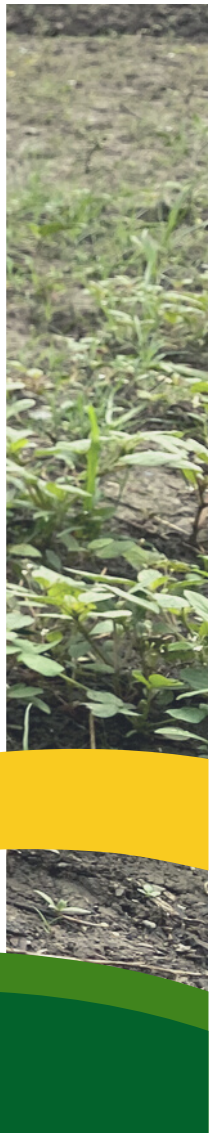




MARKET STUDY

on Open-Pollinated and Indigenous
Seed Varieties of Vegetables





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I. INTRODUCTION ^[1]

A. Background and Rationale

The Institute for Social Entrepreneurship in Asia (ISEA), in partnership with Oxfam Pilipinas is implementing a project called Establishing Community-based and Women-led Seed Banks Supporting Healthy, Safe, and Nutritious Food. This project contributes to the bigger initiative on Food Hives to Nourishing Cities, an initiative of Oxfam to spur a movement and create replicable models supporting smallholder farmers and helping consumers in urban and peri-urban centers access nutritious and affordable food.

The rich agricultural biodiversity of the Philippines is constantly under threat, experiencing losses of many valuable local as well as indigenous varieties of crops. Climate change remains a top threat to agriculture and community seed banks can play a key role to complement conservation initiatives of formal institutions such as government agencies and other academic institutions. Tomorrow's food and medicine may be found in jars of rural communities, locally managed seed banks, and many more indigenous biodiversity approaches deserve attention.

Daluyan at Ugnayan ng Organisasyong Pangkababaihan (DALUYONG) is a 5,000-strong all-women federation that the Philippine Rural Reconstruction Movement (PRRM) helped organize in 2001 to promote gender equality and women empowerment. It serves as a hub for sharing information and improving knowledge and organizational and leadership skills for effective participation in community affairs and local governance. DALUYONG also leads in the education and mobilization of rural women in sustainable area development, in advocacies and projects relating to family, community health, reproductive rights, social entrepreneurship, environment, peace, and national unity.

Daluyong have long been engaged with organic vegetable production to achieve food security and ensure healthy, safe, and nutritious food in their local communities. At their best, these initiatives were linked to local food and nutrition councils in the municipalities where they are located. Initiatives like this do not come with threats. In a recent typhoon, the community gardens of Daluyong in Marinduque were awash with rain and floodwater. They were unable to recover until now due to many factors including the availability and access to seeds.

^[1] *Based from the Terms of Reference of ISEA's Market Study on Open-Pollinated and Indigenous Seed Varieties of Vegetables*

For this Food Hives to Nourishing Cities initiative, ISEA plans to support three communities of Daluyong—Munoz and San Jose in Nueva Ecija and Gasan in Marinduque. It endeavors to set up community seed banks per site. This initiative will set up an institution-based seed resource center to be located at the PRRM Global Center in Silang, Cavite. The project will undertake in-situ seed conservation and storage, which is the planting and production of vegetable seeds in their natural habitats. Thus, the production of vegetables to ensure the production of seeds and surplus vegetables (not intended for seed production) will be marketed. Aside from the protection and storage of seeds, the seed resource center in cooperation with the community-based seed banks is envisioned to be part of a women-led social enterprise system engaged in the production, distribution, and marketing of OPV and indigenous varieties of vegetable seeds.

This project will document the process and requirements needed in setting-up the aforementioned community-based seed banks as well as the institution-based seed resource center linked to a social enterprise system producing and marketing OPV and indigenous varieties of vegetables and vegetable seeds. The project will also undertake a market study on OPV and indigenous seed varieties.

B. Project Outcome/Impact

The project is part of a bigger initiative that promotes outcomes related to achieving food security of urban and peri-urban centers and in the long term, producing healthy, safe, nutritious food in general, and vegetables in particular. A key to achieving food security in a sustainable way is ensuring the adequate supply of OPV and indigenous varieties of seeds that could sustain the production and marketing of organic vegetables. Current experience shows that OPV and indigenous varieties of seed are scarce in the market. What is abundant in the market are hybrid seeds which are often more expensive and cannot bear fruit in the next generation. These create the dependence of farmers on seed companies and big agricultural corporations that control the seed markets as they keep buying every cycle.

In the long term, this initiative will support the following:

- Setting up a robust network of community-based seed banks as part of a women-led social enterprise system producing and marketing open-pollinated varieties and indigenous seeds for organic vegetable production
- Setting up a viable institution-based seed resource center serving the needs and ensuring the sustainability of community-based seed banks of open-pollinated varieties and indigenous seeds for organic vegetable production.

II. SCOPE AND LIMITATIONS OF THE STUDY

Scope

The market research utilized primary data-gathering to trends, and insights on markets with growth potential at the national and sub-national levels and aimed to answer the main research question:

- What are the main opportunities with the best local market growth potential of open-pollinated and indigenous seed varieties of vegetables?

The results of the analysis were based on the responses of selected key informants who are directly involved in OPV seed production and marketing corroborating with the secondary documents available online or offline.

Limitations

The value chain commodities are limited to what had been identified by the key informants based on their experience in OPV seed production. These include select vegetables, rice and corn.

III. METHODOLOGY

The whole market research process was undertaken from November 2022 to January 2023. The research methodologies used in the study were interviews with key informants/actors of relevant agencies and a review of existing secondary data available offline and online.

This research captured the existing trends and opportunities of Open-Pollinated Varieties (OPV) varieties and indigenous seeds based on KII responses. In selecting key informants, snowball sampling was used due to limited market information on OPV seeds. Sources of information were technical specialists from public research stations; key relevant stakeholders from the academe and other contacts from the network of the Consultant. Despite constant coordination with technical specialists from private seed companies, the Consultant was not able to schedule a KII.

The Consultant was able to conduct the field data collection in one Nueva Ecija-based vegetable research centers to interview technical specialists. The rest of KIIs were done online via zoom platform.

IV. RESULTS AND DISCUSSIONS

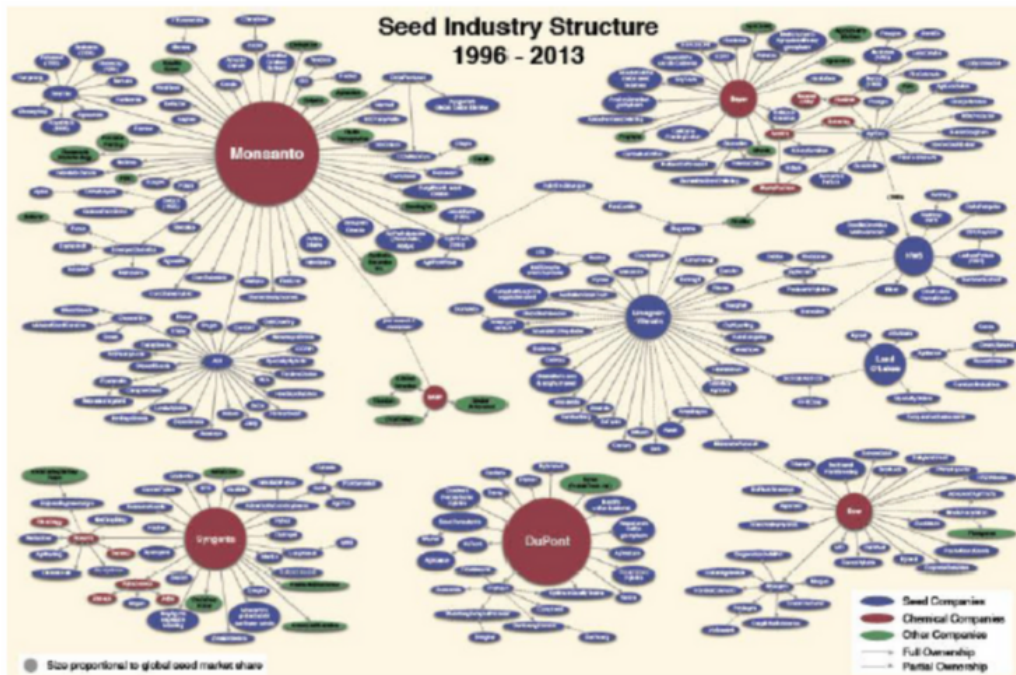
This section presents the findings of the market research including the trends and status of OPV seeds, opportunities, challenges, and recommendations in setting up OPV seeds production enterprise. Included in this market research are the staple commodities: rice and corn which can be an option for a viable enterprise. Results were based on the responses of the identified key informants.

A. Trends of Open-Pollinated Varieties Seed Production

Philippines Seed Market Trends

- The Philippines Seed Market is fragmented, with the top five companies occupying 20.76%. The major players in this market are Allied Botanical Corporation, Bayer AG, Corteva Agriscience, East-West Seed and Syngenta Group (sorted alphabetically).
- In 2021, open-pollinated varieties and hybrid derivatives had a higher share of the Philippine seed market, accounting for 65.6%. The high share was mainly due to the larger area under rice cultivation (4.2 million hectares), where open-pollinated varieties are most common. Open-pollinated seed varieties require fewer inputs, such as fertilizer and pesticides, and are less expensive than hybrid seeds.
- In 2021, transgenic hybrids accounted for 23.4% of the hybrid seed market due to their higher productivity, wider adaptability, high degree of resistance to insects, and herbicide-tolerant characteristics.
- In the Philippines, out of the total market value of open-pollinated varieties and hybrid derivatives, row crops accounted for 96.4% of the market share in 2021. The high share was due to the increased area under cultivation and the large quantity of seed requirement per unit area for sowing.
- The hybrid seed segment is expected to be the fastest-growing seed segment during the forecast period (2022-2028), registering an annual growth rate of 5.3%. The growth rate is associated with the high productivity of hybrids and the adoption of transgenic hybrids.
- In the Philippines, the adoption of hybrids and improved open-pollinated varieties resulted in many advantages, such as self-sufficiency in production, improvement in the quality of agricultural products, stability in production, high export potential, etc. Therefore, these factors are anticipated to help drive the seed market's growth during the forecast period.
- Largest Segment by Crop Family - Grains & Cereals : In the Philippines, rice is the major staple food crop that occupied a major agricultural area. Also, the increased area under corn cultivation driven the market.
- Largest Segment by Breeding Technology - Open Pollinated Varieties & Hybrid Derivatives : It is due to the higher adoption of open pollinated varieties and hybrid derivatives in rice, oilseeds and vegetables, which are the major crops cultivated in the country.
- Fastest-growing Segment by Crop Family - Grains & Cereals : It is due to the increasing area under rice and corn owing to the increasing demand for consumption, food and feed industries. Also, higher usage of hybrids in corn.
- Fastest-growing Segment by Breeding Technology - Hybrids : The fastest growth of hybrids is associated with the characteristics such as high yielding, biotic and abiotic stress resistance, high vigor and early bearing in vegetables.

Source: <https://www.mordorintelligence.com/industry-reports/seed-sector-analysis-philippines-industry>



The above figure is excerpted from the Community Seed Banking Training Module of PRRM. It shows that the control of seeds (98% of the world’s demand for seeds) is from six big companies namely Monsanto, Syngenta, DuPont, Bayer, BASF and Dow.

The image below presents the distinction between an open-pollinated variety versus a hybrid seeds:

Open Pollinated Seeds/Heirloom Seeds	Hybrid Seeds/Terminator Seeds
produced through natural crossing	seeds or plants produced through highly controlled pollination
composed of more variable plants in a population	highly uniform and generally expensive
can be recycled for several generations	they cannot be authentically recycled
could be made more genetically diverse in the field	Reduce genetic diversity
Open pollination	The result of artificially crossing two plants together
Adapted to particular places	Seeds do not produce “true to type” plants like the parents
Saved for their adaptive benefits	Bred for industrial traits.

Source: PRRM Community Seed Banking Training Module

HYV vs. Heirloom, TRVs and OPVs

High-yielding varieties (HYVs) of agricultural crops are usually characterized by a combination of the following traits in contrast to the conventional varieties: 1) Higher crop yield per area (hectare); 2) Dwarfness; 3) Improved response to fertilizers; 4) High reliance on irrigation and fertilizers - see intensive farming; 5) Early maturation; 6) Resistant to many diseases; and 7) Higher quality and quantity of crops can be produced.

Most important HYVs can be found among wheat, corn, soybean, rice, potato, and cotton. They are heavily used in commercial and plantation farms. HYVs became popular in the 1960s and played an important role in the Green Revolution, although their ancestral roots can be older. These seeds are developed in the branch of Biology, that is Biotechnology.

Monoculture crops are often planted with hybrid varieties, that are created by scientists and seed companies. Hybrid seeds are the result of artificially crossing two plants. If you save the seeds of these plants, they do not necessarily produce 'true to type', which means they will not necessarily come out like their parent plants. This is similar with people—just because your mother and father have blue eyes, they may have recessive genes from brown eyes, so you are not guaranteed to have blue eyes too. These hybrids are bred for reasons that appeal to industrial farms—mechanical handling, high yield, uniformity, and pest control. This genetic mixing reduces genetic diversity—recall in the game that diversity is important in order to respond to changes. The seeds must be purchased, because saving seed is not guaranteed, so farms across the U.S., and the world, begin using all the same varieties. There are fewer varieties available then, and these varieties will not necessarily thrive in all the different environments of this world.

Heirloom varieties such as rice or Traditional Rice Varieties (TRVs) are traditional varieties cultivated by indigenous farmers in rice terraces and passed on as heirlooms to the next generations. Open-pollinated plants are produced by seeds that have resulted from the natural pollination of the parent plant. These pollination methods include self-pollination as well as pollination achieved by birds, insects, and other natural means.

Heirloom seeds are open-pollinated or Open-Pollinated Varieties (OPVs)—which means they will grow "true to type" and produce plants like their parents from seed. They are adapted to a particular place and its climate, soil, growing conditions, and are often more resistant to the local pests and diseases and therefore climate smart. People save these seeds for this adaptability and for culinary and flavor preferences. Because heirlooms are adapted to a particular place, this reduces the need for using pesticides and herbicides, and other inputs, because the seeds will naturally do well here. Moreover, heirlooms increase the genetic diversity, because each seed changes and adapts to a particular place.

Values of Heirloom Crops: 1) Diversity; 2) Taste; 3) Adaptation; and 4) Culture

TIP: Do not plant hybrids and heirloom seeds for the same vegetable during the same growing season in a simple backyard garden. Hybrids will 'pollute' your heirlooms and you'll end up with 'junk' seeds.

Source: PRRM Community Seed Banking Training Module

B. The Focus Value Chain Commodities

Open-pollinated varieties are produced by seeds through natural pollination which may include self-pollination as well as pollination achieved by birds, insects, and other natural means. OPV seeds grow true-to-type which means that the plants produced from OPV seeds will have similar and display the same traits as the parent plant.^[2] Though, there are issues in cross-pollination if several varieties of the same crops are grown within the same plot. After pollination, seeds are allowed to mature, collected, and processed. Processing is a critical factor as it may affect the germination of seeds.

Key informants shared their knowledge and technical expertise in choosing the focused commodities for OPV seed production. These include rice (black, red or heirloom), corn (white) and vegetables ('pinakbet' but highly recommended big-seeded legumes like pigeon pea, peanut, mung bean).

[2] <https://www.gardeningknowhow.com/garden-how-to/propagation/seeds/open-pollination-information.htm>

Details	Rice (specialty)	Corn	Vegetables
Varieties/ Crops	Black, Red and Heirloom; Upland rice	White and Glutinous	Pinakbet' but highly recommended big-seeded legumes like pigeon pea, peanut; mung bean and lady-finger
Production /Source of Seeds	Farmer Producers in Benguet, Llanera Nueva Ecija (for validation) Public Research Centers (NEFVSC, DA Regional Station Centers, PhilRice) IIRR and PRRM	Nueva Ecija (San Jose and Gapan City) Pangasinan and Ilocos Public Research Centers (NEFVSC, DA Regional Station Centers) IIRR and PRRM	Public Research Centers (NEFVSC, DA Regional Station Centers) Private seed companies
Seasonality	WS and DS	WS and DS	DS, during WS (limited crops)
Demand	Ongoing project Heirloom Rice; Produced are being exported	OA Project of DA; Nueva Ecija (San Jose and Gapan City) Pangasinan and Ilocos	OA Project of DA; Small scale farmers, farmer groups, integrated schools and other government projects like 4Ps

The above table presents the trend of OPV production based on the responses of the key informants. In this research, KII results showed that the production area of rice specialty production is in Benguet. In Nueva Ecija, there are limited farmers producing black and red rice, corn and vegetables for home consumption and for next cropping. In San Jose City, there is a barangay that produces white corn all year round.

It was also affirmed during the KIIs that public research centers like PhilRice and Regional Center Station Centers of DA are producing rice and select vegetables. IIRR also provides starter rice and corn grains to farmer groups and the PRRM. PRRM has a pool of networks and contacts to outsource rice, corn and select pinakbet vegetable seeds. There are farmers in Banawe that are currently producing heirloom rice and specialty rice (black and red rice). The products are being sold to specialty markets, exported and saved seeds for next cropping. The 'Heirloom Rice Project' of the DA-Philippines can also be explored for validation.

For corn, farmers are producing at a small-scale level and they saved seeds for next cropping. In Nueva Ecija, there are areas that are producing glutinous white corn all year round for boiled white corn demand.

For pinakbet, farmers are producing only for home consumption and marketing of edible vegetables if there are surplus. Saving OPV vegetable seeds is not a common practice of farmers as confirmed by key informants from research centers that farmers repeatedly request vegetable seeds in their centers despite reminding them to multiply their initial seeds requested.

For seasonality, specialty rice and corn can be grown in 2 seasons, Wet Season (WS) and Dry Season, while 'pinakbet' crops are favorable during DS.

There is a huge demand for all these crops as there are on-going projects of DA that require OPV seeds. Also, for specialty rice, there is a huge demand from local and specialty markets as well as international markets. It was highlighted during the interview that during COVID-19 pandemic, the number of farmers, farmer-groups and institutions that are requesting OPV seeds in DA-Regional Station Centers and NEFVSC had increased.

The trend of production needs further validation as the information is limited only to the responses of the key informants and limited secondary documents online.

Vegetable

Vegetable is an essential commodity that is consumed by humans in their daily meal. It also provides essential nutrients and contributes to a healthy diet. Aside from the health benefits, vegetable production contributes to regional and national economic health as well. In the Philippines, the vegetable industry contributes more than 30 percent total agricultural production wherein the production comes from highland and lowland cropping both in the wet and dry seasons.[3]

Vegetable production is an additional source of income to many farmers, however has never been given much attention in the national food security program, unlike the other major/traditional agricultural crops such as rice, corn and coconut. While vegetables, along with fruits, began to receive government priority for development as commercial crops in the late 1970s, vegetable production, through the years, has been “accorded less attention and support by the government”. [4] From a simple horticultural activity (e.g., backyard or home gardening), vegetable production grew from 29,000 tons (valued at PhP2.8 million) in 1930 to 4.8 million tons (equivalent to PhP26 billion) in 1996. However, in 1998, production of major vegetable crops (including rootcrops, tubers, and spices) dipped to 3.6 million metric tons, valued at PhP26.8 billion). The preliminary data released by the Bureau of Agricultural Statistics (BAS) in 2002 reveal that total vegetable production declined to 3.3 million metric tons in 2001, with a total value of PhP23.6 billion.[5]

[3] HVCDP – Vegetable Commodity Profile, 2016, accessed on 20 January 2023 at http://bpi.da.gov.ph/bpi/images/PDF_file/Vegetables%20Elements%20Paper%202016.pdf

[4] Lantican 1998, p. 52.

[5] Bureau of Agricultural Statistics, (BAS), cited by Aquino, C., 2012, *The Philippine Vegetable Industry Almost Comatose*, accessed on 20 January 2023 at <https://www.focusonpoverty.org/the-philippine-vegetable-industry-almost-comatose/>

About 2.84 million tonnes of vegetables with an estimated value of PhP 3.3 billion were produced from approximately 372,260 hectares of farm land in the Philippines. However, like other agricultural crops, vegetables (fresh and processed) are being imported to fully supply the quality and quantity demand of the country wherein the imported vegetables amounted to USD886.1 million from the United States in 2017[6]. With an increasing population, an estimated population of 110.98 million[7], the country needs more fresh food including vegetables.

Under the High Value Crops Development Program (HVCDP) of the Department of Agriculture, vegetables are categorized into three criteria – Local Supply (Lowland and Highland Crops), Export Crops and Import Crops. HVCDP has identified top priority vegetables and these are the following: for Local Supply under Lowland Crops-crops are bittergourd (ampalaya), eggplant, squash, pechay (native), tomato and string beans; under Highland Crops are carrots, cabbage, cauliflower, broccoli, habitchuelas, bell pepper and pechay (chinese); export crops are okra, asparagus, ginger, garlic, shallots and hot pepper and Import Crops are onion (bulb), white potato, black pepper and mungbean.[8]



Vegetable production is marked by its highly seasonal nature, may face high working capital with limited marketing outlets, and high price variability. Further, vegetables are perishable and need good storage and distribution logistics. Despite this, vegetable production is lucrative and could provide a stable source of income to farmers.

[6] Japan International Cooperation Agency (JICA), 2019, *Survey on Issue Analysis of Food Value Chain in the Philippines*.

[7] Philippines Statistics Authority (PSA), (POPCEN 2015) <http://www.psa.gov.ph/population-and-housing/node/120080>

[8] Japan International Cooperation Agency (JICA), 2019, *Survey on Issue Analysis of Food Value Chain in the Philippines*

Traditionally, vegetables have been sold in the wet markets and trading posts. While this traditional practice continues today, other markets for vegetables such as supermarkets, hotels, hospitals, restaurants and fast-food chains are emerging. Further, the demand for vegetables is influenced by the changing lifestyles among young professionals as well as fast growth of supermarkets.[9]

The proliferation of supermarkets in the Philippines has been driven by convenience and the changing lifestyles of people who are becoming more health conscious.[10]

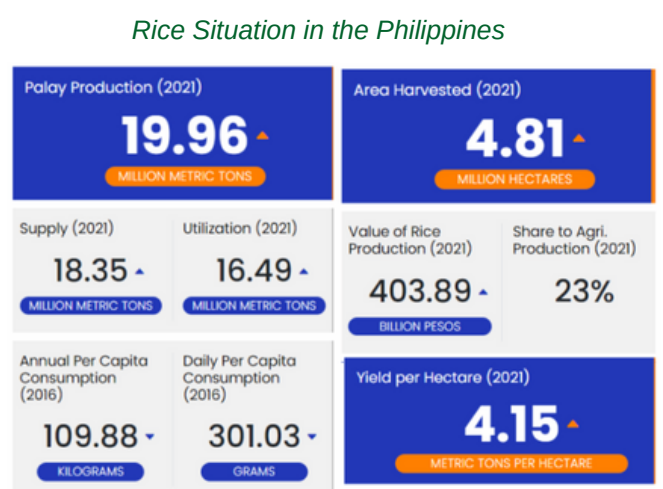
Rice

Rice has grown its importance globally and is the staple food of the Philippines. A country which depends on rice for their staple food must be rice self-sufficient due to following reasons: thinning world supply of rice, possibility of export ban, and increasing global demand for rice.[11] Various challenges from global sociocultural, environmental political landscape as well as increasing population, climate change and water scarcity affects the world's food security of rice.

In the Philippines, different programs to achieve food security have been implemented. However widely debated and argued, the terminology “self-sufficiency” was utilized by the government especially on the implementation of food security programs. “Self-sufficiency” in food staples, means that the country has the capacity and has been producing the national food requirement while at the same time maintaining a buffer stock to be used in times of need. [12] This means that a country is rice self-sufficient if it relies on its own production to meet the domestic requirements of the populace.

Global Rice Situation

- More than half of the world's population depends on rice for its major daily source of food energy and protein
- 4/5 of the world's rice is produced and consumed by small-scale farmers in low-income developing countries
- 2 billion people in Asia derive 80% of their food energy intake from rice
- During the 1990's, global rice production expanded at a rate of 1.8% per year (above the population growth rate)



[9] *Status of Domestic Markets and Consumption of Vegetables, Presented by Ramos during the 4th National Vegetable Congress, Davao City, Philippines 26-28 April*

[10] *Montiflor, M.O, Cluster Farming as a Vegetable Marketing Strategy: the Case of Smallholder Farmers in Southern and Northern Mindanao*

[11] *Philippine Rice Research Institute, (2012). 25th National Rice R&D Conference. Muñoz Nueva Ecija: Author.*

[12] *ibid.*

Issues related to seeds availability

- Available seeds are of poor quality and farmers use seeds from their own harvest for the next planting season
- Farmers use traditional varieties that are low-yielding but may have the traits desired by farmers
- Because of low income, farmers use reserved seeds for home consumption
- Farmers have difficulty getting new seeds they desire; lack of sources of seeds in marginal uplands and rainfed lowlands
- There are factors causing pressure on the supply: droughts, floods, storage facilities
- Limited seed exchange takes place within a village, or between villages but normally as a gift, and mostly among close family members (parents, brothers and sisters)
- Limited seed exchange takes place within a village, or between villages but normally a gift, and mostly among close family members (parents, brothers and sisters)
- Women in the village play an important role in the production, seed health, maintenance, and storage of seeds; but they are hardly recognized for their role
- Areas planted to traditional varieties are on the downtrend, yet these are important to farming communities as source of livelihood and food security

Corn [13]

Corn is second to rice as the most important crop in the Philippines. In spite of the fact that almost 3 million hectares are devoted to the cultivation of this crop annually, current production is not enough to meet the local needs due to low yield. In fact, since five years ago, corn importation of the Philippines has been on the increasing trend.

OPV corn are adapted by natural or manual selection to meet local conditions. The yield is comparatively lower than hybrid (2 to 3 mt per hectare). Seeds can be saved or used for next cropping and seed cost is ten times lower than hybrid. The cost of seed for a 20 kilogram pack is: PHP1,000 for Foundation Seeds, PHP750.00 for Registered Seeds and PHP for Certified Seeds.

[13] *Corn Production Technology, Department of Agriculture.*

Ways or Considerations in Maintaining Genetic Purity Before Planting

Spatial isolation

Consider an isolation distance of 200 meters from the corn fields planted with other corn varieties



Temporal isolation

Planting 3 weeks before or after with other corn varieties



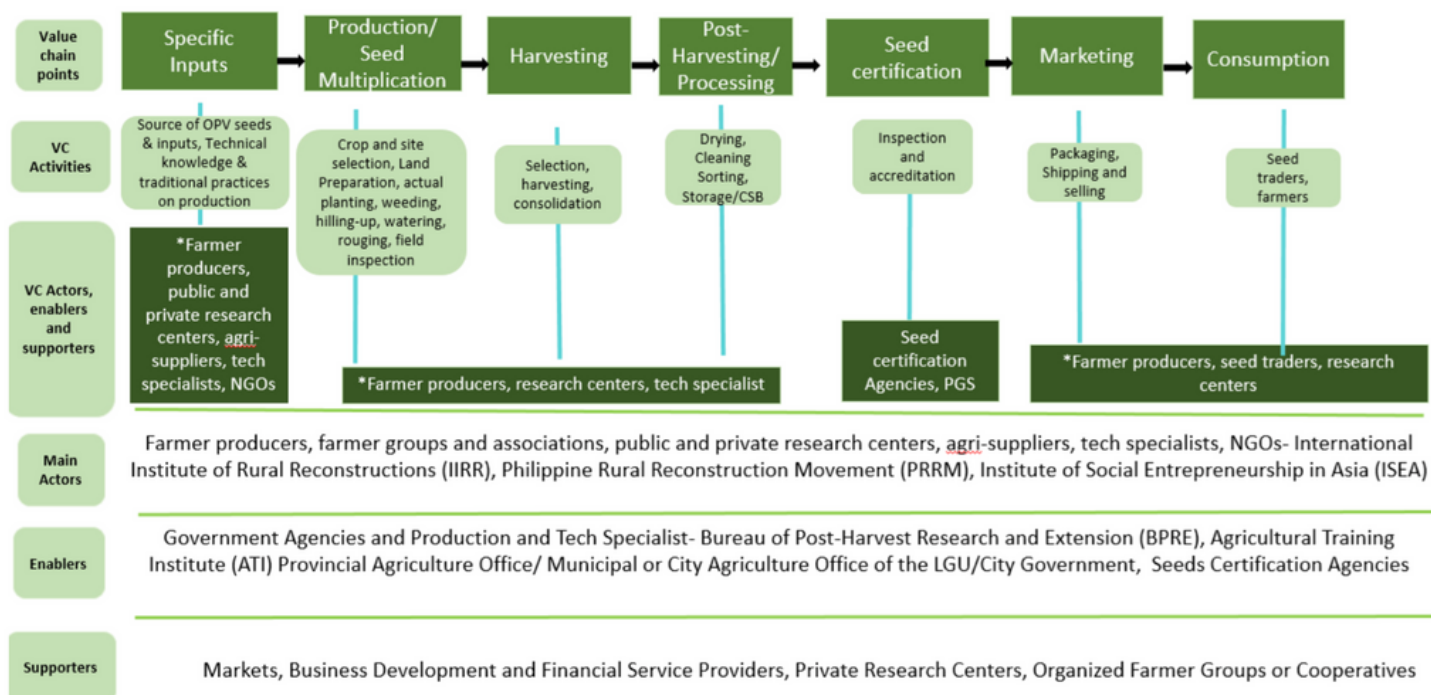
Source: Corn Production Technology, Department of Agriculture

C. The Value Chain Map in Open-Pollinated Varieties of Focused Commodities

A value chain map on Open-Pollinated Varieties seed production was created based on the results of interviews to select informants and secondary data as well as the technical experience of the Consultant both in rice and vegetable production. The value chain map presents the flow from marketing to end consumers.

Producers have limited participation in the OPV seed production value chain and markets are limited and not open for OPV varieties and indigenous seeds. For this research, the value chain commodities identified by the key informants are select vegetables, rice and corn. Please see Figure 1 for the value chain map of OPV:

Figure 1. Value Chain Map of Open-Pollinated Varieties and Indigenous Seeds Production



The above figure describes the different value chain functions of OPV such as the provision of specific inputs, production, harvesting, post-harvesting, certification, marketing, and consumption. The following discussion presents the specific activities being carried out as well as the roles of the different value chain actors. VC supporters and enablers were also shown as well as their potential support and participation. The identified commodities were: vegetables, rice, and corn.

1. Value Chain Actors of OPV Varieties and Indigenous Seed Production

Value Chain Actors	Vegetables	Rice	Corn
Main Actors	Farmers/producers, farmer groups and associations, public (NEFVRC, DA-Station Centers, IPB, BPI) and private (EastWest, Ramgo and Allied Botanical: for further validation) research centers for vegetables and PhilRice for rice; Agri-suppliers, Private and Public Technology specialists, NGOs- International Institute of Rural Reconstructions (IIRR), PRRM,		
Supporters	Government Agencies and Production and Tech Specialist- Bureau of Post-Harvest Research and Extension (BPRE), Agricultural Training Institute (ATI) Provincial Agriculture Office/ Municipal or City Agriculture Office of the LGU/City Government, Seeds Certification Agencies		
Enablers	Markets, Business Development and Financial Service Providers, Private Research Centers, Organized Farmer Groups or Cooperatives		

The main actors that comprise the market system of OPV varieties and indigenous seeds production for vegetables include public research centers such as Nueva Ecija Fruits and Vegetable Seeds Center in Nueva[14], the Regional Station Centers of the Department of Agriculture[15] and the Institute of Plant Breeding (IPB) in Los Banos[16]. PhilRice and DA-Station Centers can also provide traditional or upland rice seeds for production. Non-Government Organizations (NGOs[17]) like the International Institute of Rural Reconstructions (IIRR) has been providing starter/breeder rice and select vegetables.

Private seed companies such as Allied Botanicals, Ramgo, and East-West Seed do have OPV seeds of select vegetables hence further validation must be needed to look at if they are open for marketing.

Some farmers are also producing OPV seeds to select 'pinakbet' vegetables, rice, and corn on a small scale or limited volume for their own production and consumption. Based on the results of KII, smallholder farmer producers, farmer groups, associations, and cooperatives, integrated schools and LGUs asked OPV seeds to NEFVSC for small-scale production or backyard gardening for home consumption and marketing of surplus. The producers do not often save seeds for the next cropping as they again request the Center to provide them with OPV seeds for production. Some farmers save seeds but due to limited knowledge of selection, post-harvest, and processing, the saved seeds are not of good quality.

[14] *Based on KII responses, the Nueva Ecija Fruits and Vegetable Seeds Center, located in Science City of Muñoz, Nueva Ecija, is funded by the Provincial Local Government Unit (PLGU) of Nueva Ecija. The center is producing and marketing various OPV seeds, specifically the pinakbet vegetables. The Center is also providing training to farmers on OPV seeds and vegetables production as well as post-harvesting and processing of OPV seeds.*

[15] *Based on KII responses, the Regional Station Centers of the DA is funded by the DA-National where it produces 'pinakbet' vegetable seeds. They provide seeds for multiplier farmers hence majority of producers received seeds are not practicing saving seeds for next cropping.*

[16] *IPB is the lead agency for crop biotechnology research, retrieved on January 19, 2023, from <https://cafs.uplb.edu.ph/institute-of-plant-breeding/>*

[17] *A non-governmental organization (NGO) is a group that functions independently of any government. It is usually non-profit. NGOs, sometimes called civil society organizations, are established on community, national, and international levels to serve a social or political goal such as a humanitarian cause or the protection of the environment, retrieved on January 19, 2023 from <https://www.investopedia.com/ask/answers/13/what-is-non-government-organization.asp>*

a. Public and Private Research Centers

Due to increasing demand and preference of the majority of farmers producing at a commercial scale, the availability of hybrid seeds increases resulting in limited production of OPV seeds for focused commodities: vegetables, rice, and corn. The production of OPV varieties and indigenous seeds heavily relies on public and private research centers which include the Nueva Ecija Fruits and Vegetable Seeds Centers, for select lowland ('pinakbet') vegetables, Regional Station Centers of DA for select lowland ('pinakbet') vegetables, rice (upland and lowland) and corn. The Regional Station Centers of DA acquired breeder seeds of select vegetables from the IPB in Los Baños. PhilRice^[18] can be tapped to outsource indigenous and traditional rice seeds.

b. NGOs

There are NGOs organized to pursue various services for the betterment of women and farmer groups and could support the development of the value chain through women empowerment. This includes the IIRR and the PRRM. Support to women or women groups could be done by offering technical, linkage to various value chain actors and business development service providers to help the potential OPV enterprise be viable.

The partnership and collaboration with IIRR and PRRM can be further explored as IIRR has been supplying starter seeds while PRRM has been working with various networks to support farmer groups. IIRR could be tapped to outsource started seeds and provide technical support in the value chain of OPV varieties and indigenous seeds production while PRRM could provide linkage to other networks to outsource the seeds of the focused commodities.

2. Value Chain Enablers and Supporters of the OPV seeds production

In the value chain, enablers and supporters are needed to improve the competitiveness of selected commodities. Enablers include various institutions like the national and local government units, microfinance institutions (MFIs), Business Development Service (BDS) providers, as well as academe that will provide an enabling environment and support in the value chain of OPV seed production from input provision to marketing and end consumers.

^[18] *Philippine Rice Research Institute (PhilRice) is a government corporate entity under the Department of Agriculture created through Executive Order 1061 on 5 November 1985 (as amended) to help develop high-yielding and cost-reducing technologies so farmers can produce enough rice for all Filipinos, retrieved from <https://www.philrice.gov.ph/about-us/philrice/> on January 19, 2023*

a. Agriculture Office of the Provincial Local Government Unit and Local/City Government

The Agriculture Office of the Province and Local/City Government could provide support such as technical training on production, provision of inputs OPV seeds and organic fertilizers as well as capacity-building to organized farmer groups.

b. Bureau of Post-Harvest Research and Extension (BPRE)

The Bureau is mandated to generate, extend, and commercialize appropriate post-production technologies and practices to reduce losses, improve food and feed quality, ensure food safety, and maximize the benefits that accrue to the various stakeholders. BPRE can provide training on post-harvest, processing, handling, and storage of OPV seeds.

c. Agricultural Training Institute (ATI)

The extension arm of the Department of Agriculture that provides various technical training on agricultural production and other agri-related production.

d. Department of Trade and Industry (DTI) [19]

The DTI is a government agency in the Philippines that is in charge of the nation's commercial and industrial activities. DTI provides assistance and support in entrepreneurial and business skills.

e. Academe

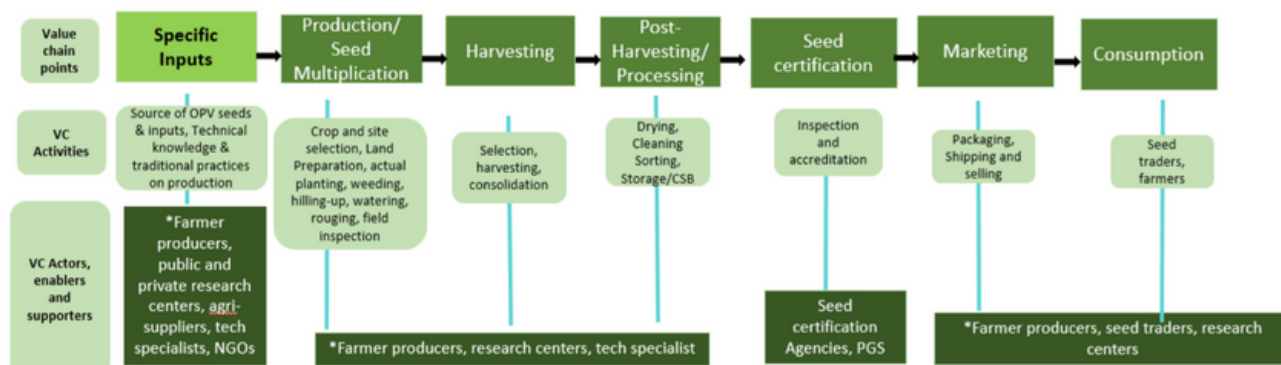
Academe or educational institutions could provide technical inputs and know how to enhance the OPV varieties and seed production as well as undertake meaningful research and development programs on focused commodities. The Mindoro State University (MSU) and Central Luzon State University (CLSU) can be tapped to support the production and establishment of a viable OPV seed production enterprise. Their scientific studies regarding OPV varieties and indigenous seeds production, management, conservation, protection, and utilization can serve as a basis for interested research groups in formulating strategic management plans and actions.

[19] Retrieved from <https://thepinoyofw.com/dti-department-of-trade-and-industry/> on January 19, 2023.

1. Value Chain Points

a. Provision of Specific Inputs

Value Chain Map of Open-Pollinated Varieties and Indigenous Seeds Production



In provision of specific inputs, source of seeds, agricultural inputs and technical knowledge on production must be taken into consideration to ensure a sustainable and viable enterprise of OPV varieties and indigenous seeds production.

Seed is the basic requirement and most significant input for sustainable agriculture. Adequate and quality seed at an appropriate time and affordable cost are the most critical and important that needed to be made available to every farmer to achieve sustainable production and bring about essential changes in the agricultural scenario of our country. The OPV value chain begins with the source of OPV seeds. Open-pollinated seeds are produced from the natural pollination of the parent plant which includes pollination methods either self-pollination or pollination achieved by birds, insects, and other natural means.^[20]

Majority of the OPV seeds are produced, kept and distributed by research centers such as the NEFVSC, IPB-LB, BPI as well as some select private research centers (Allied Botanical, Ramgo and East West). The common available OPV seeds are the 'pinakbet' vegetables, including eggplant, tomato, bitter melon, squash, beans, ladyfinger, bottle gourd, among others however key informants recommended the big-seeded legumes (pigeon pea, peanut, and mungbean) as a starter commodity for production. These legumes are less complex in production and have easier management and process for setting up the community-based seed banking (CSB).

The production of vegetables is produced all year round, with higher production yield and more variety of crops being produced from October to June (Dry Season). Only select crops that can withstand excessive water are grown during July to September (Wet Season).

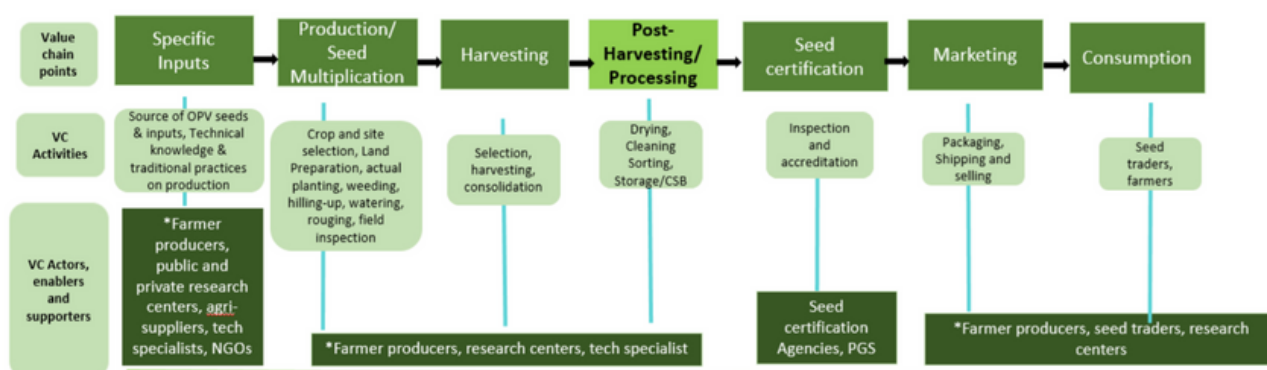
^[20] <https://www.gardeningknowhow.com/garden-how-to/propagation/seeds/open-pollination-information.htm>

Almost all producers are knowledgeable in producing OPV at a small scale-level or backyard production. However, technical knowledge in producing or saving seeds for marketing or saving seeds for next cropping are needed to ensure good quality of OPV seeds that could result in a sustainable and viable enterprise. KII results confirmed that as small as 20 square meters can start to put up an OPV seed production for various vegetables. Some can also produce using containers or recycled sacks.

For rice and corn, starter seeds can be provided by Regional Station Centers of DA, IIRR, and select farmer producers. PhilRice also implemented the Upland Rice Development Program (URDP) of the DA wherein traditional and upland seeds were distributed and propagated. This can be further looked for potential collaboration and partnership.

b. Production/ Seed Multiplication

Value Chain Map of Open-Pollinated Varieties and Indigenous Seeds Production



The PRODUCTION/SEED MULTIPLICATION function refers to the function from preparation to production and protection of the OPV vegetable and indigenous seed.

Activities and operations in OPV seeds production value chain point include crop site selection with access to good water, land preparation, actual planting (direct seeding or seedling production), management and maintenance of production (weeding, hilling-up, watering, rouging and field inspection). Production entails time, knowledge on production, hardwork and patience and to some extent minimum capital in order to carry out most of the above-mentioned operations.

Reminder: In crop selection, consider the following: 1) Quality Seeds; 2) Requirements in crop growing (Type of Soil; Lowland/Highland; Seasonality; Temperature; Light; Wind; Rain; and Resistance to pests and diseases); 3) Technical knowledge on production; and 4) Market demand.

Selection of commodities or OPV to be produced must also be based on the market demand and seasonality. For example, there are vegetables that can withstand excessive rain like eggplant. For rice, traditional or indigenous rice can withstand extreme drought. For the production area, make sure that the area has proper and good drainage to avoid further issues on crop growth and pest and diseases management.

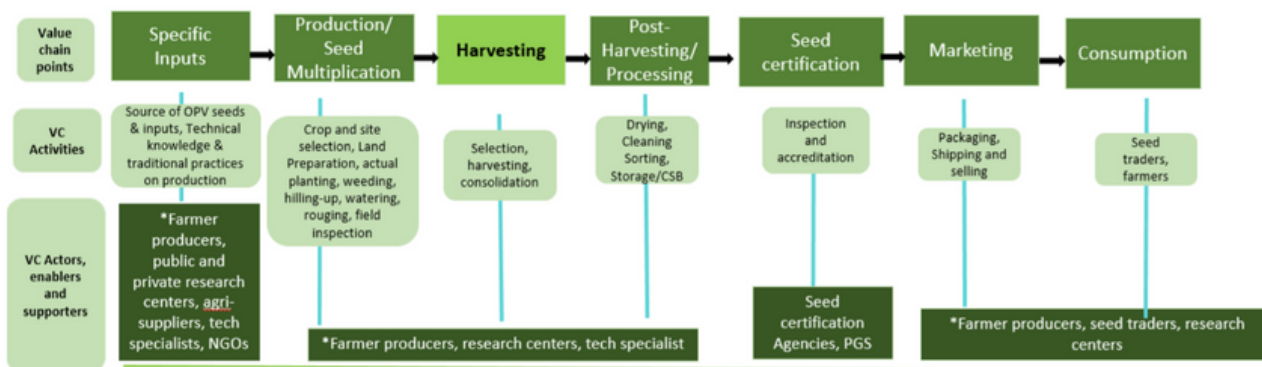
During site preparation, the producers or farmers should take into consideration the access to water as well as sites with good and proper drainage. Maintenance/ Management activities include weeding to remove unwanted species for vegetables, rice and corn while hilling-up for corn and vegetables and pruning of vegetable plants. These management practices can improve the health and growth of the plants, lessen the competition and stimulate production of plants and to avoid pest and diseases occurrence.

In vegetable production, some farmers put plastic mulch during site preparation to limit the management and maintenance operations such as weeding, hilling up and can hold water for a longer time.

During production, regular rouging and removal of unwanted plants should be done as well as regular field inspection. Unwanted plants may result in cross pollination as well as seeds mixture.

c. Harvesting

Value Chain Map of Open-Pollinated Varieties and Indigenous Seeds Production



HARVESTING is the procedure and process of gathering the matured fruit for seed collection for vegetables, and matured grain of rice and corn.

Vegetables

Quality OPV seeds require proper fruit selection. One must select fruit based on good physical appearance, with no insect pest or disease damage. After selection of fruit, allow the fruit to mature to collect seeds.

Not all fruits are selected for collecting seeds. Some OPV vegetables can be harvested for home consumption and marketing if there are surplus. Because the OPV production is at small-scale or backyard-level, the harvesting of edible fruits is mainly for home consumption. Marketing only happens if there is a surplus. Seldom produce or save seeds for next cropping as farmers keep on asking the NEFVSC to provide them with vegetable seeds. It was also highlighted that during COVID-19 pandemic, the number of farmers, farmer-groups and institutions that are requesting OPV seeds in DA-Regional Station Centers and NEFVSC had increased.

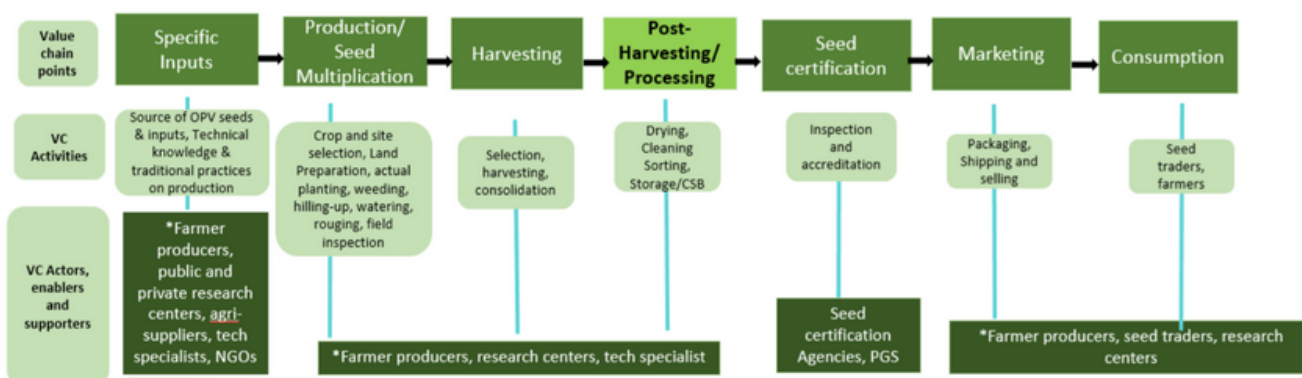
It was also mentioned during the interviews that the main purpose of the production is to ensure that the producer or farmer has access to nutritious and healthy vegetables. OPV production is low-cost, will provide food all year long, a chance to make some money and improve income over the long term through regular harvest and vegetable sales. The market for this kind of production is within the producers' neighborhood or community. No defined and regular markets as the production is small and harvesting is irregular.

Rice and Corn

For rice and corn, grains are harvested when they reach maturity depending on the varieties planted. Process of harvesting rice and corn can be further looked at. BPRE, PhilRice, or Regional Station Centers of DA can be tapped to provide technical assistance on harvest and post-harvest technologies

d. Post-Harvesting/ Processing of Seeds

Value Chain Map of Open-Pollinated Varieties and Indigenous Seeds Production



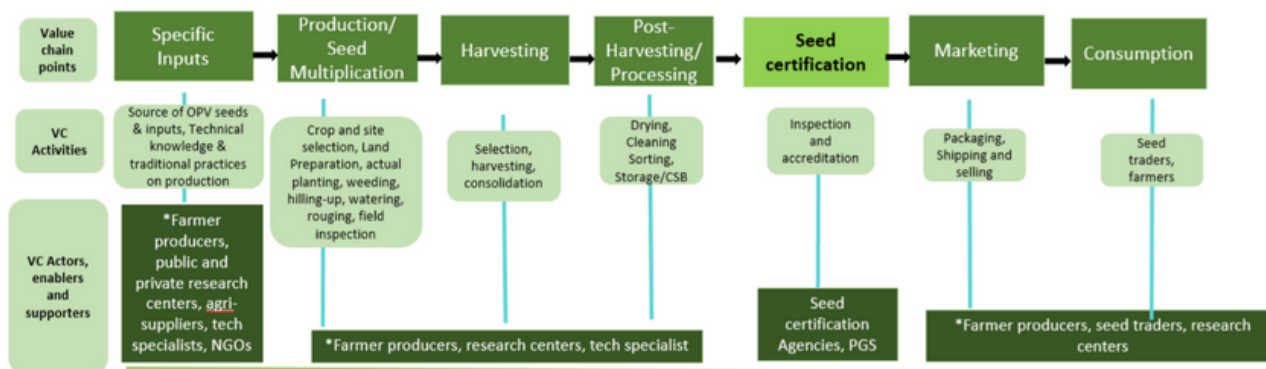
This function, POST-HARVESTING/PROCESSING focuses on the initial processes undergone by the producers or farmers. In this stage, activities such as drying (air or sun dry), cleaning, sorting, packaging and storing of OPV seeds take place.

Most of the time, primary processing begins at the level of the producers. Depending on the crops, activities in this value chain point vary. Drying may be done through air or sun. Cleaning, sorting, and packaging of OPV seeds are done inside either in a warehouse or clean rooms. However, please note that this process entails training and technical skills update and will vary based on the commodity being produced, processed and stored.

For this value chain, further data collection should be done per crop with the support from technical agencies such as NEFVSC, PhilRice, BPRE, IIRR, academe and other technical agencies, private or public, that provides support in post-harvest or processing of OPV seeds.

e. Seed Certification

Value Chain Map of Open-Pollinated Varieties and Indigenous Seeds Production

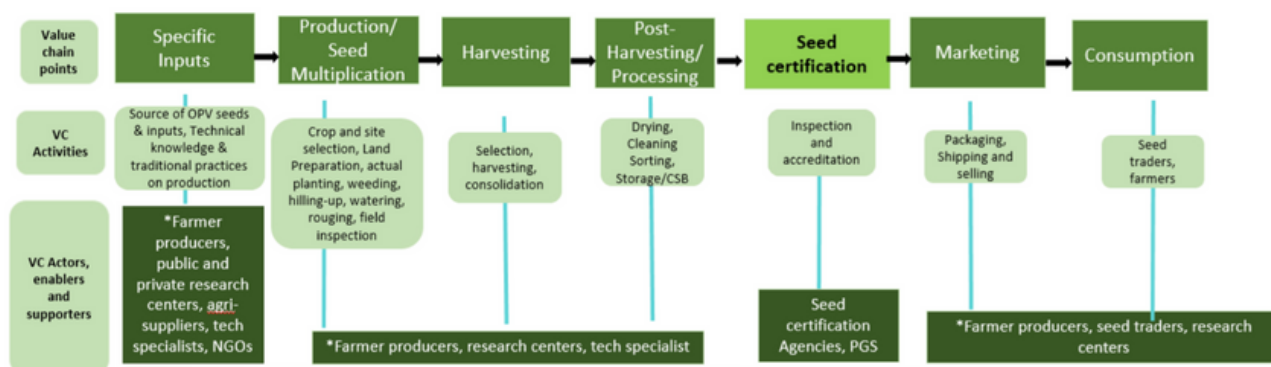


If producers are aiming to sell their produced OPV seeds, accreditation from a seed certification agency should be done. For this market study, seed certification and participatory guarantee systems need to further look at to know the process and procedures of seed certification. Producers should comply with the requirements and be an accredited seed grower so they can be allowed to sell their produced OPV seeds.

Crops Eligible for Certification

Only crop varieties, classes, cultivars, hybrids approved by the Philippine Seed Board/National Seed Industry Council shall be eligible for certification. This includes rice, corn, mungbean, soybean, peanut, sorghum, tobacco, wheat, white potato, selected fruits and plantation crops.

Value Chain Map of Open-Pollinated Varieties and Indigenous Seeds Production



Selling of OPV seeds is not an open market. Availability of OPV seeds are limited to research centers (NEFVSC, IPB-UPLB, BPI, DA Research Station Centers, PhilRice, IIRR), private research centers and some small-scale producers. Please see the below table for the list and price of OPV seeds:

Crops	Variety	Amount Per Kilo
Cucurbits		
Squash	San Leonardo	2,900.00
Sponge gourd (Patola)	Long	2,900.00
Sponge gourd (Patola)	Native	2,900.00
Bottle gourd (Upo)	1042	1,900.00
Bottle gourd (Upo)	Tambuli	1,900.00
Solanaceous		
Hot pepper (Sili)	Inokra	3,800.00
Hot pepper (Sili)	Sweet	4,000.00
Hot pepper (Sili)	Tingala	3,800.00
Eggplant (Talong)	DLP	3,800.00
Eggplant (Talong)	N.E. Green	3,600.00
Legumes		
String beans (sitaw)	6001	1,800.00
String beans (sitaw)	6009	1,800.00
String beans (sitaw)	Maxigreen	1,800.00
Other Crops		
Corn	I.E.S	120.00
Lady finger (Okra)	Smoothgreen	500.00
Lady finger (Okra) -organic	Smoothgreen	600.00
Kangkong	Upland	5,200.00
Indigenous		
Bataw Organic	Native	2,000.00
Patani Organic	Native	2,000.00
Saluyot Organic	Native	4,000.00

The availability of OPV seeds depends on the production of the Center. Price is also regulated by the Local Government. Further, purchase orders should be placed ahead of time (at least 6 months) for production planning. This is enough time for public research centers to plan, produce and make the volume purchase orders available.

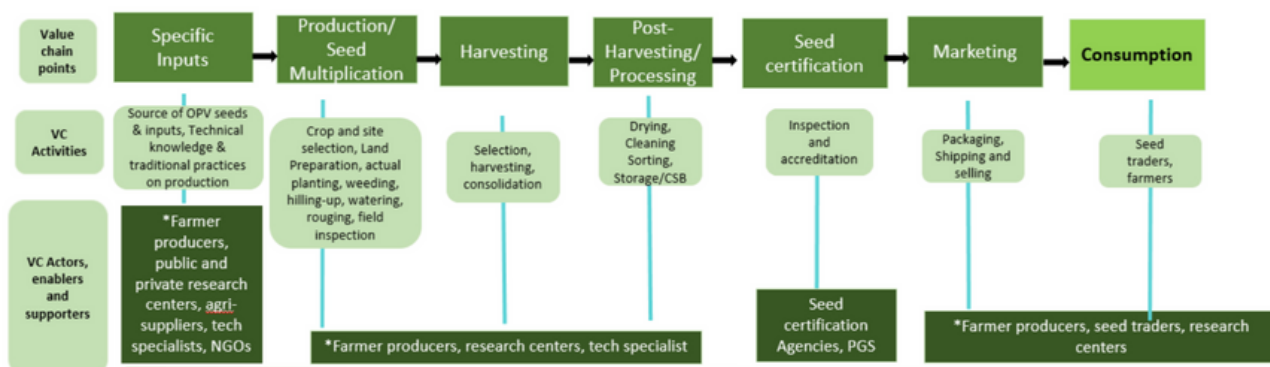
Based on KII results, the Center is providing free OPV vegetable seeds to individual farmers, farmer groups, LGUs as well as private organizations. Assorted seeds are packed approximately between 15 to 20 grams per pack depending on the available seeds produced in the Center. See below image.



Dr. Alejo confirmed that the number of packed seeds that they can provide in a farmer group depends on its members. For 50 farmer-members in a group, the Center can provide up to 250 assorted packs of OPV seeds. Requirement to avail free OPV seeds is an approved request letter from the Office of the Provincial Government in Nueva Ecija.

g. Consumers

Value Chain Map of Open-Pollinated Varieties and Indigenous Seeds Production



Small-scale farmer producers, schools, POs and farmer groups are getting OPV seeds in NEFVSC and Regional Station Centers of DA for small-scale production. The demand for OPV seeds increased during COVID-19 pandemic based on KII results and data in NEFVSC. Further, Mr. Ariel Alejo confirmed that there are some private seed traders that are buying OPV seeds like okra to NEFVSC for reselling. The demand for specialty rice is increasing both locally and internationally while corn has an all-year round demand in select areas in Nueva Ecija, Pangasinan and Ilocos. Lastly, OPV corn is 10 times lower than hybrid corn as confirmed by key informants making it more attractive to farmers to produce.

D. Concepts of Community Seed Banking (CSB)

“A community seed bank is seen as the place to obtain seeds of local crops and varieties, as commercial seed companies, extension input depots, and private dealers are marketing only modern varieties and hybrids of a limited number of crops. Community seed banks are trying to regain, maintain, and increase control over seeds by farmers and local communities and to strengthen or establish dynamic forms of cooperation among and between farmers and others involved in the conservation and sustainable use of agricultural biodiversity.” (PRRM Community Seed Banking Training Module)

Community Seed Bank^[21] is conceptualized to address scarcity of seeds, achieve seed security leading to food security and provide good quality seeds. There are various agencies/organizations that have implemented CSB such as IIRR, PhilRice and IRRI.

Seed banking or storage is one of the post-harvest activities in the value chain to secure and save seeds for next cropping. The storage of seeds varies in the crop and requires a very complicated process.

Why Community Seed Banks?

- Response to the challenge of self-sufficiency come 2013
- We have limited physical production area (2.5 million hectares)
- Fundamental to increase in production is the farmer’s access to and use of high quality seeds; and
- Seed security is vital for local and global food security and essential to poverty alleviation.

Source: Delima, 2011

^[21] *Is mainly an informal institution, locally governed and managed, whose core function is to store and preserve genetic diversity seeds for local use and future generation. It offers a way to preserve that historical and cultural value – in that sense, seed banks are like seed libraries that contain valuable information about evolution strategies of plants.*

In establishing a CSB, the following components/principles should be understood[22]:

- Seed Production
- Seed Selection, harvesting and collection and extraction
- Seed drying and storage
- Testing seed quality

1. Seed Production

Understand the concepts of seed production such as the definition, cycle, parts, and kind of seeds. It is also important to know the effect of the environment on seed production as well as the steps in seed production from timing of planting, distance, seed purity, nutrition, water and pest management.

2. Seed Selection [23]

The value of a seed lot depends on its authenticity or "trueness-to-type", germination capacity, general health and ability to withstand stresses in the field and during storage. To a large extent, selection of mother trees, of fruits in the tree and the technique and timing of seed collection determines the quality of harvested seeds. To assure a good quality seed lot, seed collection tips should be observed.

Seeds selected from mother plants should be:

- Free from weed seeds and free from viral borne diseases
- In selecting seeds, choose those that grow in the region or in climatic conditions where it should be planted
- Consider the germination percentage; select those with germination percentage of more than 90%



[22] PRRM, *Community Seed Banking Training Module*.

[23] Ibid.

VEGETABLES

Generally, it is best to have a plot of land for growing vegetable seeds. In these (relatively small) plots, you should plant 1-3 plants whose fruits will turn into seeds at their biologically mature stage. But it is also possible to select the most biologically typical plants in a field and mark them for future seed varieties (e.g., bow ties or ribbon).

To obtain seeds of varieties, the plot should be in optimal conditions as follows:

1. In a bright place, away from wind rises and draughts
2. With enough space, especially important for cross-pollinated crops.
3. Plant only 1 variety of crops. Be aware of the cross-pollinated crops.
4. Plots must be kept absolutely clean, as weeds can choke cultivated plants, over-pollinate (single-seeded crops such as crucifers), become a source of disease and a temporary shelter for pests.
5. Seedlings must be completely healthy.
6. Special care should be taken in the care and handling of the seed patch: timely watering, feeding, prevention of pests and diseases, the timing of harvesting the fruits, and further processing

Source: PRRM, Community Seed Banking Training Module

3. Seed drying and storage

In this process, the following should be taken into considerations as it affect seed health, vigor and germination rate:

- Moisture
- Temperature
- Pest

Proper labeling should be done to avoid mixture of stored seeds.

4. Testing Seed Quality [24]

Testing seed quality is done to ensure the vigor and health of seeds.

[24] Ibid.

Seed Quality Testing

1. Seed Moisture (%)

Seed moisture content is one of the most important factors influencing the seed quality in storability. Therefore, its estimation during seed quality determination is important. Seed moisture content can be determined either by hot air oven or moisture meter. The amount of moisture in the seed determines how fast the seed deteriorates and how long it can be stored. Moisture determination is necessary, especially in seedlots whose drying and/or storage history is unknown, to know if further drying is needed before packaging, storage or shipping. The general rule is that seeds will have approximately 12 percent moisture if dried for 2-3 days in the sun. Oven-drying with controlled temperature is the most common technique to determine moisture but is not practical at the farm level. Practical approximations of seed moisture include biting (not recommended especially if seeds are treated), pinching or cracking of seeds, depending on the species.

2. Purity Test

Purity denotes the percentage of seeds (by weight) belonging to the variety under certification. The working sample is closely examined, usually with the help of a magnifying glass, and the following components are separated from it: seeds of other varieties, seeds of other crops, seeds of weeds/objectionable weeds, inert matter, defective seeds. Seed purity is a measure of the cleanness and authenticity ("trueness-to-type") of the seed lot. It may be known by inspecting the composition of a particular sample.

3. Visual Inspection

Scoop out a handful of seeds from a well-mixed seed lot. Separate the seeds of interest (pure seed fraction) from other components like seeds of other varieties and/or species (including weeds), immature, broken, undersized, shriveled, diseased (with molds/fungus or fungal stains) and infested seeds (with holes, insects' eggs and larvae, or are partly eaten by insect), chaff, stone, soil, etc. If a large portion of the sample consists of impurities, clean the seed lot first before storing, shipping or planting.

4. Flotation

Most seed species sink in water and flotation could serve to separate seeds of poor quality. Soak seeds in tap water until all seeds are thoroughly wet. This may take a few minutes to a day. Take out floating seeds and retain sinkers. Poor quality (low viability) seeds often float while those of better quality often sink. However, some species are natural floaters (e.g., coconut, nipa and teak); hence, quality must be assessed through other means.

5. Rapid Viability Test

The rapid viability test is done using chemicals. The Tetrazolium Chloride (TTZ) test is a quick method of testing seed viability (1-2 days). This is usually resorted to when seed germination takes more than a month or when quick assessment about the seed lot needs to be made.

6. Germination Percentage Germination is determined as per cent of seeds that produce seedlings under a suitable environment. Thus, germination is of great importance because the sole function of seed is to produce healthy seedlings for raising a good crop. Germination test determines the percentage of seeds that produce healthy root and shoot. In most of the cases, seeds are germinated on wet filter papers placed in petri dishes. The petri dishes are kept under controlled conditions in an incubator. For most species a temperature between 18-25 °C is adequate; however, for some species a specific temperature may be required. The duration of germination test varies from 7-28 days depending upon the crops. Germinated seeds are counted at regular intervals and are removed from the petri dishes. The total number of germinated seeds would be the sum of the number of seeds that germinated at different observations.

Source: PRRM, Community Seed Banking Training Module

E. Requirements to set up an OPV seeds production and CSB

In setting up an OPV seed production and CSB, the following are the requirements based from the results of KIIs and secondary documents review:

1. Stakeholders meeting and buy in session to strategic partners and participating farmers

Conduct stakeholders meetings to identify strategic partners and participating farmers. Ensure that the potential farmer partners and stakeholders have buy-in to implement the project. Conduct assessment to determine the existing resources, needs, issues, concerns and skill set of participating farmers in developing an alternative source of income in OPV seed production and CSB. Conduct stakeholders mapping to identify their existing programs and resources that can complement the existing resources of participating farmers.

2. Training and Capacity Building to Participating Farmers

Provision of technical training should be done to equip participating farmers on technical and entrepreneurial skills of the OPV seed production and CSB. Technical training is based on selected crops for production. Produce crops that are easy to manage such as corn, rice, mungbean and big-seeded legumes as pigeon pea and peanut as suggested by key informants.

"In setting up a CSB, think about the crops, focus on few crops (rice, corn, peanut or big-seeded legumes), and allocate full time people for the management, operation and maintenance. CSB in grains like specialty and upland rice, corn, peanut and big-seeded legumes are easy to maintain", key informant, technical expert on CSB.

3. Investment on infrastructure for CSB

Invest in infrastructure with cool rooms and air conditioning for vegetable seeds (legumes). For corn and rice, it does not need cold rooms, it needs continuous drying (sun drying is okay). **Climate smart seed production and storage facilities should be made available.** Consult technical agencies like DA and BPRE in production and post-harvest facilities.

Untimely rains and frequent fluctuations in temperature have made the conventional seed production sites unfit or unfavorable in terms of production and quality of seed. The current season's weather situation (extreme drought and excessive rains) has created further stress as the majority of crops have been severely affected. Abrupt rise and dip of temperatures during the crop season in the conventional seed production areas of various crops is again a serious issue which warns of searching for alternative safe sites for climate smart quality seed production. Likewise, the storage facilities also need to be climate smart for keeping the seed quality intact.

4. Investment on manpower to manage the CSB

Train and provide capacity building on proper management and operation of CSB. The designated staff should receive proper compensation to ensure that the operation and management will be sustainable and viable. It was highlighted by key informants that most of the CSB established by different NGOs and public agencies failed due to unavailability of a full time person to oversee the management of activities in CSB. Further, communal management was not effective in managing a CSB therefore an assigned/designated person will be assigned to take full responsibility in managing and operating a CSB.

5. Market Linkage

Make sure that there is a market of OPV seeds to ensure sustainable production of farmers. It was also highlighted during the KIIs that the production should have an economic value and should provide additional income so that farmers would continue their production.

Based on interviews, a lot of CSB projects from public and private agencies failed due to many factors. One lesson shared by key experts is that setting up and managing CSB cannot guarantee a sustainable enterprise. According to a key informant, “One cannot make money on seeds, there would be meager income but not as a business. In PRRM, they find sponsors yearly, they are selling but still making a big loss”. A successful CSB works with various donors to ensure its sustainable operation and management. Cited by a key expert is the CSB established in Nepal. This needs to be further looked at to adopt best practices and lessons learned.

It was also highlighted during the KII that seeds produced should be planted within the year after it was harvested. KII results confirmed that seeds cannot be stored forever or for a very long time. It should be planted within a year in the field to avoid issues on poor germination, viability and vigor of seeds.

V. OPPORTUNITIES AND LIMITING FACTORS OF THE OPV SEEDS PRODUCTION

This section presents the findings of the market research including the trends and status of OPV seeds, opportunities, challenges, and recommendations in setting up OPV seeds production enterprise. Included in this market research are the staple commodities: rice and corn which can be an option for a viable enterprise. Results were based on the responses of the identified key informants.

A. Opportunities

1. There is sustained demand for OPV seeds

The programs of the Department of Agriculture such as Organic Agriculture Program, vegetable seeds distribution makes the OPV seeds a commodity that can endure economic changes and market demand fluctuations. Various end users specifically, the government agencies, farmer groups and private seed traders continue to eye for sustained high supply of OPV seeds. COVID-19 pandemic also allowed more people to plant different crops, specifically vegetables which corroborates the responses from KII that individual farmers, farmer groups, LGUs as well as integrated schools requested OPV seeds to NEFVSC and Regional Station Centers of DA.

2. Increasing interest by various organizations to support the seed production of OPV

There are NGOs and related agencies that are taking interest in OPV seeds production, because of the growing concerns on environment, agriculture and the need to offer sustainable and alternative incomes for small scale farmers and farmer groups. These organizations have the capital and technical skills to assist farmers and farmer groups in achieving sustained OPV seeds production enterprise. These include IIRR and PRRM. IIRR provides breeder or starter seeds, PRRM has a pool of networks for the source of OPV seeds of select vegetables, corn and rice.

3. Sustainability and resiliency in choosing OPV seeds

As described in previous discussions, planting OPV varieties and indigenous seeds leads to food security and sovereignty[25]. Planting OPV is associated with sustainable agriculture because seeds harvested can be saved for next cropping as long as proper post-harvesting processes were followed. Further, OPV varieties are adapted to a particular place and its climate, soil, growing conditions, and are often more resistant to the local pests and diseases and therefore climate smart. Also, planting OPV requires lesser agricultural inputs making it more feasible for farmers to produce.

B. Limiting Factors

1. Marketing information is still lacking

The potential markets for OPV seed production are not yet recognized. Lack of linkages between and among potential value chain actors from farmers/producers to buyers and producers and lack of information on the opportunities of OPV seeds production. Farmers that are planting OPV seeds are on a small scale and mostly for their own consumption (food consumption) with limited information on post-harvest and processing of seeds for next cropping. With the limited market information, producers were not able to sustain or engage in OPV seed production at a commercial scale.

[25] *Food sovereignty is a food system in which the people who produce, distribute, and consume food also control the mechanisms and policies of food production and distribution. This stands in contrast to the present corporate food regime, in which corporations and market institutions control the global food system. Food sovereignty emphasizes local food economies, sustainable food availability, and center culturally appropriate foods and practices, cited by PRRM from Wikipedia.*
https://en.wikipedia.org/wiki/Food_sovereignty

VI. CONCLUSION AND RECOMMENDATIONS

A. Conclusion

The study confirms that **the market system for OPV varieties and indigenous seed production is limited and OPV seeds are mostly produced by public and private research institutions and some from NGOs. There are few farmers engaging in OPV seed production as this is a complex process that requires technical skill and knowledge to establish, operate, and manage. The majority of farmers producing or planting OPV varieties are on a small scale mostly for home consumption and very few saved for the next cropping.** However, OPV seed production is economically important and can be a source of alternative livelihood as the demand is increasingly driven by the call for sustainable agriculture including organic farming. Producing OPV seeds associated with sustainable agriculture aims to strengthen the resilience and food sovereignty of farmers (particularly small-scale farmers). There is also increasing OPV demand from different public and private institutions to implement agriculture programs.

The majority of farmers heavily rely on hybrid seeds for production as their scale is commercial however it requires intensive capital: human and financial. The use of hybrid seeds for production relies heavily on inorganic fertilizers. OPV bred for productivity under organic fertilization, such as compost, requires fewer inputs and capital to grow and produce. OPV seed production is less expensive, and is more doable for low-income farmers. OPV varieties and indigenous seeds are often the best choice for small scale-farmers who cannot afford the cost of hybrids and cannot pay for inputs such as fertilizers and pesticides.

Reducing the reliance on hybrid seed imports and developing seeds adapted to the local environment provides opportunities for poverty reduction in disadvantaged regions like the Philippines. Understanding the OPV varieties and indigenous seed through mapping of its value chain can initiate to move forward in making it a viable and sustainable enterprise. The production requires support from different value chain actors, enablers and supporters to build an enabling environment resulting in a viable and sustainable enterprise.

Crises like climate change (extreme drought and excessive rains), and the ballooning of the population are clearly affecting and damaging our food production and access. Since the cost-effectiveness of open-pollinated varieties is mostly demonstrated in small-operation farms with lower capital, production risks are lower thus making it more enticing for farmers to be engaged in production.

Further, with the current COVID-19 pandemic, the number of people planting crops to make their food available and accessible is increasing.

Because of the limited market information, the present study can be further improved by looking at the local markets and other agencies (private and public) for the opportunities for OPV varieties and indigenous seeds. A complete package of technology for specific OPV seeds needs to further look at and develop risk management plans to ensure the viability and sustainability of the enterprise. Finally, a detailed feasibility for specific OPV crops is needed so that the potential community-based or farmer groups will be better guided in deciding which among the proposed OPV seed production enterprise would be the most manageable, profitable, viable, sustainable.

We propose in the following section certain strategies and approaches to build a strong, stable and sustainable value chain where equity is promoted and benefits are fairly received by each and every actor or player of the value chain.

B. Recommendations

1. In crop selection, consider the following:

Zoning/Production of different crops per area. As much as possible, produce different crops in each area to avoid price fluctuation or overproduction of supply.

Crop diversification. The production of OPV seeds is complex and it requires technical skills and expertise of the value chain actors. When it comes to engaging small-scale farmers in OPV seeds production enterprise, producers will have difficulty engaging as they lack the technical skills and the production and processing of seeds are complex. With this, it is suggested to diversify in setting-up production. Based on KII results, a 20-square meter of land can be used to produce various OPV seeds. Farmer producers can initially set-up their production using various crops. In starting a production plot for vegetables, beware of cross-pollination. It is suggested to plant different crops to avoid cross-pollination.

2. Networking and Linkage to Technical and Business Development Services

Develop technical expertise in OPV production and linkage to various research institutions like research centers (DA station centers, PhilRice, NEFVSC), academe (CLSU, Mindoro State University), other government technical agencies on crop production and post-production (ATI, BPRE) and other NGOs like PRRM and IIRR. Strengthening the linkages among value chain actors by developing some agreements that will bind the relationship between producers, consolidators, and traders. The chain actors should work in an integrated way to improve production and to strengthen sustainable market linkage, searching for market information and dissemination will be crucial.

3. Strengthening of farmer groups and community-based organizations

The farmer groups must work together to achieve set goals and objectives, particularly those designed to put into better monitoring and control the production side of the value chain. Women groups must be equipped with entrepreneurial and managerial skills to provide better direction and engender broader participation from members. Providing technical (train women groups on OPV seed production and to become entrepreneurs) and provision of financial support will go a long way in achieving these goals. Improving the management capacity of associations in planning skills to produce OPV seeds which can be targeted both for local, provincial and national markets is a priority concern. Lack of business knowledge and marketing system, farmers are unable to take OPV seed production and farming as business. Thus, a need to continue training on production, processing, seed accreditation, and marketing of OPV seeds.

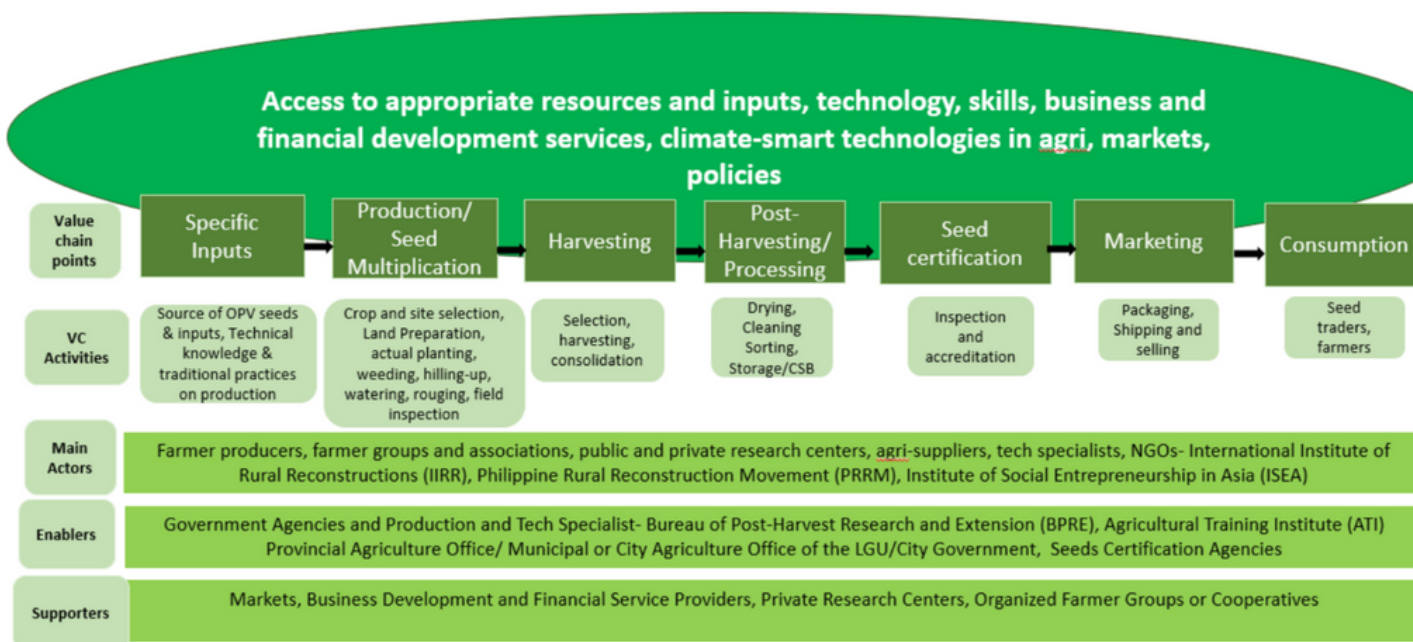
4. Established a stable market for OPV seeds

Farmer producers need support for stable markets to ensure that producers will continue to produce. Results of interviews confirmed that formal markets for OPV seeds are limited and not open. For producers to get OPV seeds, they must rely on government extension services or NGOs. KII informant confirmed that there are OPV seeds available in the market as long as the specifications are informed to sellers/consolidators. Cited was OPV mung bean seeds.

5. Integrate the value chain (VC) approach for a sustained value chain enterprise for OPV seed production

In identifying and implementing an OPV seed production enterprise, there should be an enabling environment to sustain a value-chain enterprise. See below Figure. The creation of a structure should be established with various institutions such as government and non-government agencies to ensure beneficiaries' increased profitability and sustainability in the identified value chain enterprise. *Structure refers to an enabling environment with political, cultural, economic and social constructions and norms that shape identified enterprises of potential beneficiaries' daily lives. This structure also serves as vehicle for beneficiaries' advancement, or to address various constraints in order to achieve meaningful participation of the beneficiary-respondents in the value chain.*

Enabling Business environment of Open-Pollinated Varieties and Indigenous Seeds Production Enterprise



The 'Structure' that will be created will help and assist the potential farmers/ farmer groups in managing and operating their OPV seed production enterprises. This structure will serve as advising committee or project steering team to give guidance and support in managing and operating a sustainable enterprise. This would contribute to ensure continuous access to resources, knowledge, technology, financial and business development services and profitable markets. The 'structure' will also serve as a platform for dialogue between potential farmers/farmer groups and policy-makers to better understand the policy related to their chosen enterprise, provide consultation to inform guidelines and resolutions, and recommend innovations to sustain and protect their livelihoods. Further, the 'structure' would lobby and provide support in the production of the identified VC commodities. Potential beneficiaries will also be organized to establish support systems in case market dynamics change. This includes links to insurance companies and various financial and business development and service providers for a sustained value chain enterprise.

Composition of structure:

Organized farmer groups/associations; ISEA, P/LGU-DA, IIRR, PRRM, academe, , BPRE, DTI, ATI, MFIs, registered business groups (such as farmer groups, coop) and other agencies/ organizations that would possibly contribute to the value chain enterprise.



The enabling structure has to be in place in support of the interventions given to the value chain actors. The following are recommended to have an enabling structure:

a. Organize and strengthen the farmers/farmer groups. Since there are existing organizations/associations that are organized (Daluyong communities), encourage farmer groups to participate and become active members. Registered organizations are the qualified conduits of various services from the government.

b. Access to reasonable financing schemes. There are existing MFIs and financing institutions in the research areas however financing schemes are only for those who have daily or weekly income. For those who are/ will be engaged in agriculture, there should be a financial programme scheme that is appropriate to their source of income.

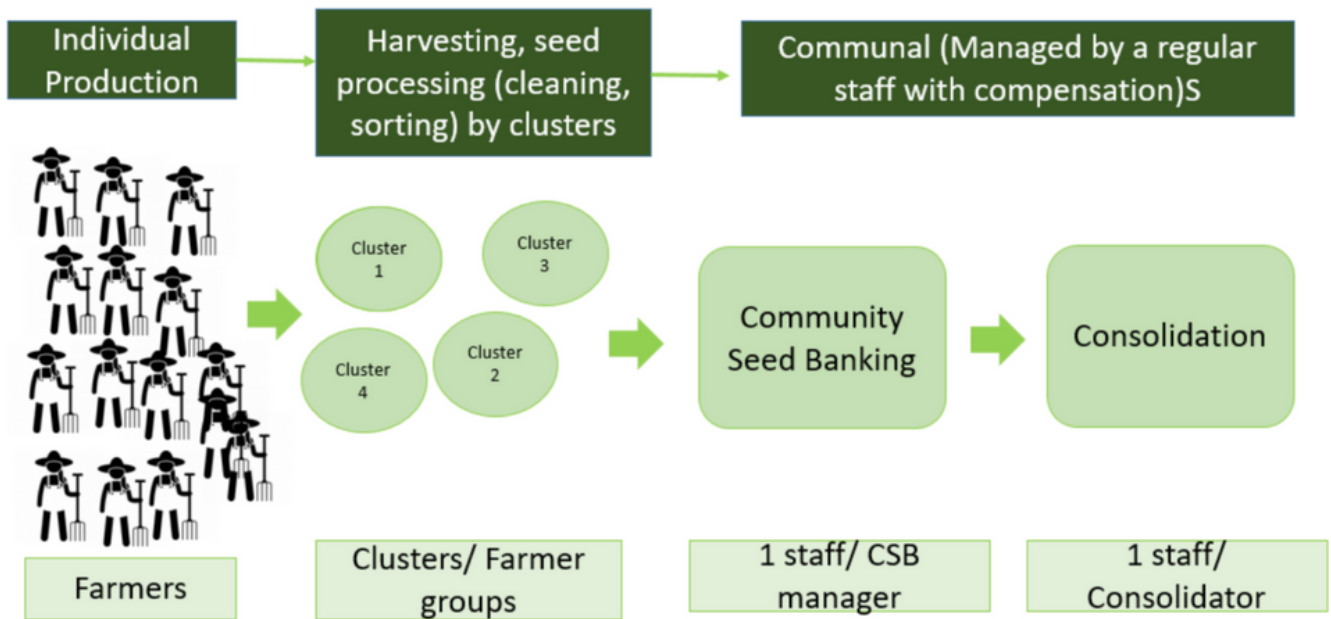
c. Access to training. Provision of training would contribute to capacity-building of farmers/farmer groups from technical skills to entrepreneurial skills. Further, other training on various value chain activities such as post-harvest, seed collection, seed extraction, processing, seed quality testing and marketing would enhance their skills, knowledge and attitude towards their enterprise. It would somehow explore new livelihood opportunities.

d. Networking and Partnership-Building. Relationships between and among value chain actors (producers) and enablers (various agencies) need to be strengthened to improve the value chain enterprise. Other networks such as cooperatives, industry groups and business investors can be tapped to facilitate investment matching.

6. Use the Clustering Approach

In setting-up a OPV seeds production, clustering approach is recommended. The production will be done by individual farmers/producers in the value chain. Each producer will decide what to produce based on the requirements (crop requirements, market demand, seasonality and technical skills), and production area. Individually, producers will manage and maintain their seed production with the help of technical specialists in making sure that the production areas are free from contamination and cross pollination. Harvesting, collection, and seed processing such as cleaning, sorting, and drying will be done by clusters. Seed banking and marketing of seeds will be done communally and will require regular manpower receiving compensation (salary) to manage, and maintain its operation. Please see the table below for the process.

Proposed Open Pollinated Seeds Production through Clustering Approach







MARKET STUDY ON OPEN-POLLINATED AND INDIGENOUS SEED VARIETIES OF VEGETABLES

Produced by the Philippine Rural Reconstruction Movement (PRRM), the Institute for Social Entrepreneurship in Asia (ISEA) and Oxfam Pilipinas

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