Australian Aid

VEGETABLE SUB-SECTOR GROWTH STRATEGY DOCUMENT FOR WEST PAPUA

March 2016

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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	Biro Pusat Statitistik (Statistics Central Agency)
MT	Metric Ton
ILAF	Intervention Logic Analysis Framework
YBTS	Yayasan Bina Tani Sejahtera
EWINDO	East West Seed Indonesia
WHO	World Health Organization

1. Executive summary

In 2012, Indonesia was the 14th largest vegetable producer in the world and contributes to only 1 percent of the total global production. In 2012, Indonesia produced a total of 10,762,704 tons of vegetables of which the total World production was 1,106,388,709 tons. Based on the BPS data in 2014 the Indonesian vegetable production reached 11,436,860 tons consisting of 22 types of vegetables.

Indonesia's vegetable production has increased by an average of 2.7 percent per year, since 2003 from 7.37 million tonnes to 11.07 million tonnes in 2013. Despite being the largest vegetable producer in Southeast Asia, Indonesia's vegetable imports is constantly growing faster than its export, and during the last ten years, trade balance of Indonesia's vegetable commodities was deficit. According to (Arsanti, et.al, 2006), the increase in import-export ratio over the years is mainly caused by decreasing competitiveness of local products since imports have a better quality and competitive price.

Domestic demand for vegetables has been increasing along with the increase in volume of vegetables imports, which accounted up to US $ 644 million in 2014[1]. This growth was due to the increasing domestic demand, coupled with awareness towards nutritional adequacy rate, and Indonesia has rapidly been increased its production and farming land area since the drastic declining trend of farming land area in 2010. Furthermore, vegetables have tremendous prospects as the trend of consuming healthy food is increasing in today's modern society. The growing tourism industry will also trigger the demand for fresh vegetables.

Horticulture farming dominated agriculture business in West Papua whereas 47,940 household worked in horticulture farming or 68 percent of total number of farmer household. However, that number decreased around 7.33 % of 51,731 farmer households in 2003. This decrease was due to the increasing appeal of other economic sectors, hence family members or the coming generation shifted to other sector, for instance, worked in government offices, construction, and manufacture and service industry. Greater Manokwari had the highest number of farmer households in 2013, i.e. 21,314 farmer households. However, that number was decreasing compared to 26,265 farmer households in 2003. Meanwhile, the number of horticulture farmer household in Manokwari at the same year was 14,225.

Some main vegetables in Manokwari are still imported from out of West Papua. Main vegetables, for example, potatoes, carrots, shallots, tomatoes, chillies and others are imported because the production is still 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.

In general, vegetable farming in West Papua is distinguished based on lowland and upland farming. Lowland farming is done by transmigrant and indigenous farmers. Transmigrant farmers cultivate more high-valued crops than indigenous that tend to plant fast harvested vegetables like leafy vegetables. Upland farming is conducted only by indigenous

[1] *Source: BPS, Processed by Trade Data and Information Center, Ministry of Trade*

farmers. Despite the high-valued vegetables they produce, upland farmers produce them in low quantity.

Vegetable farming in West Papua is characterised by small farm sizes which are lack of knowledge in crop management, in which they are spending minimal effort to grow and maintain their crops with limited resources and external inputs. Even though there is availability of a large range of chemicals and agriculture inputs in the agro-retailer kiosks, smallholder farmers in some districts do not use pesticides and fertilizers. In Greater Manokwari, most farmer's main source of income is horticulture including vegetable farming, and consequently they tend to be satisfied with any yield gained from the vegetable farming. Furthermore, the limitation of farming techniques and knowledge contribute to poor management of vegetable farming in West Papua.

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 West 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

Global vegetable production has been experiencing a remarkable increase. Output has been growing by 2.9 percent annually between 2000 and 2012. The world production was estimated at 1.1 billion tonnes in 2012 and was led by China which accounted for over 51% of total production. The world's fifth-largest vegetable producers were China, India, United States of America, Turkey and Iran (Islamic Rep. Of)[2].

[2] *Source: http://www.geohive.com/*

Figure 1. Global vegetable production trend[3]

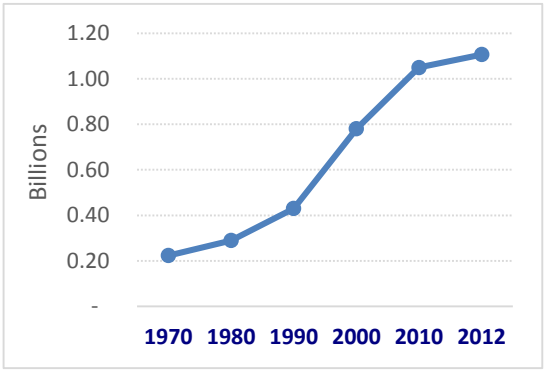
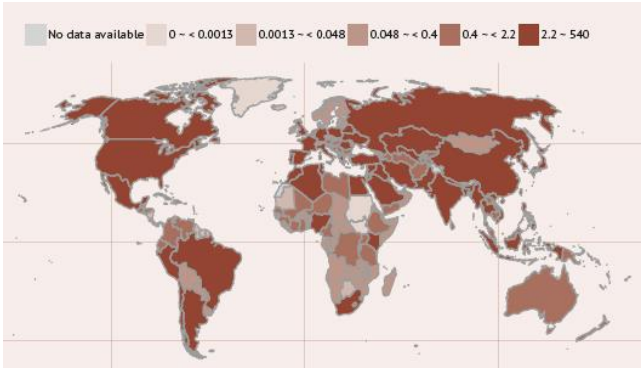
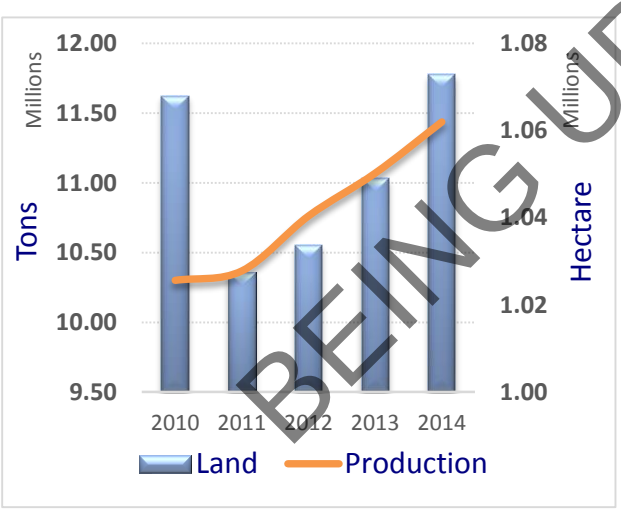


Figure 2. Vegetable producing countries, including melon (in million tonnes, 2010)



In 2012, Indonesia was the 14th largest vegetable producer in the world and contributes to only 1 percent of the total global production. In 2012, Indonesia produced a total of 10,762,704 tons of vegetables of which the total World production was 1,106,388,709 tons. Based on the BPS data in 2014 the Indonesian vegetable production reached 11,436,860 tons consisting of 22 types of vegetables.

Figure 3. Vegetable Production and Harvested Area in Indonesia[4]



Indonesia's vegetable production has increased by an average of 2.7 percent per year, since 2003 from 7.37 million tonnes to 11.07 million tonnes in 2013. Despite being the largest vegetable producer in Southeast Asia, Indonesia's vegetable imports is constantly growing faster than its export, and during the last ten years, trade balance of Indonesia's vegetable commodities was deficit. According to (Arsanti, et.al, 2006), the increase in import-export ratio over the years is mainly caused by decreasing competitiveness of local products since imports have a better quality and competitive price.

Domestic demand for vegetables has been increasing along with the increase in volume of vegetables imports, which accounted up to US $ 644 million in 2014[5]. This growth was due to the increasing domestic demand, coupled with awareness towards nutritional adequacy rate, and Indonesia has rapidly been increased its production and farming land area since the drastic declining trend of farming land area in 2010. Furthermore, vegetables have tremendous prospects as the trend of consuming healthy food is increasing in today's modern society. The growing tourism industry will also trigger the demand for fresh vegetables.

[3] *Source: Geohive: http://www.geohive.com/charts/ag_vegetables.aspx*
[4] *Source: BPS - Statistics Indonesia and Directorate General of Horticulture*
[5] *Source: BPS, Processed by Trade Data and Information Center, Ministry of Trade*

Approximately 1 million hectares of Indonesia's land area is occupied by vegetable farm (2 percent of the total agricultural land) with a potential additional of 1.3 million hectare of which is converted from rice farming to vegetable farming during the dry season. According, to the BPS figures the average farm size for horticulture crops is 0.84 ha and for vegetable crops is less than 0.5 ha. Most farms are small-holder farmers that have limited technical skill and knowledge to perform good agriculture practices in order to optimize their yields required by the market demand.

Government of Indonesia prioritized agriculture sector and reducing regional imbalances as one of its major development goals in the recent years, considering that agricultural growth is the key to reducing poverty and ensuring food security. The development goals of Government of Indonesia are disrupted due to periodic climate shocks that impacts agriculture sector and thus aggravating food security and poverty situations. On an annual basis, 300,000 ha of crop lands are rendered unproductive due to deficient years even in so-called 'normal years'. Periodic El Niño could amplify the area to 1 million ha translating to 5 million tons of food grains.

3.1.2 Local context

West Papua is a quite new province which has been separated from Papua province in 2003. This province is one of the poorest provinces with poverty rate of 26.26 percent in 2014 that is higher than national poverty rate of 10.96 percent. Around 48.71 percent of the population work at agriculture sector, however with that high percentage of workforce, agriculture sector does not contribute much to GDP, only about 11.65 percent. This indicates that productivity is agriculture sector is low, only 1.48 percent in 2013. This becomes one of the reasons why agriculture sector is now left by its workforce.

In 2013, horticulture farming dominated agriculture business in West Papua. It is shown from the number of household that worked in horticulture farming that was 47,940 or 68 percent of total number of farmer household. However, that number decreased around 7.33 % of 51,731 farmer households in 2003. This decrease was due to the increasing appeal of other economic sectors, hence family members or the coming generation shifted to other sector, for instance, worked in government offices, construction, and manufacture and service industry.

Greater Manokwari is one of the main producers of vegetable in West Papua along with Kabupaten Sorong before divided into three districts in 2013. Greater Manokwari had the highest number of farmer households in 2013, i.e. 21,314 farmer households. However, that number was decreasing compared to 26,265 farmer households in 2003. Meanwhile, the number of horticulture farmer household in Manokwari at the same year was 14,225.

Infrastructure and transportation are still major issues because the quality remains poor. These lead to high transportation cost that affects the higher price of goods including agriculture products. Vegetable farmers especially in Arfak Mountain -an upland farmland- should pay high transportation cost to sell their vegetable products e.g. cabbages, spring onions, carrots and potatoes to the central market in Manokwari. Their products are often less competitive than vegetables imported from other islands

Some main vegetables in Manokwari are still imported from out of West Papua except green leafy vegetables that can be fulfilled from West Papua's farm lands. Main vegetables, for example, potatoes, carrots, shallots, tomatoes, chillies and others are imported from Surabaya, Makassar and Manado. Those vegetables are imported because the 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.

In general, vegetable farming in West Papua is distinguished based on lowland farming and upland farming. Lowland farming is done by transmigrant and indigenous farmers. Transmigrant farmers cultivate more high-valued crops than indigenous do e.g. chillies, tomatoes and shallots. Indigenous farmers tend to plant fast harvested vegetables like leafy vegetables. Upland farming is conducted only by indigenous farmers. Despite the high-valued vegetables they produce, upland farmers produce them in low quantity.

Quality of some vegetables produced in West Papua, particularly leafy vegetables are good. However, due to the lack of post-harvest handling when being transported, the quality of vegetables often decreased when it arrived on the market. Meanwhile, the quality of the vegetables commonly grown in the highlands in Pegunungan Arfak such as tomatoes and carrots quality is still low.

3.2 Sector dynamics

3.2.1 Market overview

Vegetable farming in West Papua is characterised by small farm sizes which are lack of knowledge in crop management, in which they are spending minimal effort to grow and maintain their crops with limited resources and external inputs. Even though there is availability of a large range of chemicals and agriculture inputs in the agro-retailer stores, smallholder farmers in some districts do not use pesticides and fertilizers. In Greater Manokwari, most farmer's main source of income is horticulture including vegetable farming, and consequently they tend to be satisfied with any yield gained from the vegetable farming. Furthermore, the limitation of farming techniques and knowledge contribute to poor management of vegetable farming in West Papua.

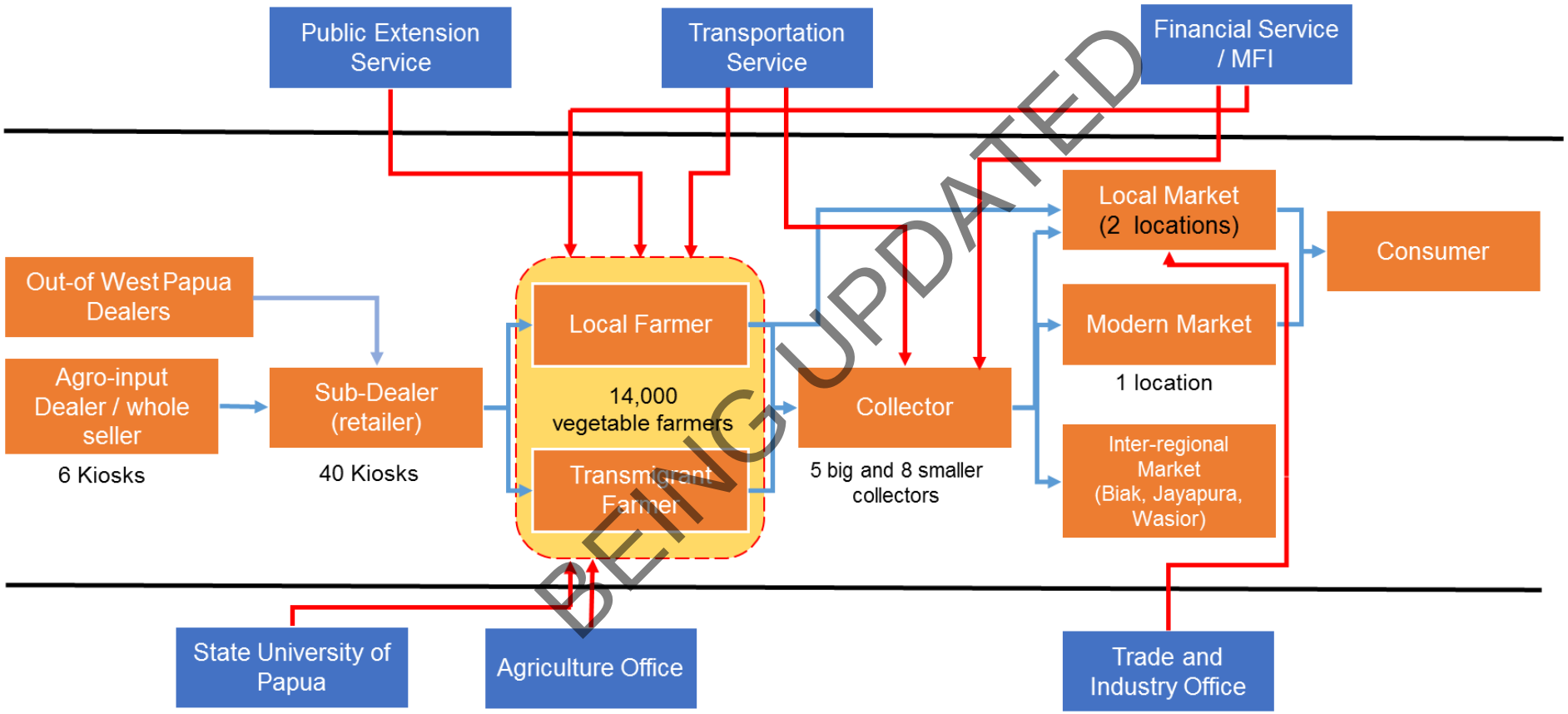
Nevertheless, trans-migrant farmers who most live at lowland in Manokwari own or operate larger farming land and recognize vegetable farming as a profitable business and have started adopting it as their main livelihood. Compared to the farmers in upland, farmers in lowland have better understanding and knowledge about farming practices of vegetable farming.

In Greater Manokwari, 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 West Papua and particularly in Greater Manokwari 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 to traders in the local market. The crops are then traded in traditional markets, while few quantities are traded to hotels and restaurants. Besides, if there is oversupply sometimes it is also channeled to markets in other provinces or ferried to other neighboring Islands.

3.2.2 Sector map



3.2.3 Core value chain

Inputs

The main sources of planting material are from input retailers, and only small percentage of smallholder farmers use retained seed. Various kind of seed brands are widely available in input distributors and smaller shops in subdistrict areas. Most farmers in Timor 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. *Panah Merah* is the most trusted brand used by farmers in Manokwari. 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 fertilisers and pesticides. Most farmers use subsidised fertilisers on their farms and will access other chemical inputs using the same network of private input retailers as other crops. Most common fertilisers used by framers are subsidised NPK, SP36, 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 fertilisers and few portion of farmers also utilize their livestock manure to be proceed become organic fertilizer. A number of chemical brands (including Nufarm, 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 inputs in several districts of Manokwari 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 seed and its use. In general, each season, farmers in Manokwari usually plant 3 to 5 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 – 0.5 hectares. Land size that can be done by farmers basically depends on the ability of farmers and labor availability. 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 (maize).

Agricultural productivity of vegetables in Manokwari is fairly low at an average of 2.54 MT per hectare below the average national productivity of vegetables reached 12.55 MT per hectare.[6] The cause is there is still lack of knowledge and skills of vegetable farmers. Farmers in Manokwari are facing limited availability of technology. Most farmers use simple planting equipment. In addition, farmers are also facing labor shortages. This is due to the discontinuous

[6] Source: Statistical Seasonal Vegetable and Fruit Plants Indonesia 2014

generation of farmers, improving learning opportunities also shift in employment from agriculture to construction, manufacturing and civil servants.

Farmers in Manokwari usually plant more than one type of vegetable even plant around 3 to 5 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 labourers (sometimes both). The use of family labour is a common practice, whereas hiring labourer to work in the field is very rare. In a most of the households, househusband usually perform the production tasks includes spraying pesticides, fertilising, watering, and transporting harvested vegetables. Meanwhile, housewife take on the role of 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 West 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 is 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 Manokwari, 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. In rare cases, when certain vegetables are scarce in the market, collectors or middleman come to villages collecting available harvest in farmers land. Together with men, women take responsibility of vegetable

selling. However, since women are considered to be better negotiators and are responsible for managing the household finances, there is a preference for women to conduct the sales of vegetables.

There are two traditional markets in Manokwari where big collectors receive vegetables from the various production centers around Greater Manokwari, namely Wosi market and Sanggeng market. Most vegetables are sold in both markets, the other portions are sold to the supermarket as well as to other regions in West Papua where there is demand at that area.

3.2.4 Supporting Functions / Services

The underdeveloped economic condition of West Papua makes only few private sectors investing in and operating there. Some private sectors coming into West 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 West 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 West 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, for example of Oransbari to Manokwari or from Prafi to Manokwari. But not for vegetables produced from the highlands of Arfak Mountain that transport to the market in Manokwari. The difficult terrain forced the farmers use four wheel drive car, which is costly, in order to get their harvest into the city.

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 West Papua, only about 16 percent of farmers. 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 centers make the extension workers unable to access the area regularly.

At the same time, input dealers 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. Wholesalers are also a weak source of technical know-how in the sector.

3.2.5 Supporting Rules and Regulations (Enabling Environment)

Agricultural policy in Indonesia focused for decades on achieving food self-sufficiency and price stability, especially in rice. 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).

The Ministry of Agriculture of Republic Indonesia regulation 358/Kpts/OT.140/9/2005 has enforced technical and quarantine requirement for import fruits and vegetable to Indonesia. The rule legislate physical quality standard of the crops as well as assign eligible ports for the incoming crops:

1. Tanjung Priok Port, Jakarta
2. Tanjung Perak Port, Surabaya
3. Belawan Port, Medan
4. Kabil Port, Batam
5. Soekarno Hatta Airport, Jakarta
6. I Gusti Ngurah Rai Airport, Denpasar
7. Makassar Port, Makassar

Supported by the availability of the nearest Makassar port, coupled with high vegetable demand, Government program toward attempts to increase farmer' income and eradicate malnutrition in Papua and West Papua has been a priority as the province has potential for the development of the vegetable sector.

For supporting Government commitment to improve the livelihood of West Papua inhabitants, the Ministry of Agriculture enforced regulation number 48/ Permentan/OT.140/10/2009 about Good Agricultural Practice for Fruit and Vegetables. The regulation is mainly aimed to:

1. Increases production and productivity
2. Increases quality and safety of harvested crops
3. Increases production effectiveness
4. Improves efficiency of utilization of natural resource
5. Maintains soil fertility, environment sustainability and sustainable production system
6. Encourages farmers and farmer groups to have a responsible behaviour toward crop produced, its implication to health and safety of themselves, and also environment.
7. Enhances crop competitiveness and its acceptance in international and domestic market.
8. Provides safety to customer.
9. Improves farmer welfare.

Local Government in West Papua on several occasions involves Papua State University to provide technical assistance to farmers. Local Government has a number of funds and programs for agricultural sector, but due to limited resources they cannot carry out their programs by themselves. In other side the university has a number of good resources faculty,

researchers and students can be assigned to assist the farmers. But according to some farmers, mentoring programs conducted by the University is not much helpful for them, because the approach is too theoretical and they do not really understand about technical and business aspects.

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 West 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 summarised as:

- Farmers experience low productivity because they do not use good quality seed
- Lack of supply management effects to high cost of vegetables distribution cost
- Farmers lack of information and knowledge of harvesting and post harvesting handling

Farmers experience low productivity because they do not use good quality seed. In general, farmers in West Papua, and especially in the Greater Manokwari have been using the seeds bought from seed kioks. 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. Panah Merah and Kapal Terbang, some others are type from of infamous brands that are produced in Java.

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.

So far there is no suitable information that can become knowledge for farmers to use good quality seeds so as to increase crop yields.

Farmers lack of supply management that effects to high cost of vegetable distribution cost. 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 vegetables 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.

For farmers in upland, transportation does matter. Expensive transportation cost makes their vegetable prices are uncompetitive compared to other vegetable products as well as with other similar vegetables imported from out of island. During this time there is no collector who takes vegetables on upland, so it requires farmers to go down to the market in Manokwari and sell their vegetables directly to consumers.

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. Therefore 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 are able to channel their harvested products to the modern market.

4.2 Weaknesses in Services and Rules/Regulations

There are a number of services and enabling environment factors which affect the underlying causes of the problems highlighted above. In order 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 detailed in the ILAF table and include:

- 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
- Supply management system is not available
- 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. Seed producers do not have promoters or extension workers in Manokwari that inform the use of a good seed. 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.

Supply management system is not available. At present farmers are only planting vegetables, as long as they can plant it and the harvests can be sold. While the collectors only receive vegetable crops from farmers without notifying what type the vegetable are needed, when there will be demand, how much volume are required. Indeed, traders do not consider that not only the price could provide the certainty. So, if there is a better transportation, supply will meet the demand, both in terms of quantity and time. It may provide the certainty.

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 vegetables are improved, there may be an opportunity to export vegetables to other island. Nevertheless, there is no private sector or extension service provider who have taken the opportunity for improving post-harvest handling techniques and practises.

4.3 Cross Cutting Issues (Gender and Environment)

4.3.1. Gender

Gender inequalities are embedded in the social values and daily life practices of the indigenous people of West Papua. They mainly derive from misinterpretation of cultural traditions related to dowry and clan inheritance that contribute to women's subordination to men and the resulting weak decision-making roles women have with regard to food and nutrition issues. As a result, women are especially vulnerable to food insecurity and under-nutrition. Even though poverty stands as the major factor causing under-nutrition, gender inequality worsens the situation for children and women, especially pregnant and lactating mothers.

In West 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 programmes 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 trans-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, including Greater Manokwari. 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 Greater Manokwari 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 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.

Based on our calculations, there is potential to unlock at least AUD 6.2 M in intervention area.

Table 1. Market potential calculation

Description/Years	Total Business in the target area (s)
Potential Production	
Existing Production (MT)	11,322
Potential New Production in Existing Areas (MT)	5,661
Total Potential Production (MT)	16,983
Market/Production Value	
Average Selling price season kg (IDR)	11,000
Current Value of Production (million IDR)	124,542
Total value of potential production (million IDR)	186,813
Total Value of potential production (AUD)	18,681,300
Total potential value of increased production (million IDR)	62,271
Total potential value of increased production (AUD)	6,227,100

5.2 Vision of change

Focusing on achieving the potential outlined above for the vegetable sector in West 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: (1) increase production and productivity of vegetable to substitute imports of vegetables and (2) improve market performance for farmers by establishing supply management system. At the **service level**, it is envisaged that farmers will have improved access to: (1) good quality seed, (2) information and extension, (3) post-harvest, and (4) transportation services.

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 fertiliser companies) and agro-input retailers. Finally, financial service will involves credit union and agricultural equipment companies.

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, three key intervention areas are necessary to transform the vegetable sector in West Papua:

Intervention Areas	Approved, on-going, or completed interventions and intervention concepts
Intervention Area 1: Promote the provision of knowledge and the use of good quality seed	Intervention is running with Konco Tani as partner
Intervention Area 2: Create vegetable supply management System	
Intervention Area 3: 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).

Konco Tani, main dealer of Panah Merah, is interested to provide extension service through its field staff to the farmers. Working with YBTS, Konco Tani will establish several demo plots in few districts in Manokwari. Konco Tani is planned to improve its seed retailers establish modern fresh vegetables market with a contract farming scheme, and it is the entity's interest to ensure quality and quantity of produced vegetables. Hence, it will provide cultivation techniques knowledge to the farmers.

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Intervention Area 2: Create vegetable supply management system

Introducing better planting schedules and the information of harvest time estimation and the amount of harvest of certain types of vegetables will help farmers to provide the certainty about vegetables can be sold. Similarly, the improvement of vegetable collection system accompanied by improved transportation and distribution side will assist farmers in reducing costs and then increasing farmers' income.

Collector is the most important actor in informing volume, quality, price and even other market channels that can be developed. Collector is also the party that has relationship very close with the transporter. Thus the collector and transporter become the main actors in developing the vegetable supply management system.

To create the vegetable supply management system, AIP-PRISMA will work with both the above

market actors. Farmers will be introduced with a new supply management system that is in line with improvements in the production side.

Intervention Area 3: Promote the provision of harvest and post-harvest handling information service

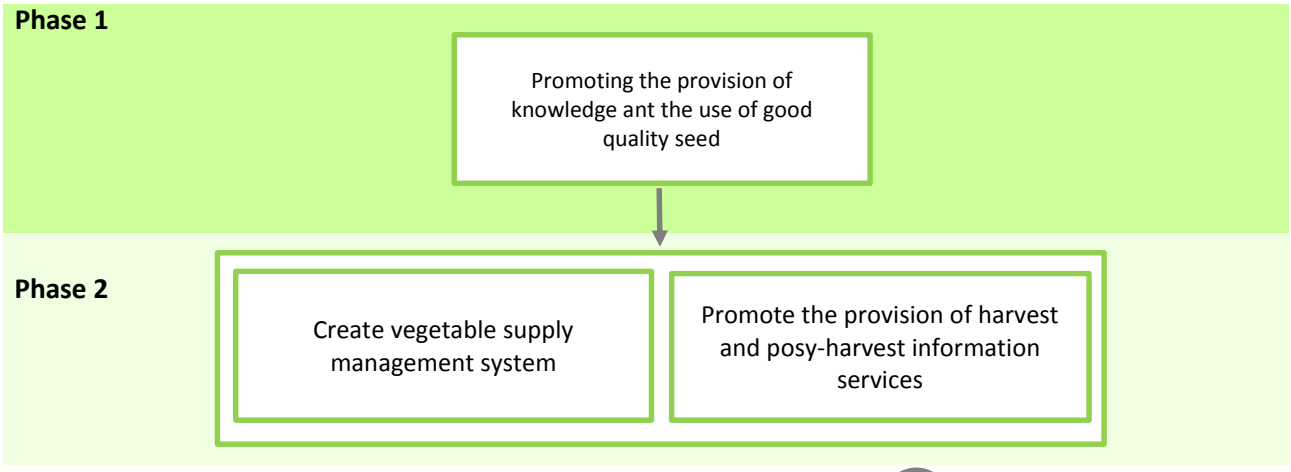
The introduction of appropriate harvest and post-harvest services can allow farmers to realise higher prices through two channels—first of all, the ability to harvest vegetable appropriately can give farmers greater chances to have good quality product, and secondly, better post-harvest practices, equipment, 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 minimising loses when vegetable transported. There is already some evidence from other provinces and countries that appropriate harvest and post-harvest handling have been highly effective at reducing post-harvest quality losses and increasing household incomes. 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, (3) supporting mechanisms for farmers groups in working together to sell their products direct to markets, whether fresh markets or other potential "modern" markets such as hotels, supermarkets and hospitals.

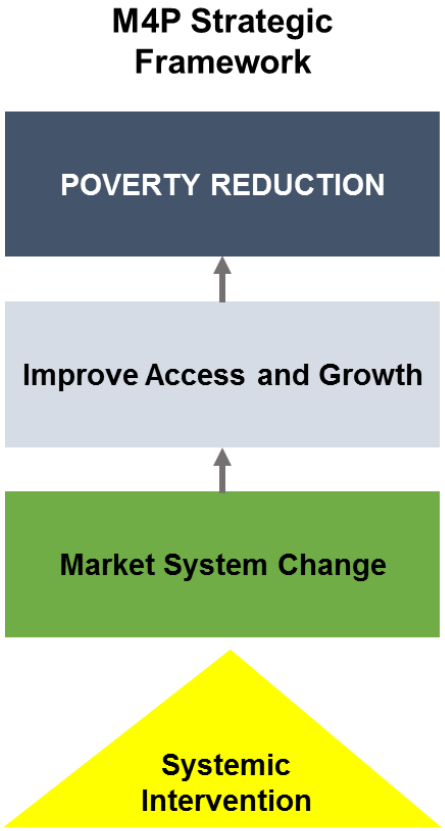
AIP-PRISMA is exploring the possibility of engagement of farmers, local traders and collectors, input retailers for a project activities to promote potential value added products such as pickles from tomato, pumpkin or shallot, or local "*sambal*" from chillies. The vegetable processing can be promoted to empower housewife aiming for improving livelihood of vegetable household.

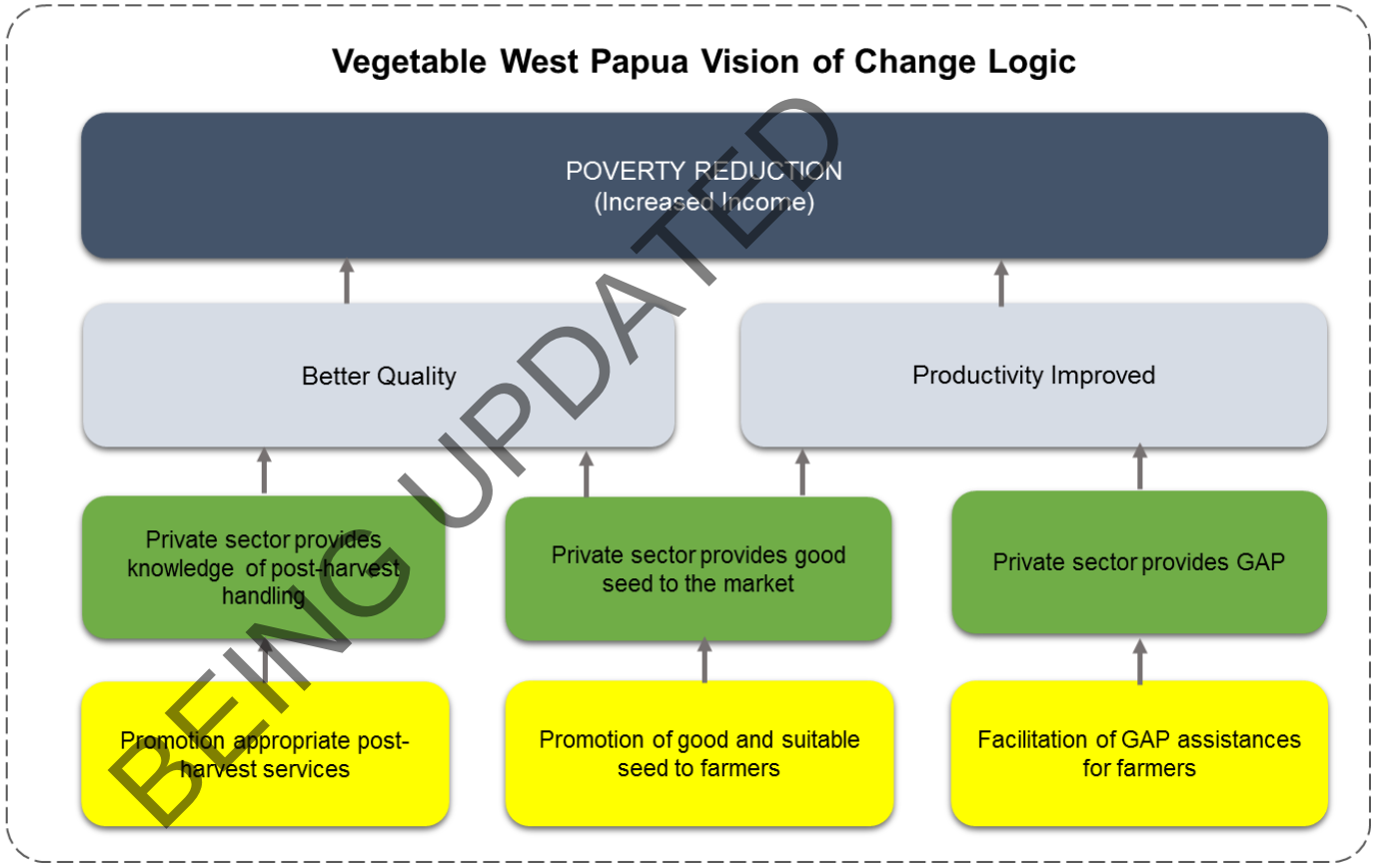
5.4 Sequencing and prioritization of interventions

It is recommended that the interventions in the West 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 knowledge and the use of good quality seed.* Then **the second phase** will focus on improving market access. This phase will be achieved through *creating supply management system of vegetable* and coupled with *promoting the provision harvest and post-harvest information services*.



5.4 Sector Vision of Change Logic





Annex 1. Intervention Logic Analysis Framework (ILAF)[7]

(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 use good quality seed	Limited availability of good quality seed Farmers lack of information of good quality seed	Seed dealer/retailer Seed information services	▪ Seed dealer do not promote the good quality seed of vegetable ▪ Information of a good quality seed from seed producer do not reach small farmers	**Intervention 1:** Promote the provision of knowledge and the good quality seed	▪ Seed Dealer ▪ Extension workers
Lack of Supply Management effects to high cost of vegetables distribution	▪ Farmers lack of vegetable distribution ▪ Farmers do not get the information related to the demand of vegetables	Supply Management System Services	Supply Management System is not available	**Intervention 2:** Create Supply Management System	• Seed producers • Collector • Public Extension Agency (Agriculture office)
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	**Intervention 3**: Promote the provision of harvest and post-harvest handling information service	• Extension workers • Collector

[7] *Adapted from Toolkit for Market System Analysis, International Development Enterprises (iDE), 2012*

Annex 2. Identified market actors

Market actors	Institution	Contact	Position
Finance	Cooperative Sami Jaya	Mr. Petrus	Manager
Input	UD Konco Tani – seed dealer	Mr. Ali Maskur	Owner
	Seed Retailer	Mr. Cucun	Owner
	Seed Retailer	Mrs. Siti	
	Seed Retailer	Mr. Mukono	Owner
Trader / Collector	Vegetable Collector	Mr. Maji	Owner
	Vegetable Collector	Mrs. Atun	
	Vegetable Collector	Mr. Nur	
Government	PUPT - Extension Department	Mr. Gunawan	Coordinator
Farmer / Group	Farmers Group	Mr. Septinus	Leader
	Farmer	Mrs. Beti Sewum	

Annex 2a. 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,

Annex 3. People Interviewed

Date	Location	Represent	Name of interviewed	Position	Contact Details
	Prafi, Manokwari	Konco Tani - Seed Dealer	Mr. Ali Maskur	Owner	
	Manokwari	Vegetable Collector	Mr. Maji	Collector	
	Manokwari	Vegetable Collector	Mrs. Atun	Collector	
	Manokwari	Vegetable Collector	Mr. Nur	Collector	
	Manokwari, Jakarta	BTS Foundation	Mr. Dani	Field Coordinator	
	Sidey, Manokwari	Farmer	Mr. Septinus	Owner	
	SP 2 Prafi	Seed retailer	Mr. Mukonono	Owner	
	Manokwari	NGO - PERDU	Mr. Risdianto	Chairman	
	Oransbari	Farmer	Mrs. Beti Sewum	Owner	
	Oransbari	PUPT	Mr. Gunawan	Coodinator	
	Oransbari	Seed retailer	Mr. Cucun	Owner	
	Oransbari	Seed retailer	Mrs. Siti	Owner	

Annex 4. Investigation Team

Ferry D Latief – Senior Business Consultant, AIP-PRISMA
Celia Siura – Deputy of Provincial Manager, AIP-PRISMA
Reslian Pardede – Head of Portfolio, AIP-PRISMA
Fradrianty Berdnovita – Consultant