is improved, there may be an opportunity to export vegetables to others island. Nevertheless, there is no private sector or extension service provider who have taken the opportunity for improving post-harvest handling techniques and practices.

## 4.3 Cross Cutting Issues (Gender and Environment)

### 4.3.1. Gender

Traditionally, women in Papua are the group that has access to natural resources and traditional markets. In Papua, women play a critical role in achieving food and nutrition security. Empowering women to make free and informed choices for their family is critical in improving food and nutrition security. By considering women as food holders, women empowerment programs are tailored to support women in decision making processes that affect the nutritional well-being of the family.

However, in the case of vegetable farming, indigenous women do more roles in activities and decision making than indigenous men. Vegetable farming which basically is widely planted in the yard and it is still considered to be part of the domestic work. Indigenous men normally take a smaller role to help women in farming.

Meanwhile the gender relations of women migrants, which mostly from Java, are not different from the situation in rural areas in Java. In general, men dominate in outdoor activities, while more women are doing in domestic works. However, men are responsible for farming activities in the area although some works are done by women.

### 4.3.2. Environment

Papua Island is still categorized as an island with fertile soil. The rain throughout the year and enough humidity give farmers the opportunity to be able to plant throughout the year without drought. Also with the natural nutrient content in the soil make farmland in Papua does not require a lot of fertilizer.

However, in some areas that perform intensive agriculture such as transmigration areas are planting in the wetlands, fertilizers and other chemicals have been widely used. However, there is no environmental problems so far due to the use of fertilizers and chemicals.

## 5. Strategy for Change

The strategy is designed to strengthen the weaknesses in the current service provision and enabling environment in the market system. This takes the form of (1) identifying the market potential, through calculations to show the potential of the sector; (2) a vision of change, to envisage how the value chain or market system would operate if identified problems are resolved; and (3) a set of interventions which can be targeted at specific market actors or groups of market actors which can be engaged to drive change in the system.

### 5.1 Market Potential

**There is market opportunity to stimulate production of vegetables in order to meet the rest demand which currently still fulfilled by importing from other island.** There is potential for AIP-PRISMA to tap into the prospect of boosting the production by increasing productivity

through the use of good agricultural practices and good quality seed. There is also a potential to promote market outlook assessment for improving planting decision management. Besides, there is also scope for implementing better post-harvest handling to add economic value of the harvested vegetables.

**Table 1. Market potential calculation**

Description/Years	Total Business in the target area (s)
<b>Potential Production</b>	
Existing Production (MT) <sup>1</sup>	36,022
Potential New Production in Existing Areas (MT)	18,011
Total Potential Production (MT)	54,033
<b>Market/Production Value</b>	
Average Selling price season kg (IDR)	13,000
Current Value of Production (IDR)	468,286,000
Total value of potential production (IDR)	702,429,000
Total Value of potential production (AUD)	70,242
Total potential value of increased production (IDR)	234,143,000
Total potential value of increased production (AUD)	23,414

*Source<sup>1</sup>: Statistics of Seasonal Vegetable and Fruit Plants Papua Provinces 2015*

## 5.2 Vision of change

Focusing on achieving the potential outlined above for the vegetable sector in Papua, a vision of change can be outlined for both the sector and service levels. The vision of change at the **sector level** is to increase production and productivity of vegetable to substitute imports of vegetables by promoting GAP and good quality seed. At the **service level**, it is envisaged that farmers will have improved access to: (1) good quality seed, (2) information and extension,

We envision that traders, collectors, distributors, transporter and government would be involved in providing a range of these services, good agricultural practices including post-harvest and distribution services. Seed and information services would also involve input suppliers (seed or fertilizer companies) and agro-input retailers.

## 5.3 Interventions areas and pathways to systemic change

It is crucial that interventions are designed which are 'systemic' so that outcomes are not dependent upon the project or development partner for sustainability. This means that AIP-PRISMA should not seek to provide services (or at least only temporarily) but rather enter the market system in a catalytic manner to tackle the service weaknesses in existing market actors.

Based on our analysis, key intervention area necessary to transform the vegetable sector in Papua:

Intervention Areas	Approved, on-going, or completed interventions and intervention concepts
<b>Intervention Area 1:</b> Promote the provision of knowledge and the use of good quality seed and GAP	Intervention is running with EWINDO as partner
<b>Intervention Area 2:</b> Promote the provision of harvest and post-harvest handling information service	

### **Intervention Area 1: Promote the provision of knowledge and the use of good quality seed**

Activities aiming for increasing productivity may involve: (1) supporting promotion of suitable of vegetable seed, (2) supporting information provision to farmers through extension services and involvement of seed retailers, (3) supporting farmer capacity building for good cultivation practices of vegetable farming. Since women are involved in the planting of vegetables and influence decisions around seed and pesticide usage, as well as trading practices, it will be important that exposure to the benefits of vegetable planting in rainy season and information on better practices are accessible to women and tailored to their needs.

In order to promote better cultivation, AIP-PRISMA will work with seed and input dealer to promote cultivation techniques knowledge. Vegetable farming practices which will be introduced may involve good seeds, good land preparation, sowing and transplanting, and maintenance of crops (fertilization and crop protection).

EWINDO is interested to provide extension service through its field staff to the farmers. EWINDO field staff facilitates training sessions where groups of farmers are given the opportunity to ask questions, discuss techniques and learn from the trainers as well as from each other. The topics are linked to the growth stages of the demonstration fields that are being observed by the farmers. In addition to training farmers and key farmers, EWINDO will also offers Training of Trainers to other service providers, government and private sector actors.

### **Intervention Area 2: Promote the provision of harvest and post-harvest handling information service**

The introduction of appropriate harvest and post-harvest services can allow farmers to realize higher prices through two channels—first of all, the ability to harvest vegetable appropriately can give farmers greater chances to have good quality product, and secondly, better post-harvest practices, equipment, and technologies can reduce or prevent deterioration in the quality of vegetable. Appropriate post-harvest handling is important for reducing impurities as well as for minimizing losses when vegetable transported. There is potential to work with traders and transporters who have incentives to secure better quality vegetable.

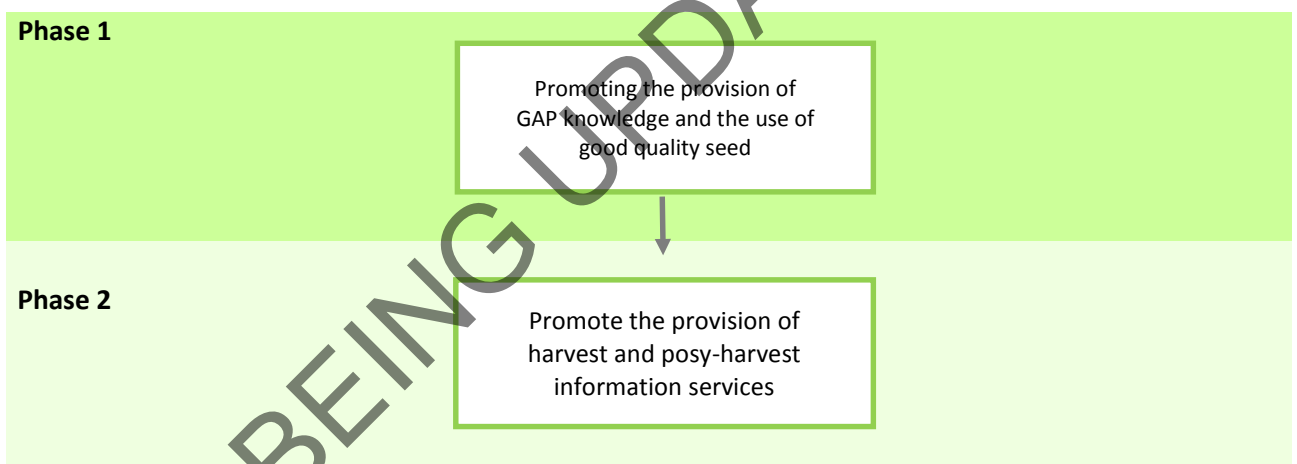
The key objective is to retain quality of fresh harvested vegetables as well as improve market

value of the crop. The efforts which will be included are (1) supporting farmers in understanding how to effectively engage with market actors aside from middle men or collectors who traditionally buy vegetable in low price, (2) supporting capacity building programs of post-harvest handling include proper sanitation, packaging, storage and transportation.

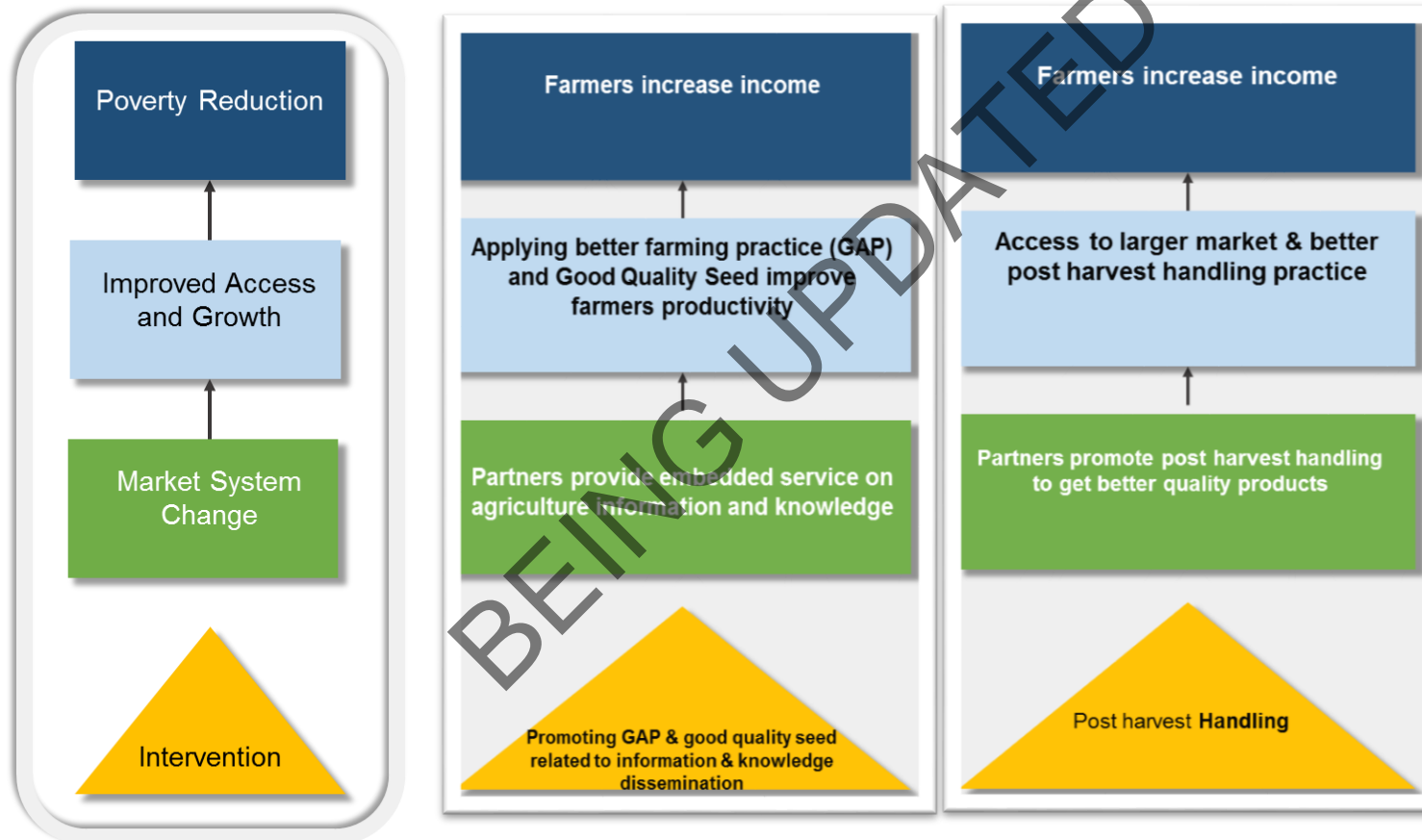
Other possibility is engagement of farmers, local traders and collectors, input retailers to promote potential value added products such as pickles from tomato, pumpkin or shallot, or local “*sambal*” from chilies. The vegetable processing can be promoted to empower housewife aiming for improving livelihood of vegetable household.

#### **5.4 Sequencing and prioritization of interventions**

**It is recommended that the interventions in Papua vegetable sector be implemented in two phases. In the first phase**, the focus will be on increasing production and productivity by *promoting the provision of GAP knowledge and the use of good quality seed*. Then **the second phase** will focus on improving market access. This phase will be achieved through *promoting the provision harvest and post-harvest information services*.



## 5.5 Sector Vision of Change Logic





## Annex 1. Intervention Logic Analysis Framework (ILAF)<sup>11</sup>

(1) Problem / Symptom	(2) Underlying cause	(3) (4) Services and Enabling Environment	(5) Service weaknesses/ underlying causes	(6) Interventions	Service Provider / Partner
Farmers experience low productivity because they do not apply GAP and good quality seed	Limited availability of good quality seed Farmers lack of information of good quality seed	Seed dealer/retailer GAP and Seed information services	<ul style="list-style-type: none"> <li>▪ Seed dealer do not promote the good quality seed of vegetable</li> <li>▪ Limited agronomist and government extension services</li> </ul>	<b>Intervention 1:</b> Promote the provision of knowledge on GAP and good quality seed	<ul style="list-style-type: none"> <li>▪ Extension workers</li> <li>▪ Seed Dealer/Retailer</li> </ul>
Farmers lack of information and knowledge of harvesting and post harvesting handling	There is no provider that provide information as well as train famers on harvesting and post-harvesting handling	Harvest and post-harvesting handling service	Harvest and post-harvest handling information service is not available	<b>Intervention 3:</b> Promote the provision of harvest and post-harvest handling information service	<ul style="list-style-type: none"> <li>• Extension workers</li> <li>• Collector</li> </ul>

<sup>11</sup> Adapted from *Toolkit for Market System Analysis, International Development Enterprises (iDE), 2012*

## Annex 2. Gender Roles Analysis

No.	Activity in production cycle	Task division		Explanation
		Male	Female	
1	Decision on type of commodity to plant		√	Discussion between men and women, but mostly decision dominated by women based on economic reason.
2	Buy Seeds		√	Women usually buy seeds at local market while shopping groceries
3	Seeds selection for planting		√	Women sort the seeds to be planted
4	Field preparation and cultivation	√		Men but when labor insufficient using the service of male worker
5	Planting	√	√	Cooperation between men and women
7	Fertilizing plant	√	√	Farmers do not use chemical fertilizer. They use organic one from and apply it by men and women.
8	Watering			No watering activities
9	Weeding		√	Timing decision and weeding activity by women
10	Pest control	√	√	Pests mostly come from their pets. Male and female control the pests together.
11	Harvesting	√	√	Men and women together but when labor insufficient using the service female worker.
12	Transportation		√	From field to home and home to market.
13	Selling		√	Selling, where and price decided by women,