

# Evaluating the Viability of **Family Farming** in Maragondon, Cavite



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Alice T. Valerio, Ph.D.

Willington O. Onuh, Ph.D.

### **Maragondon Learning Community and Family Farming Project Team**

Joanna B. Dalusag - Coordinator, Maragondon Learning Community

Angelyn Badiang – Project Coordinator, Family Farming Project

Alyanna Joy A. Quinones – Field Staff

Maribeth A. Arahan – Field Staff

Jonel A. Jesalva – Field Staff

Irish Baguilat

Ronnie de Castro

Christy Tacugue

Angie Algo

### **Technical Advisers**

Julian Gonsalves

Emilita Monville Oro

Rene Vidallo

Magnolia Rosimo

### **Photographs**

Giulia Soria

Joanna Dalusag

### **Layout**

Dulce Dominguez

### **Donor**

Latter Day Saints of Charities

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## Background

Agriculture lies at the heart of the development process and smallholder farmers are often seen as the driving force of economic growth, poverty reduction, and food security (Food and Agriculture Organization [FAO], 2015). The FAO of the United Nations (UN-FAO) describes family farming as all family-based agricultural activities which are linked to several areas of rural development. Family farming is a means of organizing agricultural, forestry, fisheries, pastoral, and aquaculture production which is managed and operated by a family and predominantly reliant on family labor, including both women's and men's.

Family farming has an important socioeconomic, environmental, and cultural role. Both in developing and developed countries, family farming is the predominant form of agriculture in the food production sector. Small family farms produce two-thirds of the world's food security and contribute greatly to national food security. There are more than 500 million family farms, constituting 98% of all farms and at least 53% of agricultural land, thus producing at least 53% of the world's food which makes them the backbone of agriculture in most countries. In developing countries, 70% of the population live in rural areas and depend on agriculture for subsistence and income obtained from agricultural activities. About 90% of the world's 570M farms are owned and operated by families. Also, family farms are the stewards of their land and natural resources. The water, land biodiversity, and

soil are not only means of production. They are important productive assets or resources for long-term investments for today's agricultural activities and in the future.

Family farms are part of the solution for achieving food security, sustainable rural development, and climate change mitigation and adaptation. However, the majority of them remain poor, suffer from hunger, lack secured land tenure and resource rights, lack access to safety social protection, safety nets, support services, technology, extension service, markets, and finance. Their conditions are widely overlooked in national policies and they also bear the brunt of the impacts of climate change, though they are the key to the solution.

In the Philippines, there are 5.56 million farms/holdings (FAO, 2015) covering 7.19 million hectares, which translated to an average area of 1.29 hectares per farm/holding. About 99% or 5.51 million hectares of the farms/holdings in the country were operated by households or by the person. In 2012, it was estimated that 12 million people are employed in the agriculture sector where 70% are poor farmers and fisherfolks. The 2018 Global Hunger Index, ranked the Philippines 69<sup>th</sup> out of 119 countries where farmers earned a measly average nominal wage rate of PhP 280.00/day.

For smallholder farmers or family farming to be successful, there are several important factors to be implemented such as such sustainable agro-ecological conditions and territorial characteristics; policy environment; equal access of men and women farmers to markets; land and natural resources; technology, training, finance, and extension services; fair economic and sociocultural conditions; availability of specialized education among others. Furthermore, addressing or closing the gender gap, by supporting women's access to resources (e.g., land, credit, fertilizers, extension services, and other productive inputs) can increase yields by 20-30 percent and decrease the global hungry population by 150 million (FAO, 2011).

In the context of small family farming, women farmers play a significant role in agriculture and rural development and contribute to food security, nutrition, and economic growth both in their families and in society. Livelihoods depend on the joint efforts of family members. However, their role, contributions, and conditions are often undervalued and unrecognized. Women farmers are often invisible in agricultural censuses and statistics. Women have less access to productive assets, resources, services, and economic opportunities compared to their male counterparts. The gender gap in agriculture further hampers the potential of family farming (FAO, 2015).

Recognizing the role that small family farms contribute to ensuring global food security, improving nutrition, eradicating poverty, ending hunger, conserving biodiversity, achieving environmental sustainability, and helping in addressing migration, the United Nations General Assembly in 2017 declared 2019 to 2028 as the Decade of Family Farming. This resolution aims to promote projects and policies that will reposition family farming at the center of agricultural, environmental, and social policies in national agenda and to achieve a more equitable balanced development; recognize the important roles of women and young farmers and push for their empowerment as a necessary condition and consistent with the Sustainable Development Goals (SDGs) (FAO, 2015). Thus, IIRR continues to demonstrate the validity of the family farm approach as it worked with small family farmers in the Philippines, particularly in the town of Maragondon in Cavite Province.



## IIRR's Work on Family Farming in Maragondon

The municipality of Maragondon in the Province of Cavite was chosen to be the learning community for modeling the concept of *family farming as a community-based approach in sustaining food and nutrition security and resiliency amidst changing climate and environment* due to IIRR's past projects implemented in the early 1990s. The upland municipality of Maragondon is the biggest town in the province with a total land area of 16,549 hectares (63.9 sqm), occupying about 13% of the provincial total land area. It is the most forested part of Cavite located in the western part of the province situated along the foothills of the mountain ranges bordering the provinces of Cavite and Batangas. It is bounded to the north by Naic and Indang, to the south by Nasugbu, Batangas to the west by Ternate, to the east by Gen. Aguinaldo and Alfonso; and to the southeast by Magallanes. Maragondon is approximately 54 km from Metro Manila (Maragondon Comprehensive Land Plan CDP, 2015).

The bulk of Maragondon's population (37,720 in 2015 Census) comprising a total of 68.29%, is in the rural areas and largely dependent on agriculture. Around 7,359.6675 hectares or 44.47% of the total land area of the municipality is devoted to agriculture. Of these agricultural land areas, 4,206.69 hectares or 57.16% of the total agricultural land are planted to lowland, rainfed and upland rice, and various crops (both food and commercial crops) while the rest of the agricultural area became idle because of the absence of irrigation system. Farming remains the major source of livelihood for most households with banana, lowland and upland rice, sugarcane, and cassava as dominant crops. Root crops, vegetables, and fruits are also produced while some households

raise small livestock and poultry in their backyards to supplement their income. The average landholding is one (1) hectare and below. Maragondon also produces an abundant supply of bamboo. Most of the farmers are engaged in bamboo production and rely on selling bamboo (poles, sticks) as a quick source of income. The average family income in the municipality is PhP 10,000.00. Leasehold tenancy is most common which constitutes about 44.33% of the total farmers involved 485 farmers (Maragondon CDP, 2015).

Agriculture and family farming remained to be significant but under maximized given their huge potentials and opportunities. More so, small family farming households are confronted with various issues and challenges that undermine their potentials in achieving food security and nutrition and better livelihood and income outcomes. Among them are (a) insufficient food production to meet the rapidly increasing population growth growing; (b) diminishing agricultural land areas in favor of residential and commercial uses due to rapid development and urbanization of the province; (c) depleting land and water resources that threaten the sustainability of food production; (d) low productivity and farm income due to the very high cost of production inputs and excessive use and improper farming practices; (e) slow adoption of technology due to lack of access to agricultural support services, extension, and information and effective cooperative organizations; weak linkages between research and extension, and poor participation of farmers beneficiaries; (f) poor provision of critical support services such as credit facilities, irrigation facilities, and better road network; and (g) aging farmers and less young farmers engaged in farming.

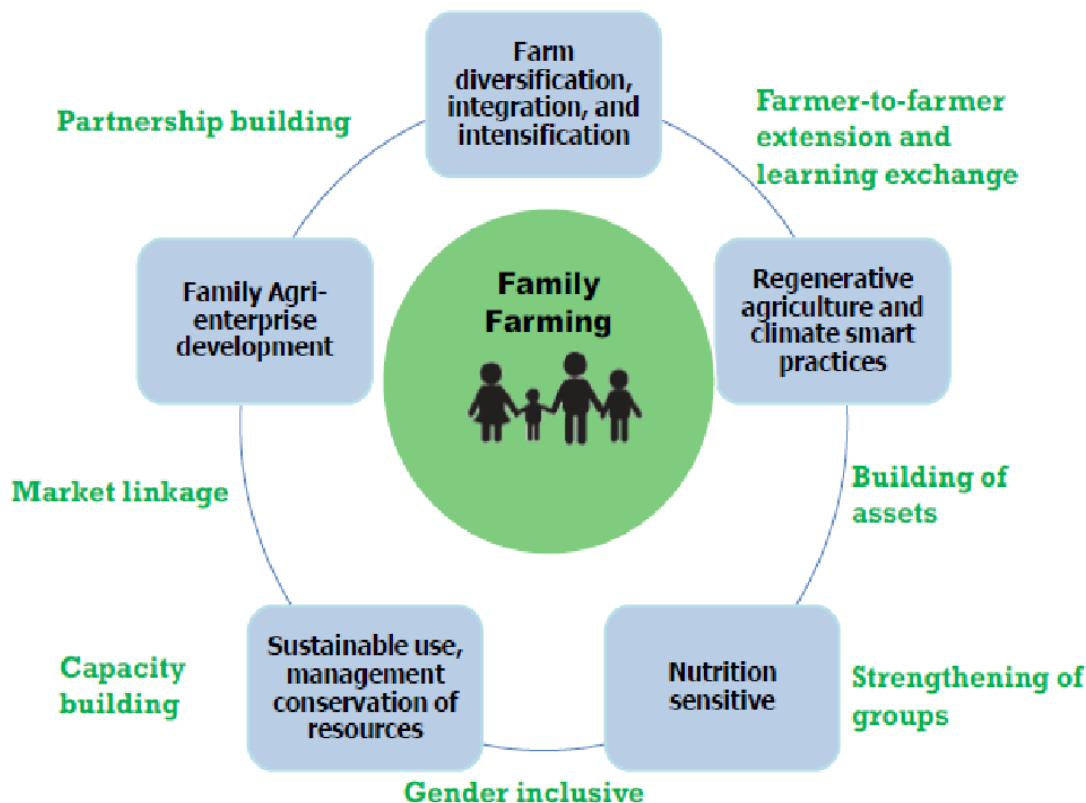
## **1) Doing More with Less Project Phase 1 2014-2016 Project Outcomes**

In 2014, IIRR, with partnership from the Latter-Day Saints Charities (LDS), piloted the family farming concept as a model in achieving food and nutrition security and improving the livelihoods of small farmers in Maragondon. The project titled "*Doing More With Less*" was implemented in two (2) rural barangays of Layong Mabilog and Talipusngo benefiting 26 small farmers. The project operationalized the family farming strategies and its core elements to help improve farmers' resilience, sustainably intensify their production, and make their farms agro and economically sound. The strategies and core elements implemented were farm diversification; farm intensification; regenerative agriculture; and climate-smart, nutrition-sensitive, agriculture enterprise development; and market-linkage (See Figure 1).

### **a) Improved food access and income through farm diversification and livestock integration**

Twenty-six family farms have improved food access and income through farm diversification and integration of fruit trees, root and tuber crops for food, feed, and income; legumes, native vegetables, and commercial crops such as papaya, ginger, and pineapple; and integration of small livestock such as native pigs, goats, native chicken, and ducks. They were enhanced and diversified by incorporating nine types of fruit trees, intensification of root and tuber crops for food, feed, and income; legumes, native vegetables, and commercial crops such as papaya, ginger, and pineapple; and integration of small livestock such as native pigs, goats, native chicken, and ducks. The distribution of different crops lessened the negative impact of the drought in 2015 and for some farmers and resulted in a significant increase in the diversity of the farms. The increase in the diversity of food crops within family farms ensured food availability year-round while economically important crops like ginger, papaya, and pineapple planted in at least 1,000 sq m of land generated significant income for some farmers.

About 16 family farmers increased their farm assets in ten (10) months upon the dispersal of small livestock while six (6) were able to earn extra income through the sale of piglets or roasted pigs. A two-month-old piglet was sold at Php 2,000.00 each while lechon was sold at Php 500.00/kilo and one (1) native goat valued at Php1,500.00 to 3,000.00. Raising small and large livestock served as insurance and savings during emergencies and crop failures.



**Family Farming Core Elements and Multiple Complimentary Strategies**

## **b) Increased income sources through product development and value-adding**

Men and women farmers were trained on cassava processing such as preparing cassava cakes and chips out of cassava grates and native-lechon making. The DA- CALABARZON through the Southern Tagalog Integrated Agricultural Research Center (STIARC). DA provided them cassava processing equipment (granulator, chipper, and grater) which facilitated the production and selling of cassava cakes locally.

## **c) Enhanced skills and capacities of family farmers on different products and farming technologies and sustainable practices**

Various capacity building activities for project partners were conducted to ensure sustainability. These were field/farm exposure visits, lectures, hands-on training, participation in national trade and exhibits, and field trials on alternative farming or eco-friendly low-cost farm practices, multi-storey cropping systems.

The project outcomes were achieved through direct provision of planting materials and inputs coupled with training and practicum, exposure visits, regular monitoring, technical assistance, and asset transfer (small livestock i.e., native pig, goat, and poultry). Likewise, the pass-on scheme of these inputs, materials, and assets to another farmer once harvest/farrowing is reached has been encouraged to benefit other community members.

## 2) Achieving Food Security and Nutrition Through Small Family Farms

### Project Phase II July 2017-June 2020

In 2017, the second phase of the Family Farming Project titled *Achieving Food Security and Nutrition through Small Family Farms* was implemented which demonstrated the viability of family farming in achieving food and nutrition security and resiliency in the wake of changing climate and widening income gaps. The project enhanced the food security situation of at least 360 farming families; improved nutrition contribution of agriculture-livelihood interventions; built farmers' capacity of farmers to produce high quality and safe food using eco-friendly practices for local consumers; and demonstrated that family farms (investment-worthy) are economically viable, environmentally sound and sustainable.

From the initial 26 family farmers covering 2 barangays in the first phase, the project partners were expanded to 60 farming families as models, and learning sites where evidence and knowledge on the viability of family farming were gathered and generated. The additional village, Barangay Pantihan 3, was covered bringing a total of three barangays as learning areas. Also, the project targeted 300 farming households as scaling out partners who benefitted from different family farming interventions. These farming households came from the same barangays and nearby barangays of Tulay B, Pantihan IV, and nearby Municipality of Gen. Emilio Aguinaldo, or known as Bailen.

Apart from strengthening the 60 family farms as learning sites and the scaling out component, other project components include nutrition and health education, enhancement of ecosystem services through the planting of multipurpose trees, enterprise development, value addition and product development, and learning exchanges. Implemented strategies include a direct provision on planting materials and inputs such as fruit trees, legumes, vegetables, cash crops, quality stocks of native pigs, native poultry, and native goats. These are coupled with field exposure visits and exchanges, seminars, hands-on training, extension work, and technical assistance.



## Phase 2 Highlights of Project Interventions

The Family Farming strategies and approaches were implemented with key interventions and support which helped the family farming learning sites develop and transformed their farms into multistorey cropping system and integrated farming system, which are the sustainable family farming system models in Cavite. These interventions and support included the direct provision of different seeds, planting materials and stocks; capacity building; organizing and strengthening of groups; field visits and monitoring, extension service and technical assistance; provision of information and education materials; and access to support services and linkage with different service institutions and stakeholders.

The following activities and interventions were done by the project:

1. Project orientation consultations, scoping, screening selection, and validation meetings with partners (Cavite Provincial Agriculture Office Municipal Agriculture Offices of Maragondon, Bailen, and Magallanes, Phase 1 Partners, barangay officials, and farmers); field visits and interviews; farm assessments, baselining, and farm planning for the selection of the 60 family learning sites;
2. Provision of seeds and planting materials of corn, upland and lowland rice, legumes, vegetable diversity kit, fruit trees, root and tuber crops like sweet potato, purple yam, and arrowroot cash crops; and stocks

of native pigs, chicken, duck, and goat were provided to the 60 family farmers that helped in transforming and developing their farms into multi-storey cropping and integrated farming systems. Participatory varietal testing of upland rice and legumes; diversification, and intensification of different crops; and integration of small livestock were promoted. Planting of natural feed sources and intensive feed gardens were also promoted as well as planting leguminous crops for nutritious sources of food and fertilizer crops.

3. A total of 18 seminars, hands-on training, and roving workshop or field exchange visits were conducted from August 2017 to January 2020 and participated in by 457 men and women farmers (152 female and 304 male), both from learning sites and scaling out farmers. Topics included: (a) diversification of root and tuber crops, legumes, vegetables, and fruit trees; (b) production and management of small livestock (native pigs, chicken, and goats) and as additional income source; (c) proper fruit trees production and management; (d) soil nutrient management through low external input and green leaf manuring; (e) on-farm water conservation and management; (f) bio-intensive gardening including proper seed savings and storage; (g) nutrition education on indigenous vegetable benefits; (f) the importance of farm recording; (g) market-link and marketing opportunities; (h) community crop museum; and (i) product value-adding and packaging.
4. The Farmer's Learning Groups FLG and Community-managed Savings and Credit Association (CoMSCA) were organized. FLG is a platform for learning and building support networks among farmers. It is an informal structure where farmers with mutual interests work together; meet regularly to monitor their plans; learn from each other's shares and exchange ideas, innovations, and experiences. FLG meetings also provided opportunities for farmers to receive local agriculture office programs and services. through the assigned agricultural technicians attending the FLG meetings. Among these services availed were:
  - a) renewal and enrolment of family farmers' in the crop insurance program (crops and livestock);
  - b) updating of farmers' registry system of basic sectors in agriculture (RSBSA);
  - c) artificial insemination and vaccination of big livestock;
  - d) inclusion of three (3) farmers in the dairy raising seminar and training;
  - e) participation of 5 farmers in the DA Central office caravan held at Trece Martires City;
  - f) inclusion of three farmers in the techno-demo farms for banana-tissue cultured cardava variety;
  - g) inclusion of Barangays Talipusngo and Layong Mabilog in the DA
  - h) Maragondon proposal for solar-powered irrigation facility;
  - i) provision of rice mill, thresher, and multi-tiller equipment for Sitio Magay rice farmers in Pantihan 3;
  - j) provision of seminar on swine raising production
  - k) inclusion of two-family farmers in the chicken production assistance;
  - l) implementation of season-long FFS on Integrated Farming System in Sitio Magay

CoMSCA is a self-help group where members are pooling their savings for the provision of a loan to its members with minimal interest and paid in a short period. It provided quick and affordable access to credit to farmer-members ranging from PhP 500 - PhP5,000 with 3% interest per month and payable within three months. Loans were mainly used for family emergencies, buying inputs and livestock, repair of an animal shelter, children's tuition fee, and additional capital for small food business. Three (3) CoMSCA groups were organized for two cycles. From an initial 30 men and women farmer-members with an initial monthly minimum share or saving of PhP50, the members reached 38

members during the first cycle. The combined total share capital and interests reached PhP 42,210. Each member earned 10% - 12% from interests. For its 2<sup>nd</sup> cycle, there are now three CoMSCA groups with total members of 73 (41 female and 32 male). The total combined share capital and interest reached PhP 201,900. About 75% of the farmer-members have availed of the quick and affordable loans used for procurement of farm inputs; family emergency (sick); expansion and repair of animal shelter; tuition fees; additional capital for business, transportation allowance for a new job, and payment for utilities.

5. IIRR has established a strong partnership with key partners and stakeholders such as farmers, LGUs, DA, private groups, academe; and linkage with various organizations and service providers that are necessary for implementing this project. Likewise, exploratory discussions and meetings were also done with other institutions for possible partnerships. They provided technical assistance, extension services, and shared opportunities and resources for implementing the project.
6. Regular field visits and provision of extension services and advices supported and further enhanced family farmers' knowledge, skills, learnings, and innovations on crops, soil, and livestock production and management in transforming their family farms into the multi-storey and integrated cropping systems.
7. Provision of information, education, and campaign materials on native chicken and pig production and management; a recipe of indigenous vegetables, IFG, organic fertilizer production, companion planting, fermentation of kakawate leaves, contour farming, SRI, and pest management for rice farmers, and typhoon IECs. Likewise, IEC posters about typhoon and typhoon signals were given.
8. Establishment of community support facilities such as small-scale/community coffee nursery; community crop museum; and propagation and breeding centers for scaling out beneficiaries.



## Objectives of the Study

After expanding the project to 60 farming families as models and learning sites, this study aims to evaluate the viability of family farms in Maragondon, Cavite after a series of IIRR interventions. Specifically, it aims:

1. To describe the demographic characteristics of the farm households and their family farms;
2. To determine the extent of diversification of family farms;
3. To assess the viability of family farms through the profitability and proportion of farm income to total income across farming systems; and
4. To identify the factors that contribute to the viability of family farming.



## Limitations of the Study

Productivity, a measure of the ability of the factors of production to generate output, is one of the most popular ways to measure economic viability but since a farm is devoted to a variety of crops and animals, the land productivity in terms of physical output was not determined. Instead, net farm income was used to measure economic viability which is expressed in monetary terms. Food security is another important variable in this study; however, it was constrained by the limitation of data. While there are lots of indicators of food security in the literature, this was measured using the responses from the seven statements about food security.



# Methodology

## 1) Description of the Study Areas

### a) Barangay Talipusngo

There are 22 men and women family farmers (46.67%) from Barangay Talipusngo, 11 of them (18.33%) are identified as the Comprehensive Agrarian Reform Program (CARP) beneficiaries. Barangay Talipusngo is an upland community with a total land area of 1,094 sq km. The barangay is 9 km away from the Maragondon town proper, bounded by Barangay Ramirez (Magallanes) in the southeast; Barangay Layong Mabilog in the north, and Barangay Mabato in the west. Its sloping topography and soil are suitable for producing banana-saba, corn, root crops, upland rice, fruit tree production, and sugarcane. From 2016 to 2018, 50% of its landholdings were converted to sugarcane plantations for the ethanol production plants in the nearby town of Magallanes. The majority of the family farmers tend to small and large livestock providing savings and cash in times of emergencies.

## **b) Barangay Layong Mabilog**

There are 24 men and women family farmers (30%) from Barangay Layong Mabilog. The barangay was used to be part of its adjacent Barangay Talipusngo until 1986. The barangay is an upland and hilly community bounded by Barangay Mabato in the east; Barangay Bucal 1 in the west; Barangay Talipusngo in the south; and Barangay Tulay B in the north. The community is 7 km away from the town proper with a total land area of 861 sq km and with a 1,132 population in 2018. Most of the farms are accessible by foot and horse due to the lack of a paved road network. The majority of households rely on crops such as banana-saba, root crops, and bamboo. Stick making from bamboo also provides regular income for farming households. Farmers tend pigs and chicken for consumption while big livestock such as horses, cows, and carabaos are for farm use and savings in times of emergency.

## **c) Barangay Pantihan 3**

Fourteen men and women family farmers (23.33%) are from Barangay Pantihan 3. It is 13 km away from the Maragondon town proper. The barangay has a total land area of 5,259 sq km with a population of 1,615 (NSO, 2014). Pantihan 3 is bounded by Barangay Pantihan 2 in the north; Barangay Pantihan 4 in the south; Barangay Banaba (Indang) in the east; and Barangay Batas-Dao (Gen. E. Aguinaldo) in the west. Pantihan 3 is a rural community which produces rice (upland and irrigated rice) corn, banana-saba, fruits, and vegetables. An irrigation facility is constructed in Sitio Magay. Pantihan 3 is one of the identified agrarian reform communities of the Department of Agrarian Reform (DAR). A farmers' cooperative named SIKHAY was established but is now non-functional due to organizational and management issues.

## **2) Selection of Farm Family Sites**

From the three barangays above, 60 model farms were selected as beneficiaries of the project based on the following criteria:

- a) Farms with sizes ranging from 0.5 ha to 3.0 ha with priority given to those with smaller farm sizes;
- b) With land title or Certificate of Land Ownership Award (CLOA); inheritance;
- c) Those families with children and families that are living within the farm
- d) Priority was given to women farmers, particularly the women-headed family farms;
- e) Priority was given to small farmers relying on agriculture or farming with 0 to few large ruminants;
- f) Farmers have a high vision of further developing the farm and they have the capacity and ability to manage the farm; and
- g) They are the actual tillers of the farm and have been in farming for a couple of years already.

The barangays were chosen based on the number of farmers in the community with the said criteria above. The list of the farmers was obtained from the Municipal Agriculture Office (MAO), co-farmers, barangay LGUs, and the Department of Agrarian Reform (DAR). There was a series of consultations done with the MAO officers, barangay officials, and DAR officials to come up with a short-list of farmers. Then, screening with selected/short-listed farmers was done discussing the issues on farming and farming situation in the communities. Finally, farmers were selected based on the criteria mentioned above.

The next step was the assessment and validation of farms if they are meeting the criteria set. Consultation and orientation were done, discussing their farm vision and plans and the seasonal cropping calendar. They were also oriented about the IIRR project, that is, modeling the concept of family farming as a community-based approach in sustaining food and nutrition security and resiliency amidst changing climate and environment. Monthly monitoring of the farms was done and relevant data were recorded.

### 3) Data Collection

The 2017 baseline data were collected using an instrument that includes the sociodemographic profile of the farmers, health and nutrition information, household and farm assets, health and nutrition, sources of income, main crops, farming/production systems, and the like. Data points were only focused on 60 farms/farmers for three years.

To help in data collection, the following extension services were done by the IIRR apart from facilitating their monthly meetings. Regular field visits and provision of extension services are important to support and enhance family farmers' knowledge, skills, learnings, and innovations on crops, soil, and livestock production and management in transforming their family farms into multi-story and integrated cropping systems:

- a) Soil analysis of selected nine farms provided information on the condition of their soil nutrients and appropriate recommendations and practices for its improving soil nutrients;
- b) Monitoring of pits for the planting of fruit trees;
- c) Mentoring on types of shelters for native pigs and goats;
- d) Technical assistance to sick and giving birth native pigs;
- e) Application of natural mulch; kakawate leaves for fruit trees maintenance;
- f) Vaccination of native pigs for anti-hog cholera and native chicken for avian flu;
- g) Technical assistance on crop management and monitoring of farmers' varietal seed selection on rice, corn, legumes, and root and tuber crops;
- h) Farm planning and layout;
- i) Production of natural feeds and fertilizers;
- j) Pest and diseases management in rice and vegetables;
- k) Technical assistance on proper A-line measure and sloping, contour farming, planting of ginger and purple yam; and
- l) Provision of different information and education materials on crop production and management, market linkage, and early warning information on typhoons, El Nino, and La Nina.

### 4) Analytical Procedures

#### a) Description of the variables and measurements

The analysis of data focused on the 60 farmer-participants in a period of three years, 2017-2019. The information collected for each sample farm includes the sociodemographic characteristics of the farmer-participants and their households, farm characteristics, food security, access to services, production practices, yield, production costs, total farm income, off-farm income, off-farm employment, and the like were described with the use of mean, standard deviation, range, frequency, percent, and percentile.

Farm viability is an issue of major concern. The viability of the farm was measured using profitability as an indicator measured by net farm income per hectare. A viable family farm implies that a household receives enough income from all sources to cover their living expenses. Fortunately, detailed data on production and expenses were available on individual landholdings which provide the opportunity to use it as an indicator of farm viability and provides some insights on the distribution and differences in net farm income across sizes of farm holdings and farming experience of participants. While most of the data are on the agricultural activities of the participants, data on non-farm activities were also collected. This leads to the analysis of the share of farm income and non-farm income to the total family income. The farmer and his/her family can have the non-farm income to augment, be it on or outside the farm. The income from the farm and the income from outside sources, combined, determine their disposable income. This is important to understand the investment behavior and food security of the family.

The categorization of food security status, food secure, and food insecure of farmer participants (henceforth, participants), was derived from the following seven food access questions administered through a survey:

1. In the last 12 months, "Got worried that family won't be able to eat enough food"? (Yes/No).
2. In the last 12 months, "Are there days that you or household member did not eat nutritious food"? (Yes/No).
3. In the last 12 months, "Did it happen that you or household experience only one type of food"? (Yes/No).
4. In the last 12 months, "Are there days you or household member skipped meal during the day"? (Yes/No).
5. In the last 12 months, "Have you or household members experienced eating insufficient food"? (Yes/No).
6. In the last 12 months, "Were there days that you and your household member ran out of food to eat"? (Yes/No).
7. In the last 12 months, "Were there days that you and your household member ran out of food to eat"? (Yes/No).

For purposes of analysis, the food security status of the participants was categorized as:

1. Food secure (assigned the value, 1) = participants that answered "No" to all questions.
2. Food insecure (assigned the value,0) = households that answered "Yes" to any of the questions.

## **b) Model specification and data analysis**

Descriptive measures such as mean, range, standard deviation, and percentile were substantiated with cross-tabulation to describe the profile of the farmers and family farms and to further trace an association between the viability of family farming and the demographics and farm characteristics. A two-sample *t*-test was used to compare the profitability of the farm in terms of food security, testing the hypothesis that the profitability of the farm differs significantly if households are food secure or food insecure. Binary logistic regression was used to examine factors influencing food security and ordinary least squares regression was used to access the determinants of farm income.

The general form of binary logistic regression following Greene (2012) can be written as

$$Y_i^* = x_i' \alpha + \varepsilon_i \quad (1)$$

where the  $Y_i^*$  is not directly observed, but its relationship with  $Y_i$  is dependent on the values (1, 0) as described in equation 2.

$$Y_i = \begin{cases} 1, & \text{if } Y_i^* = 1 \\ 0, & \text{if } Y_i^* = 0 \end{cases} \quad (2)$$

$Y_i$  is a dichotomous variable that takes the value of 1 if the participant in the IIRR project is food secure and 0 otherwise,  $x$  is a vector of explanatory variables,  $\alpha$  indicates a vector of parameters, and  $\varepsilon$  is the error term or disturbance. The  $Y_i$  can be read as the odds of a participant being food secure or being food insecure. This intuition can be used to model this occurrence or probability following the method of maximum likelihood (Hosmer & Lemeshow, 1989; Greene, 2012, Ngema, Sibanda & Musemwa, 2018).

$$P_i = \frac{e^{Y_i}}{1 + e^{Y_i}} \quad (3)$$

where  $P_i$  is the likelihood of the  $i$ th participant's food security classification being food secure and  $(1 - P_i)$  is the likelihood of being food insecure. The odds can then be developed more formally ( $Y = 1$ , food secure; and  $Y = 0$ , food insecure) as (Agidew & Singh, 2018):

$$odds = \frac{P_i}{1 - P_i} \quad (4)$$

where  $P_i$  represents the proportion of the likelihood of a participant being food secure and  $1 - P_i$  is the likelihood of being food insecure. Applying natural logarithm to equation 4, that is the logarithm of ration yields,

$$Y_i = \ln \left( \frac{P_i}{1 - P_i} \right) \quad (5)$$

where  $Y_i$  is the logarithm of the odds ratio which simply relates to a participant's classification as food secure. The regression equation can be written as:

$$\ln Y = \ln[Y / 1 - Y] = \alpha_0 + \alpha_1 X_1 + \alpha_2 X_2 + \alpha_3 X_3 + \dots + \alpha_n X_n + \varepsilon_i \quad (6)$$

where  $\ln$  = natural logarithm,  $Y$  = probability of a participant being food secure,  $1 - Y$  = probability of a participant being food insecure,  $\alpha_i$  = coefficients of explanatory variables,  $X_n$  = predictor or explanatory variables, and  $\varepsilon_i$  = error or disturbance term. Choice of explanatory variables was based on the literature: road access, access to credit/insurance, age, household size, income, off-farm employment, gender (Abegaz, 2017; Ngema, et al., 2018; Shaikh, 2007; Mango et al., 2014). Using these variables, the binary logistic regression model tries to determine the likelihood in a significant sense of being food secure or food insecure by a participant.

The determinants of farm income, measured in terms of farm income per capita, were identified using the ordinary least square regression model. The outcome or dependent variable, log total farm income per capita

(total household income/square meter/household size) is hypothesized to be a linear function of a vector of households and farm-specific support service factors ( $X_i$ ). This can be specified as:

$$y_i = x_i' \beta + \varepsilon_i \quad (7)$$

or, simply

$$Y_i = \beta_0 + \beta_1 X_i + \dots + \beta_k X_k + \varepsilon_i \quad (8)$$

In equation 8,  $\varepsilon_i$ s are independent random normal variables with mean zero (0) and variance,  $\sigma^2$  (period). Equation 8 is only reliable if it conforms to assumptions of the classical linear regression model (Greene, p.10). The primary interest is to estimate the parameters ( $\beta$ 's) of explanatory factors ( $X_i$ ) under the assumption that the average value of Y given the value of X is related. The Y is log-transformed to address linearity and constant variance assumption. The choice of explanatory variables depends on the literature and the unique data of the IIRR project.



## Results and Discussion

### I. Demographic Profile of the Family Farming-Participants

The majority of farmers (60%) were within the active productive age of 24-53 years (Table 1). This makes the farmers more able to accommodate and adopt new approaches in agriculture. Of the 60 farmer-participants, a little more than 70% are more than 44 years old, with most of them (30%) falling in the age range of 44 to 53 (Figure 1). This was followed by those in the 54 to 63 years old bracket (28.33%), and 21.67% in the 34 to 43 age range. The eldest farmer is 75 years old, with 11.67% comprising the age group of 64 to 75 years old, close to retirement age. It can be presumed that farming has been their way of life since they were still young. The youngest, however, is 24 years old, belonging to the age range of 24 to 33. Overall, the mean age is 49.75 years with a standard deviation of 11.95. Based on a 2017 survey of the Department of Agriculture (DA), the average age of farmers in the Philippines is 60 years old. Hence, the farmer-participants in the study are still young, on average.

Table 1. Socioeconomic parameters of the family farms respondents by barangay, Maragondon, Cavite, 2017

Variable	Mabilog (n = 28) Frequency	Talipusngo (n=18) Frequency	Pantihan3 (n=14) Frequency	All Barangays (n=60) Frequency      Percent	
Age of the Farmer (Years)					
24 – 33	1	0	4	5	8.33
34 - 43	5	1	7	13	21.67
44 - 53	9	8	1	18	30.00
54 - 63	9	7	1	17	28.33
64 - 75	4	2	1	7	11.67
Percent	46.67	30.00	23.33	60	100.00
Mean = 49.75					
Std Dev = 11.95					
Min = 24					
Max = 75					

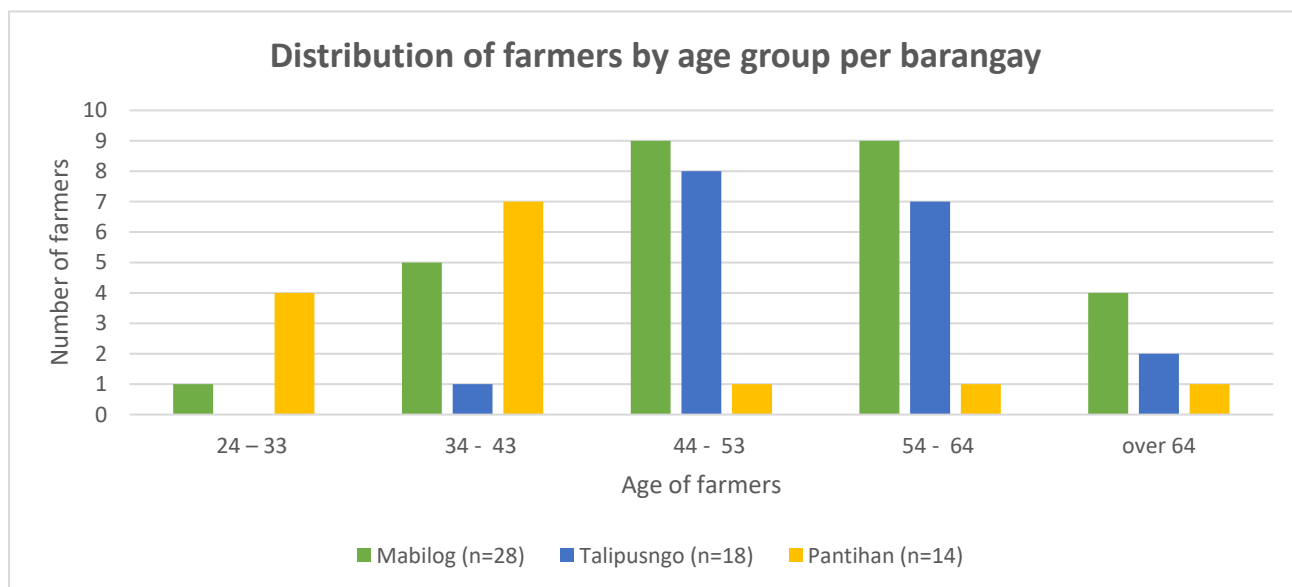


Figure 1. Age group of farmers per barangay, Maragondon, Cavite, 2017

Farming is indeed for the men which is evidenced by the share of the male farmers at 93.33%. Only 4 or 6.67% are women-headed households who are presumed to be widowed. The majority of them (78.34%) are married, 18.33% are widowed, and the rest (3.33%) are believed to be in a common-law arrangement (Figure 2). For a family farm to become viable and sustainable, having a family would ensure much dedication of the farmers to their farms which is the main source of family income,

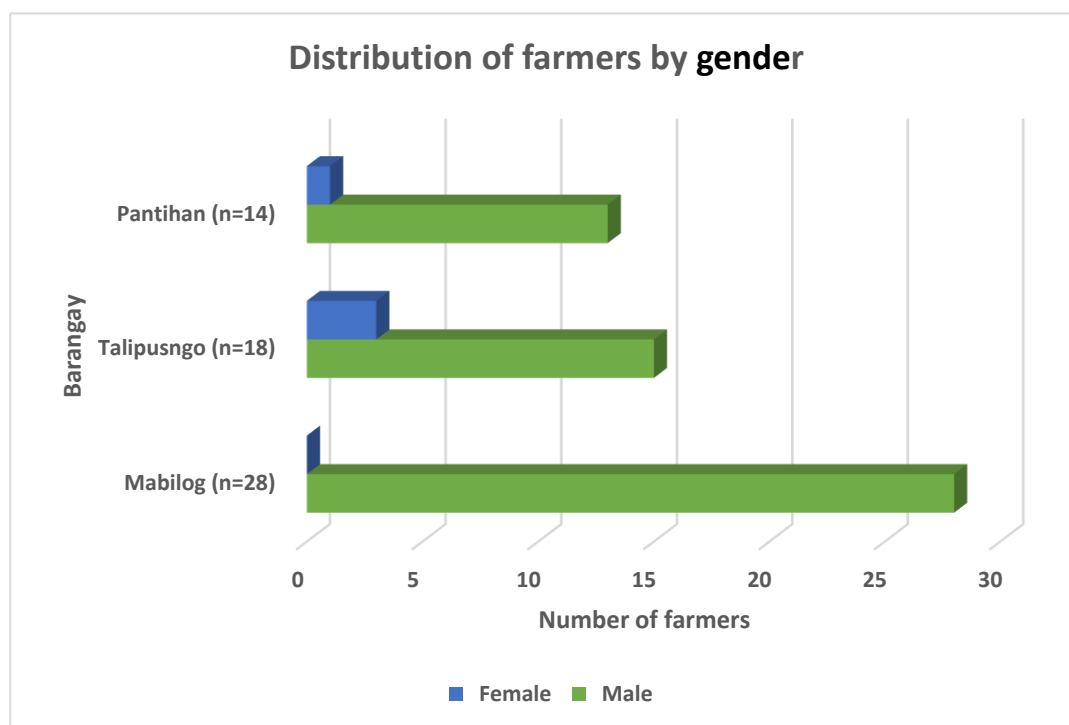


Figure 2. Gender of family farmers per barangay, Maragondon, Cavite, 2017

In terms of educational attainment, only one participant (1.67%) has a college degree and nine participants (15%) have no grade completed. In general, farmers have low educational attainment, completing high school education only. About 26.67% of them were able to finish vocational courses, 11.66% are elementary graduate to the high school level, while only 2 (3.33%) have reached the college level. It can be noted that in general, more farmers are expected to understand and adopt the new agricultural techniques and successfully adopt farm innovations (Table 2).

Table 2. Educational attainment of family farmers by barangay, Maragondon, Cavite, 2017

	Mabilog	Talipusngo	Pantihan3	All Barangays	
Variable	(n = 28)	(n= 18)	(n= 14)	(n=60)	
	Frequency	Frequency	Frequency	Frequency	Percent
<i>Education of the Farmer</i>					
No grade completed	1	0	0	1	1.67
Elementary graduate	1	1	0	2	3.33
High school level	3	2	0	5	8.33
High school graduate	13	9	3	25	41.67
Vocational	6	5	5	16	26.67
College level	1	0	1	2	3.33
College graduate	3	1	5	9	15.00

The mean household size is approximately 5, which is the usual average family size of Filipino households. The minimum size is 1 while the maximum is 11. Though the majority have a household size of 1 to 4 (53.33%), a higher percentage (45%) was also shared by 5 to 8 members (Figure 3).

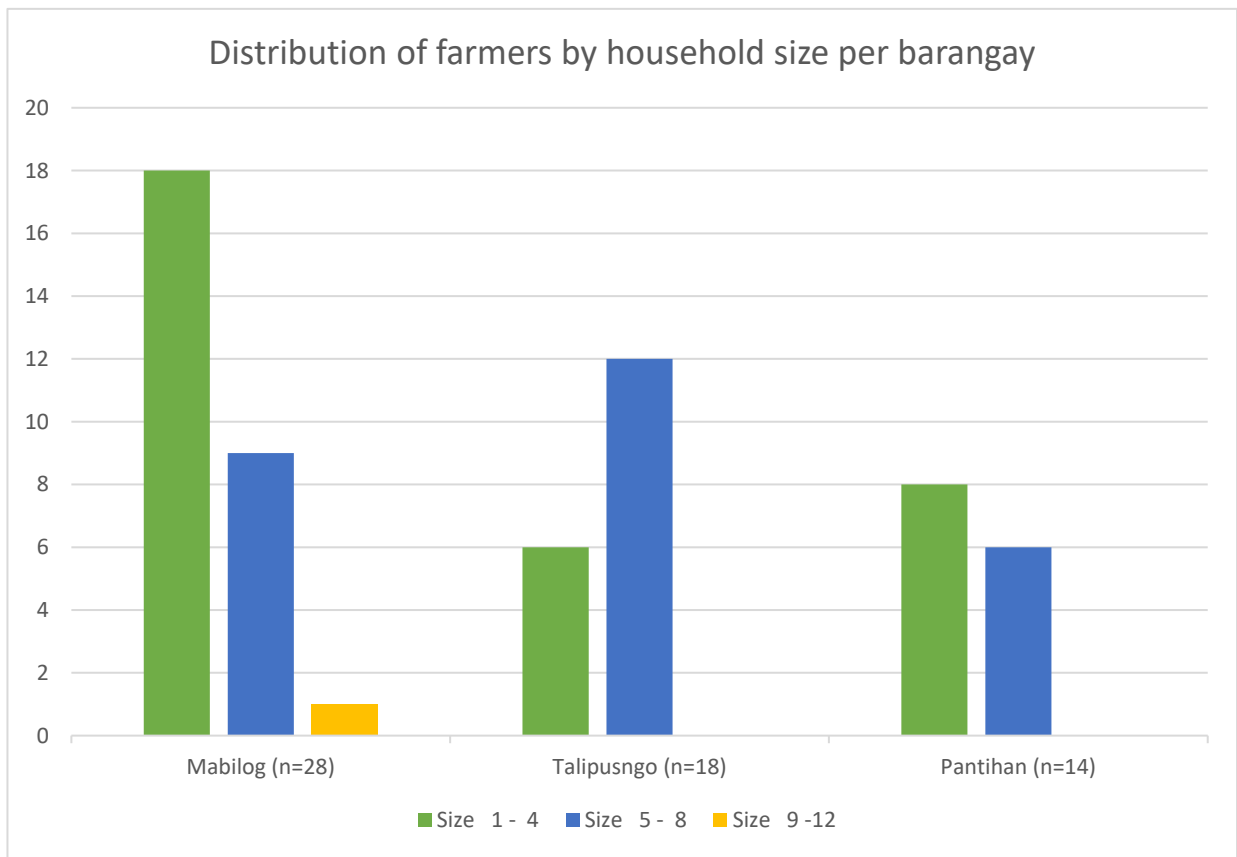


Figure 3. Household sizes of family farming per barangay, Maragondon, Cavite, 2017

In terms of the number of children, the mean number is 3.85 or approximately 4, which conforms with the average number of children per woman in the rural areas of 3.8. A majority (48.33%) have 1 to 4 children while 15% have 7 to 9. The highest number of children is 9 while the lowest is 1 (Figure 4).

About 47% (28) of spouses of participants indicated having other jobs in addition to being housewives. They have part-time works such as being a trader/vendor, server, stick maker, manicurist, sari-sari store owner, and Overseas Foreign Worker. Aside from farming, other farmers are also engaged in other jobs like tricycle driver, electrician, carpenter, construction worker, stick maker, buy and sell, and government employment who are likely those who are degree holders (Figures 5 & 6).

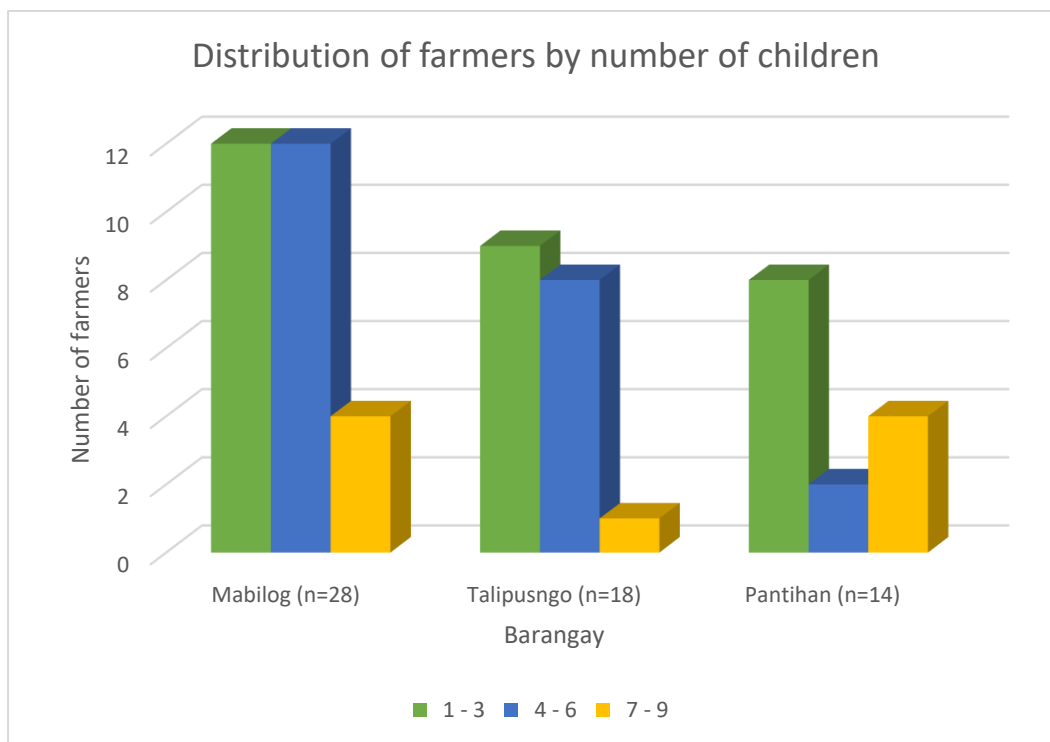


Figure 4. Number of children of family farmers, Maragondon, Cavite, 2017

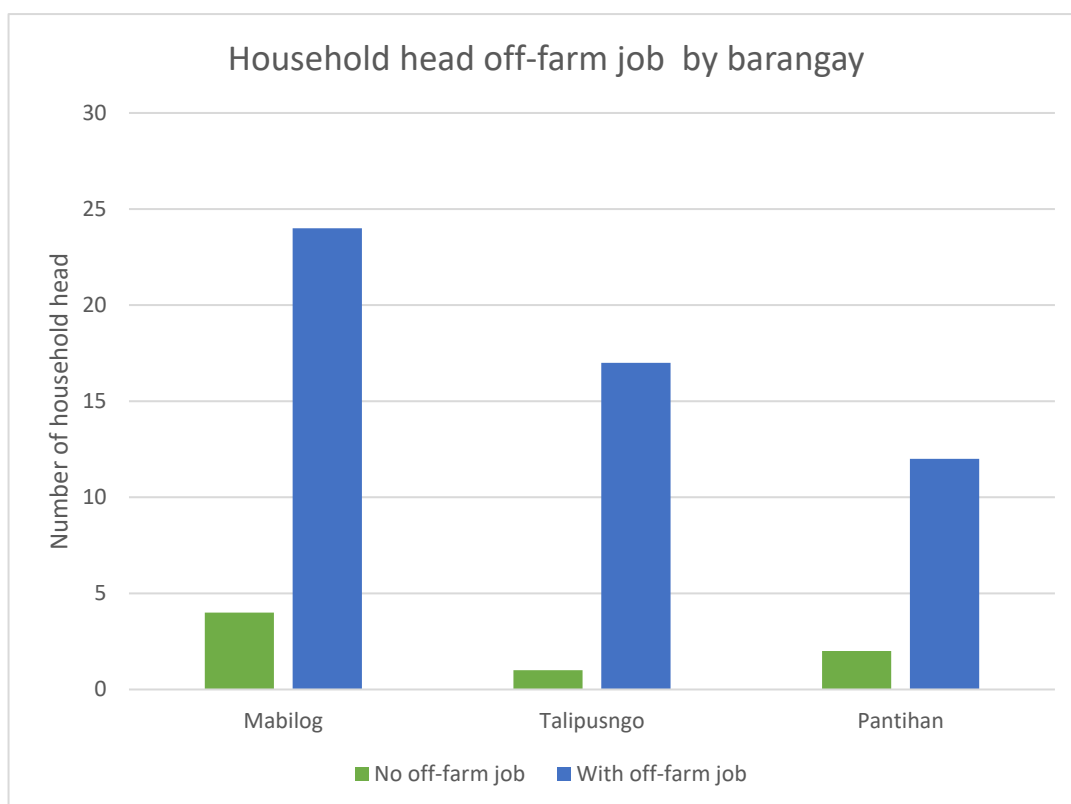


Figure 5. Distribution of family farmers with off-farm jobs, Maragondon, Cavite, 2017

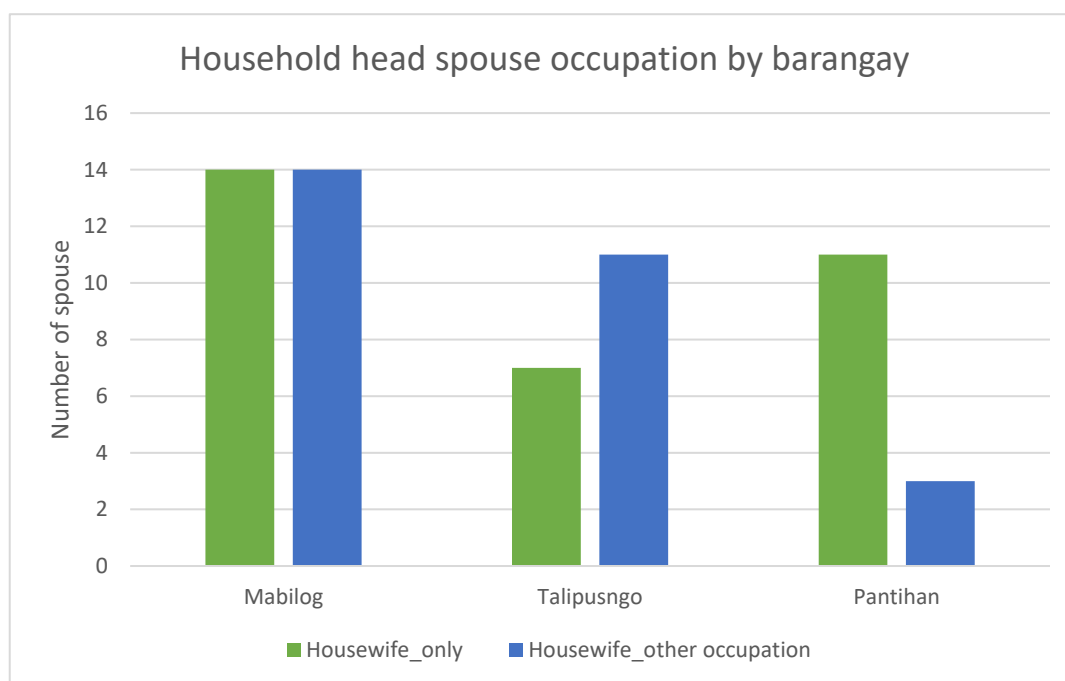


Figure 6. Distribution of family farmers' spouse with other occupation, Maragondon, Cavite, 2017

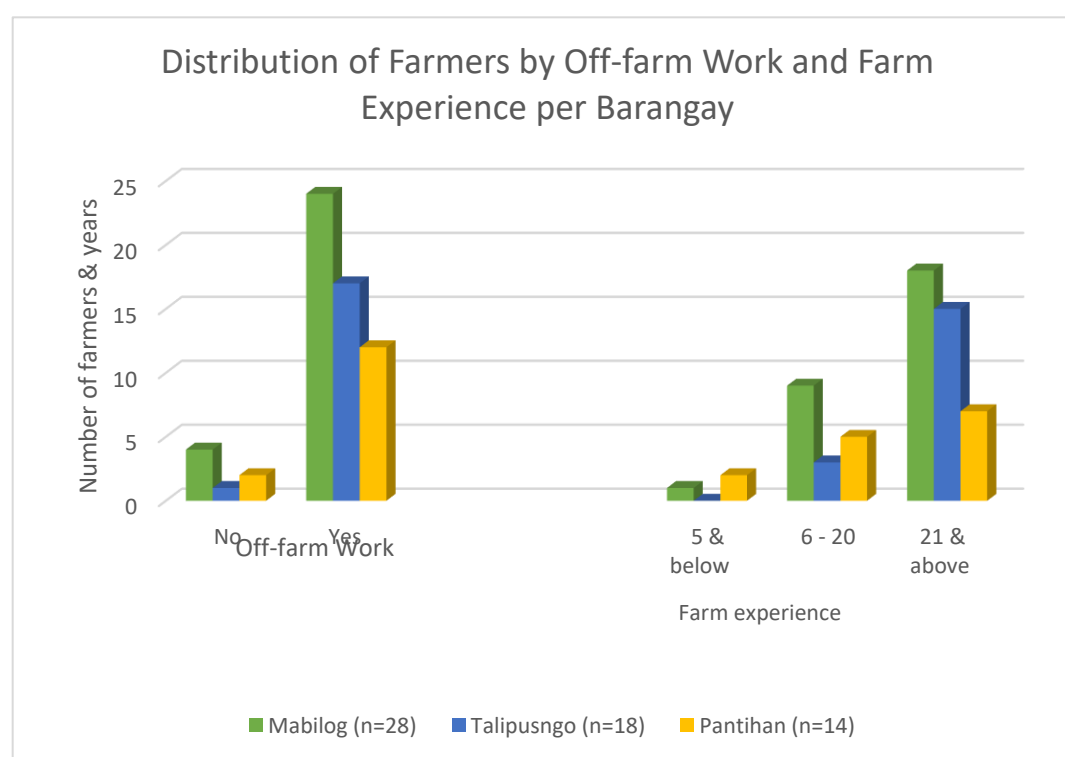


Figure 7. Family farming years of farming experience and with other work aside from farming, Maragondon, Cavite, 2017

A little less than 70% of the participants have had over 20 years of farming experience which shows that this is a farming community. Moreover, about 28.33% and 5% have been in farming for 6 to 20 years and less than 5 years, respectively. These are probably those farmers who are relatively younger (Figure 7).

## II. Farm Characteristics

Table 3 shows that the mean farm size is 1.54 ha with the farm sizes ranging from 0.20 to 4.2 ha. More farmers (53.33%) are currently cultivating farm area less than or equal to one hectare. About 71% are operating on one farm only while the rest are tending two farms either as owner, tenant, or worker. These barangays are indeed an agricultural community because most of the farmers (88.33%) inherited their farms from their parents and grandparents while the remaining percentage (11.67%) are beneficiaries of the Comprehensive Agrarian Reform Program (CARP).

On average, their family farms are relatively small. This is surprising, but it is also indicative of the level of beneficiaries of IIRR's project. The term family farm gives an image of a family whose household members work full-time on the farm, depending on their income entirely on the farm. This seems plausible since about 75% of the farmers asserted that their wives and children are helping in the farm activities.

About 67% (40) of the participants have had over 20 years of farming experience which shows that this is a farming community. Moreover, about 28.33% and 5% have been in farming for 6 to 20 years and less than 5 years, respectively. These are probably those farmers who are relatively younger. Table 3 shows that 53.33% of the farmers own 1 ha and below, 25% are operating 2.01 to 3 ha while only 1(1.67%) farmer owns more than 3 ha.

Table 3. Characteristics of family farms by barangay, Maragondon, Cavite, 2017

	<b>Mabilog</b>	<b>Talipusngo</b>	<b>Pantihan3</b>	<b>All Barangays</b>	
<b>Variable</b>	<b>(n = 28)</b>	<b>(n=18)</b>	<b>(n=14)</b>	<b>(n=60)</b>	
	<b>Frequency</b>	<b>Frequency</b>	<b>Frequency</b>	<b>Frequency</b>	<b>Percent</b>
<b>Farm Size (ha)</b>					
1.0 & below	12	10	10	32	53.33
1.01 - 2.00	8	1	3	12	20.00
2.01 – 3.00	7	7	1	15	25.00
3.01 – 4.20	1	0	0	1	1.67
<b>Total</b>					
<b>Percent</b>					
Mean = 1.54					
Std Dev					
Minimum = 0.20					
Maximum = 4.20					
<b>Farming System</b>					
Integrated Farming	20	15	6	41	68.33
Mixed Cropping	8	2	8	18	30.00
Monocropping	0	1	0	1	1.67

Cavite is known for mixed farming or integrated farming since time immemorial. This is a farming system where crops and animals are raised on the farm to reduce the use of external inputs, and eventually promoting sustainable agriculture. Most of the upland areas in Cavite are sloping in terrain, hence, the farmers need to maximize its use by planting in between several crops to optimize production. Also, since the farmers are owning

relatively small-sized farms, they need to maximize their use by practicing diversified and integrated farming systems.

In these barangays, most of the farmers (68.33%) are practicing the integrated farming system, 30% are engaging in mixed cropping, while only 1.67% are into monocropping (rice). Most of the farms that are into integrated and mixed cropping systems have banana-based mixed with corn, root crops (cassava, purple yam, taro, sweet potato, ginger, peanut), vegetables (sponge gourd, string beans, mustard, pechay, ladyfingers, squash, pigeon pea, cowpea, mustard, cucumber, winged bean, lima bean, and eggplant), fruits (soursop, mango, rambutan, star apple, sugar apple, cashew, cotton fruit, dalanghita, tamarind, jackfruit, avocado, chico, pineapple, pomelo, lanzones, papaya, calamansi, Spanish plum, black plum, and cacao), corn, and other plantation crops such as coffee and coconut. In the case of animals, they either have pig fattener, pig gilt, pig sow, native pig, native chicken, carabao, cow, horse, goat). Others are also maintaining bamboos which have proven to be one of their good sources of farm income. Other minor trees planted are mahogany, narra, and alibangbang, probably serving as windbreaks.

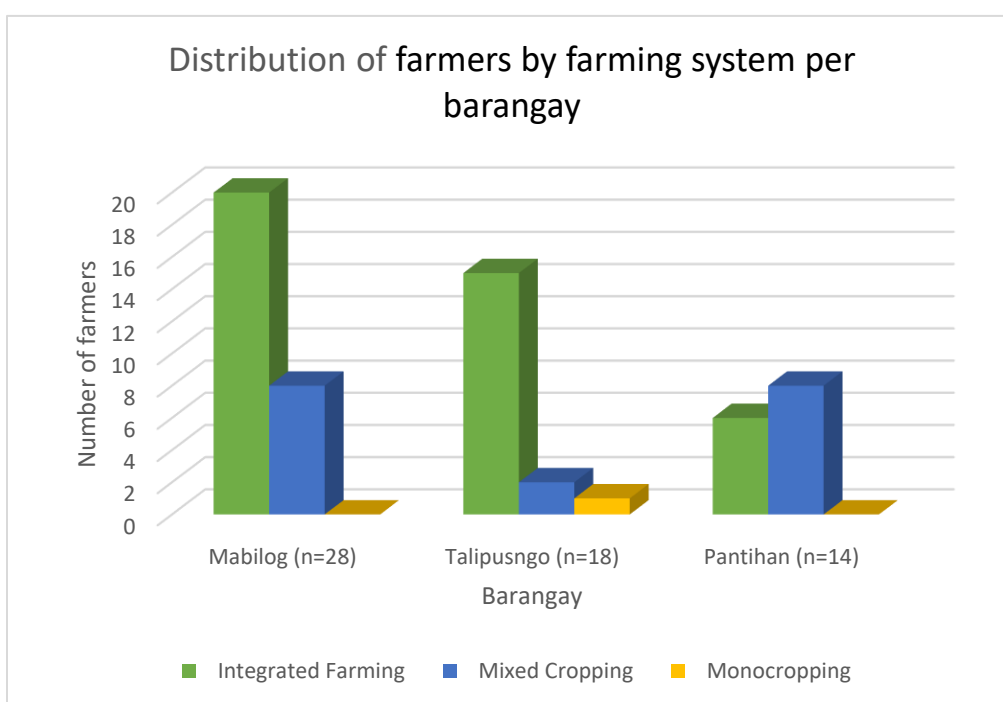


Figure 8. Farming system practices of family farming, Maragondon, Cavite, 2017

### III. Gender Participation in Decision-Making and Farm Activities

In terms of involvement of family members in farm decision making, land utilization/use, crops and varieties to plant, technologies to use are dominated by men family farmers while decisions on selling/marketing of crops, livestock and productive assets are about evenly shared by both men and women. As expected, the decisions on managing their income and expenses; how much will be spent and allotted as capital for their livelihood; and what food to prepare and eat are mostly dominated or done by women family farmers. Figure 9 shows the gender role or the participation of husband and wife in decision-making and farming activities.

On average, decision making on land use preparation, planting activities, seedling type selection, and technology use are done at about 80% and 20% by male and female respectively. In the case of marketing and use of live animals, decision making is about 60% and 40% for male and female respectively. However, there is no clear evidence of gender dominance with respect to decision making in the areas of marketing and buying of products. In the management of earnings and expenses, there is a clear gendered dominance with women making about 74% of decisions and men making about 26 % of decisions. Although, evidence of joint decision making exists in capital and food, about 60% are made by women, and only 40% by men.

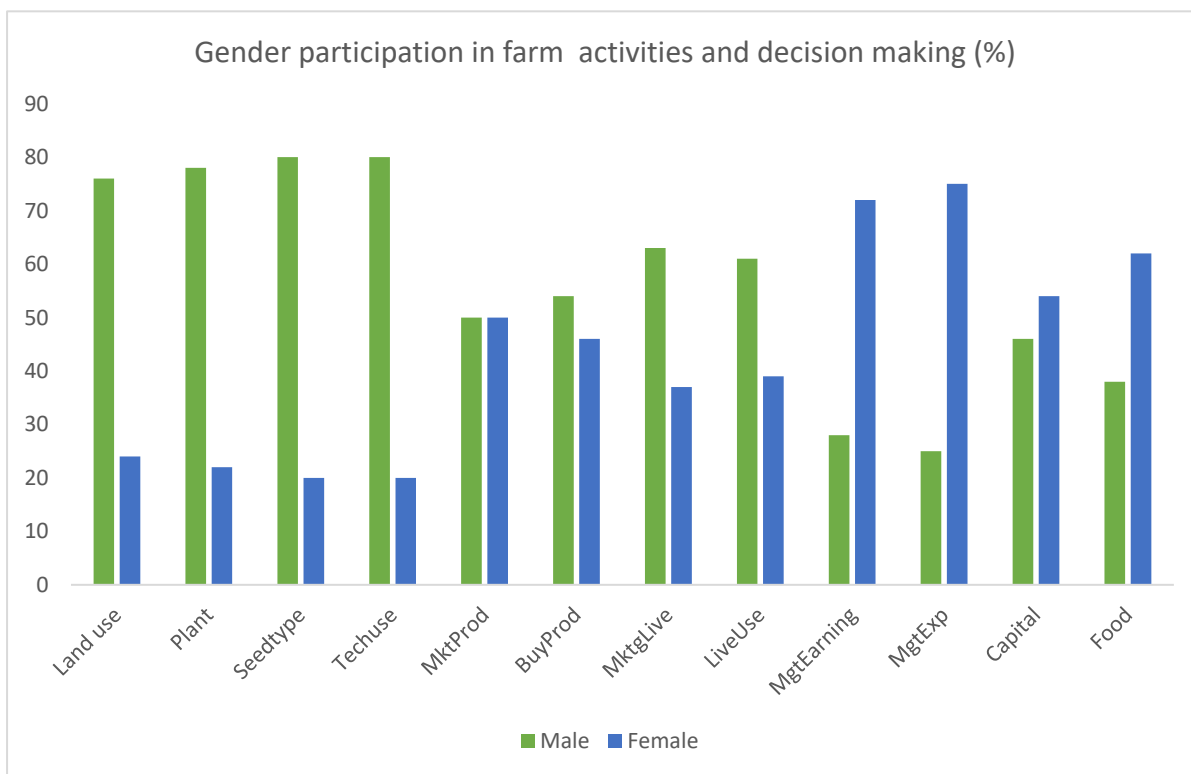


Figure 9. Gender participation in farm activities and decision-making, Maragondon, Cavite, 2017

In general, while men are at the forefront of most agricultural activities, the women play a great role in making decisions on the farm. To continue women empowerment, gender intervention frameworks are still needed to close the gender gaps in decision making.

## IV. Market Access

About 63.34% of the family farmers sell to traders, 17 or 28.33% directly sells their farm products to trading centers or markets in Maragondon, Ternate, Naic, and Tanza while the remaining 5 or 8% of family farmers are into buy and sell or trading of farm products (Figure 10).

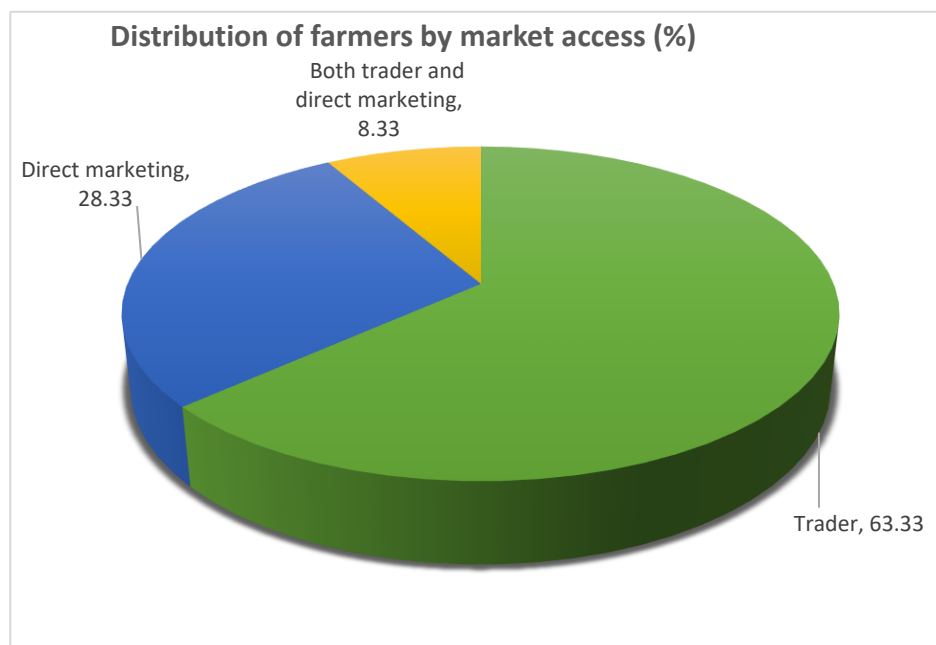


Figure 10. Distribution of family farmers by market access, Maragondon, Cavite, 2017

## V. Food Security

The food security situation improved in 2018 and 2019. About 36% (22 participants) were food insecure in 2017 and only 20% (or 12 participants) indicated being food insecure in 2018/2019 (Figure 11). The categorization of the food security status of households was based on responses to any of the seven household items referencing food security. It seems plausible that family farming had indeed contributed to the food security condition of households in the three barangays recording a 26.32% increase in the number of families who asserted that they are food secured after a year.

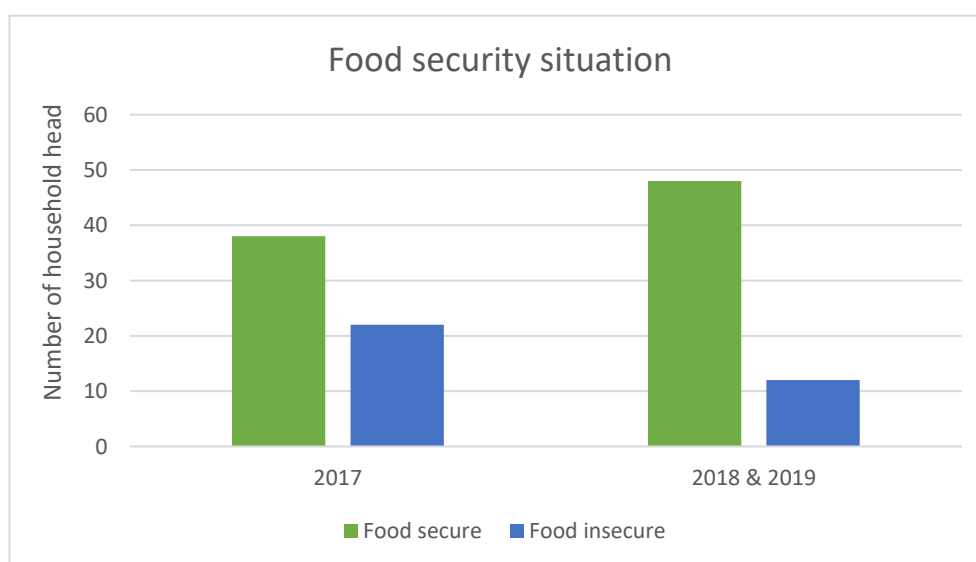


Figure 11. Food security status of households by barangay, Maragondon, 2017 - 2019

## VI. Farm Practices

About two-thirds of the farmers are practicing mulching, intercropping, and fallowing or resting of the land. It is also interesting to note that the majority have access to roads and have crop insurance. This is also the pattern when these were compared across farm sizes. In the case of farmers with 2.01 to 3 hectares, 60% of them said that there are no accessible roads (Figure 12). Most of them across farm sizes have access to crop insurance except for one who has the biggest farm. All farmers with 1.01 to 2.0 hectares have crop insurance.

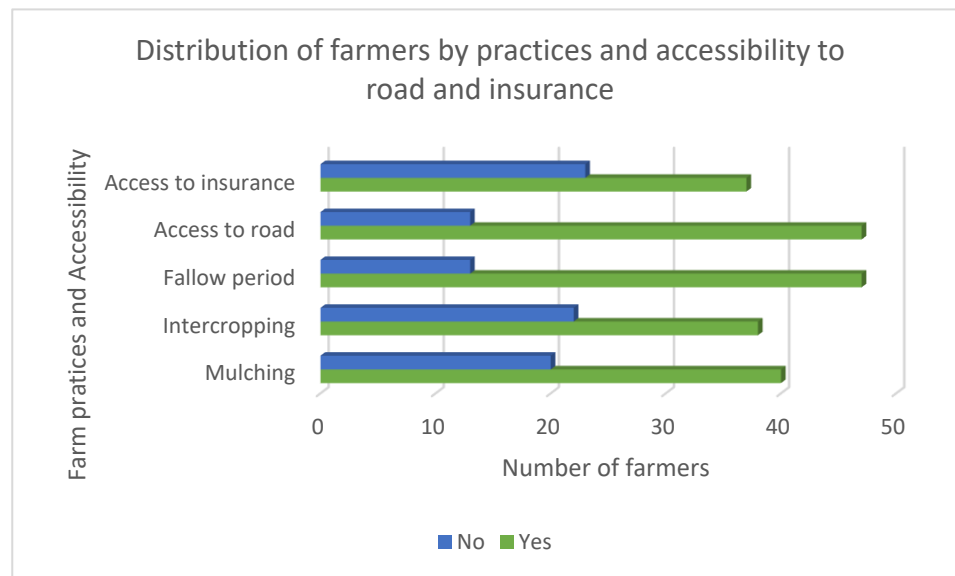


Figure 12. Farm practices and accessibility to roads and insurance, Maragondon, Cavite, 2017

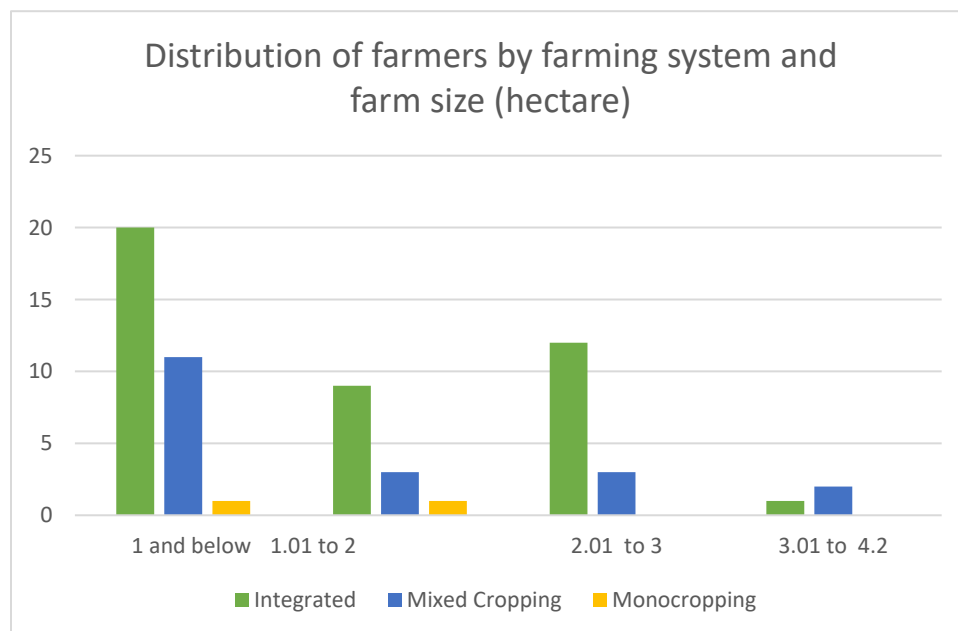


Figure 13. Farming system practices by farm size, Maragondon, Cavite, 2017

In the three-year periods under study, more farmers (68.33%) are adopting the integrated farming system with banana (saba) as the main crop and tend to farm one or less hectares. This was mostly observed in barangays Layong Mabilog and Talipusngo. In Pantihan 3, all small-sized farmers are practicing mixed cropping. Only one farmer from Talipusngo employed monocropping which is a sugarcane farm<sup>1</sup>.

## VII. Viability of Family Farms

### a) Farm income

Farm income suggests the ability of agricultural activity to reward the farmer and his family or to guarantee adequate incomes that would allow sustainability of the farm in the medium-long term. This reflects the opportunity cost of all the factors of production possessed by the farmers. Simply put, this would reflect the ability to remunerate the labor input the farmer and his family at a wage comparable to pay in other alternative activities and the amount invested in the farm.

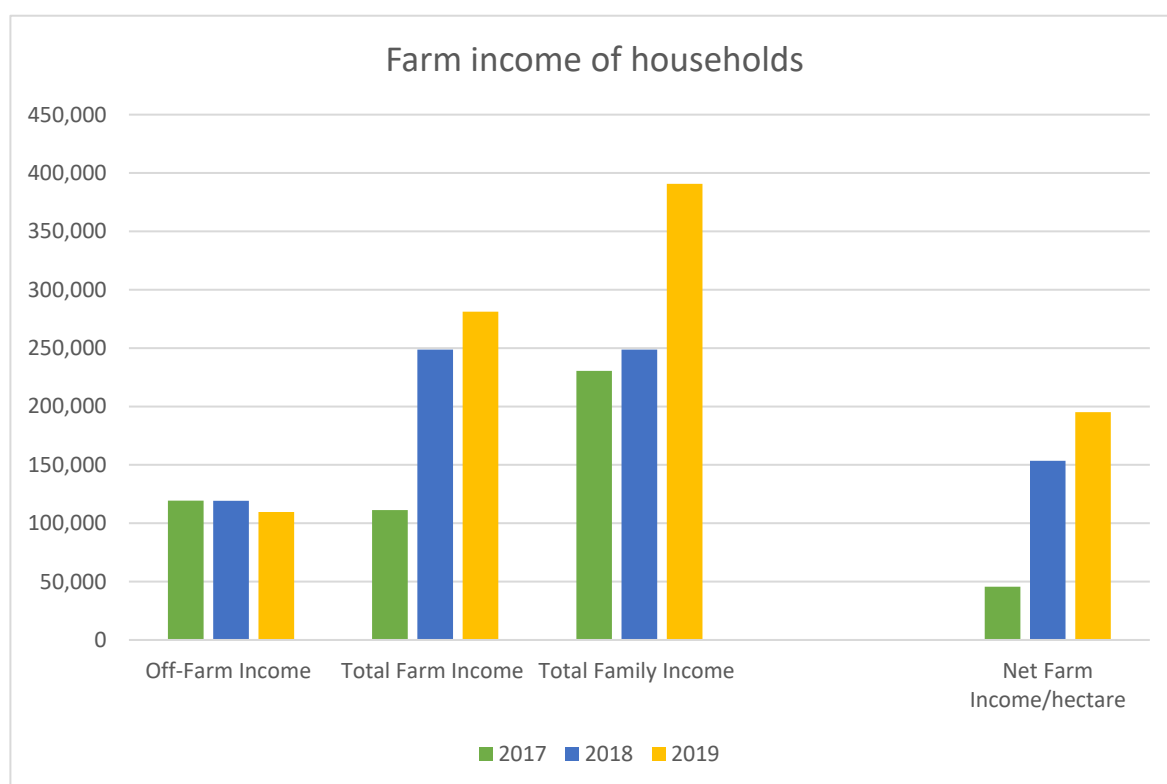


Figure 14. Farm income of family farming households, Maragondon, Cavite, 2017 - 2019

The farmer-respondents reported two sources of income – farm and non-farm. They reported a mean total family income of Php230,558 per year or approximately Php19,213.17 per month or Php3,842 per capita in 2017 (Figure 14). Roughly, 55% of this income came from off-farm employment and 45% from farm earnings only (Figure 15). If only from the farm income, they would have barely Php9,269.41 per month or Php1,853.88 per capita which is not enough to have a modest life. This may be the reason why they opted for off-farm jobs to

<sup>1</sup> The family farmer is part of the Phase 1 project. After Phase 1, his father entered into a contract with the ethanol manufacturer. The contract for sugarcane production ended in 2018.

augment their meager farm income. Those who reported that they have off-farm employment was working as a carpenter, tricycle driver, electrician, buy and sell, and government employment.

In 2018, total income has increased to PhP248,724 or PhP20,727/month, 67% of this income came from farm sources (Figure 15). Overall, the mean total farm income has increased by 69.46% from 2017 to 2019 with an average monthly income of PhP32,558. The farm income share was 69% with the rest coming from off-farm employment (Figure 15). It is also quite interesting to note that the maximum income has gone up to a high of PhP920,040 or PhP76,670/month compared to PhP615,200 or PhP51,267 in 2017 (Figure 14). This indicates that the farm is ensuring to the family an income level that is at least equal to the off-farm jobs and then the farm can be considered viable in this three- year period.

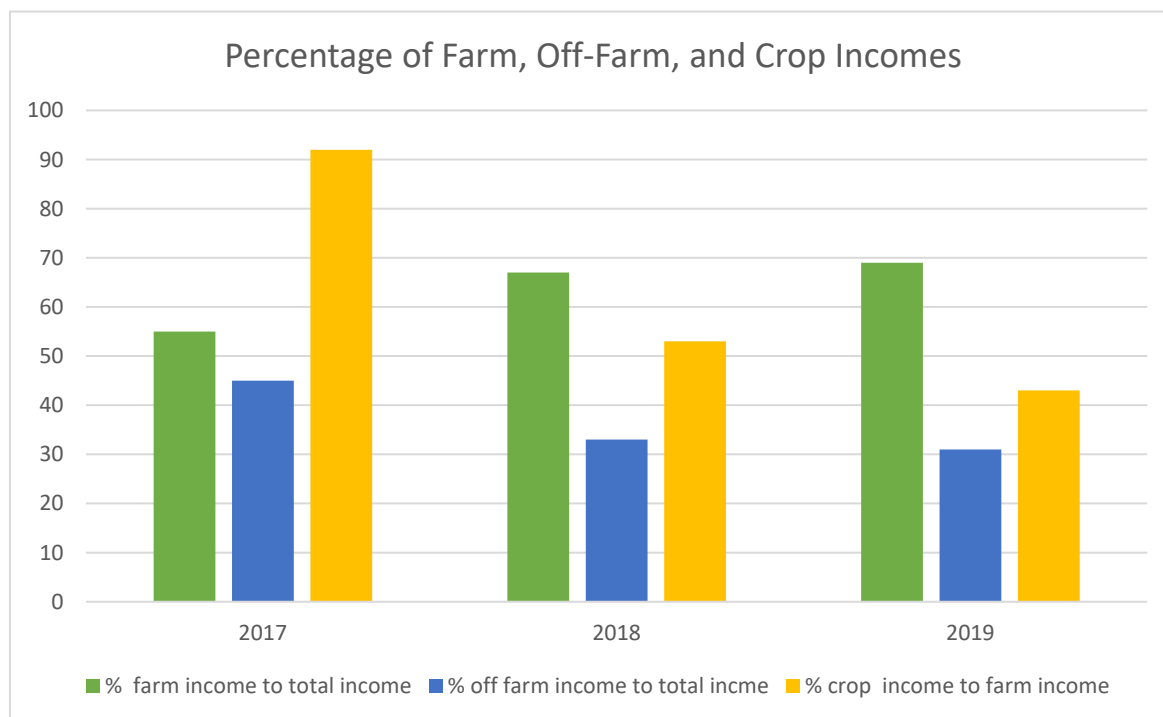


Figure 15. Percentage of income across sources, Maragondon, Cavite, 2017-2019

Family farm income is considered a major indicator of farm viability (Hooks et al., 2017; O'Brien et al., 2008) and can vary due to differences in farm size, farming experience, and farming system. The baseline annual gross farm income was PhP11,330/sq m or the family farm was earning roughly PhP9,441/ha per month. With the project intervention of the IIRR, the farm income per hectare has increased by more than doubled in 2018 and almost tripled in 2019. In 2018, farm income registered a mean monthly income of Php21,233/ha and Php25,933/ha in 2019. Considering the mean farm size of 1.54 hectares, then they earned as much as PhP32,698.82 and PhP39,936.82 in 2018 and 2019, respectively. In terms of net farm income/year, a significant increase was noted with PhP45,600, PhP153,500, and PhP195,200 per hectare in 2017, 2018, and 2019 respectively.

Figure 16 shows the farm profitability on a per square meter basis. These figures are equivalent to the mean net farm income of PhP3,800, PhP12,791, and PhP16,267 on a hectare basis in 2017, 2018, and 2019, respectively. Given their average landholding, their net farm income has increased from PhP5,852 in 2017 to

Php19,698.14 in 2018, to Php25,015.18 in 2019. This means an average rate of increase by 327.46% from 2017 to 2019.

From the foregoing, it can be gleaned that farm income contributed to the household income and family farms can be considered as viable. Based on a 2017 survey of the Department of Agriculture (DA), the family farm’s average income is around Php100,000 a year, according to the latest Family Income and Expenditure Survey, or just over Php8,000 a month, which is well below the poverty line. Considering the farm income of the family farms under study, the 60 households are beyond the national family farm’s average income of Php100,000 a year which is a good indication that family farming is viable. In the short term, their farms have been considered viable to the extent that they were able to ensure a level of income per family work unit at least more than the average national farm income of Php100,000 per hectare and much beyond the poverty level of income. This also gives an assurance that if the practices are sustained, the level of income will adequately remunerate all the factors owned by the farmer and his/her family at their opportunity cost.

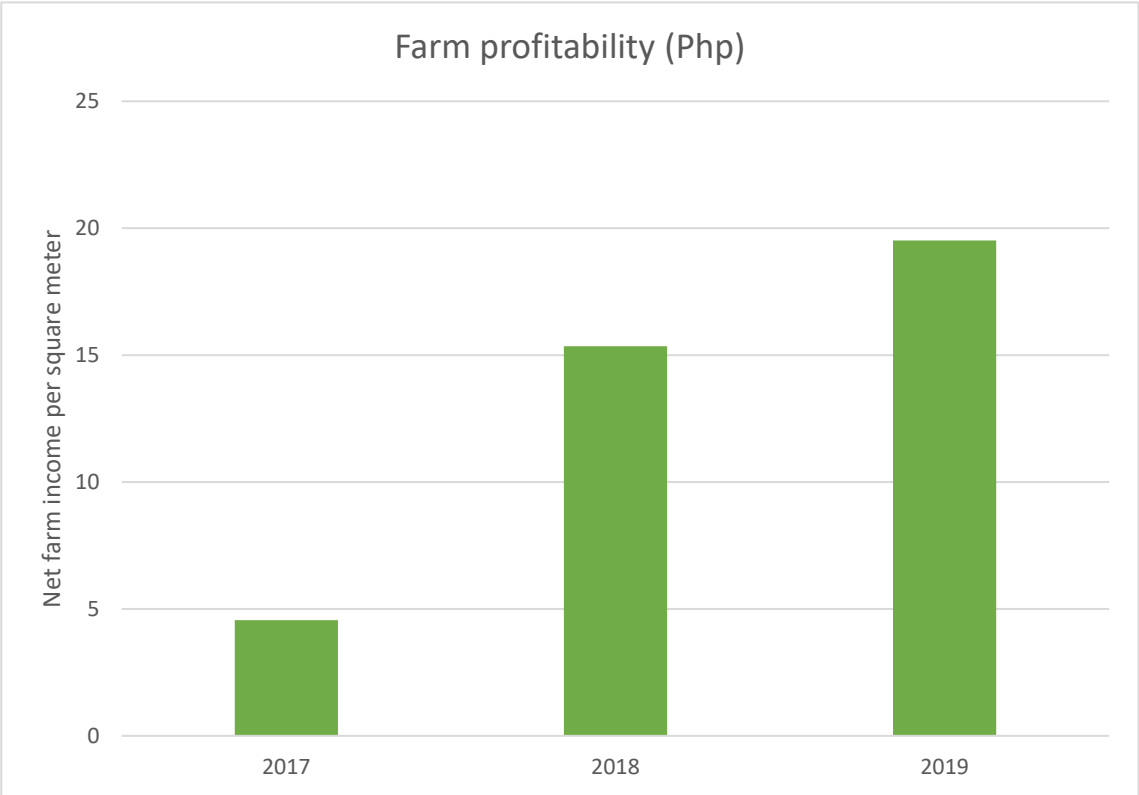


Figure 16. Net farm income per square meter of family farming in Maragondon, Cavite, 2017 - 2019

**b) Proportion of farm income to total income**

Proportion of farm income to total income rose steadily from 2017 to 2019, that is, from 55% to 69%. See Figure 17. While off-farm income is important, farm income brings in the lion share and may continuously be a major part of their family income if they will sustain and continue to improve the cropping system that they have started to adopt for three years. Moreover, the proportion of crop income to farm income was 92% in 2017, however, this number went down very quickly in 2018 and even further down in 2019 (Figure 17). Perhaps, chicken and livestock kept the farmers above water in 2019. This means that keeping animals on their farm is a good practice to employ to maximize the use of land.

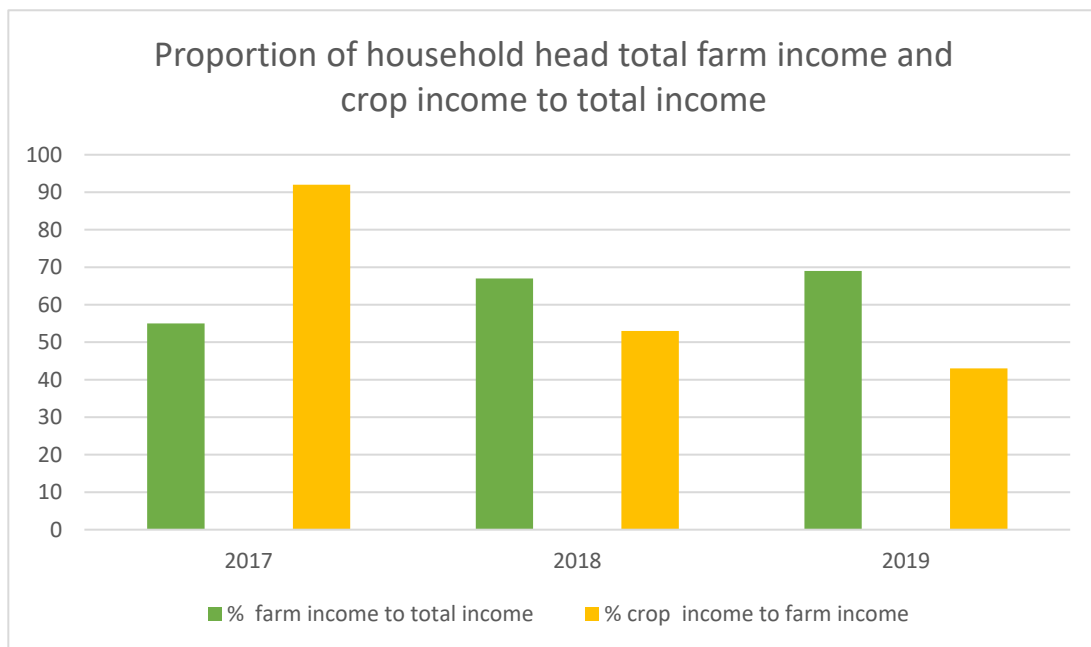


Figure 17. Proportion of farm and crop income to total household income

### c) Profitability across farm size and experience

Table 4. Net income and farm area of households, Maragondon, Cavite, 2017 - 2019

Farm Size (ha)	Frequency	2017	2018	2019
		Mean Net Income	Mean Net Income	Mean Net Income
1.0 & below	32	65,900 <sup>a</sup>	215,400	286,300
		5,491.67 <sup>b</sup>	17,950	23,858.33
		[10.49]	[27.53]	[31.15]
1.01 - 2.00	12	29,700	103,300	105,800
		2,475	8,608.33	8,816.67
		[3.77]	[7.55]	[7.34]
2.01 – 3.00	15	17,500	67,300	79,200
		1,458.33	5,608.33	6,600
		[1.92]	[4.95]	[6.07]
3.01 – 4.20	1	7,500	67,300	92,400
		625	5,608.33	7,700
		[0]	[0]	[0]

Note: standard deviation [ ]

<sup>a</sup> Mean net farm income/ha/yr

<sup>b</sup> Mean net farm income/mo

The rest of the figures would follow the same computation.

In terms of profitability across farm size, the mean net farm income of the farmers with less than or equal to one hectare was the highest (Table 4 and Figure 18). The net farm income for this group rose steadily between 2017 and 2019. It has increased, on average, from PhP65,900/ha in 2017 to PhP286,300 in 2019. Those with 1.01 to 2.0 hectares were a distant second in terms of profitability while those with more than 2 hectares did reasonably well in terms of profitability but not as well as farmers operating less than 2 hectares. Monthly, the farmers’ net farm income for the lowest farm size category has increased from PhP5,491.67/ha to about PhP23,858.33/ha in 2019 which is more than four times compared to 2017. The mean net income for small-sized farms was higher by more than two times in 2018 and by more than three times in 2019 compared to bigger-sized farms.

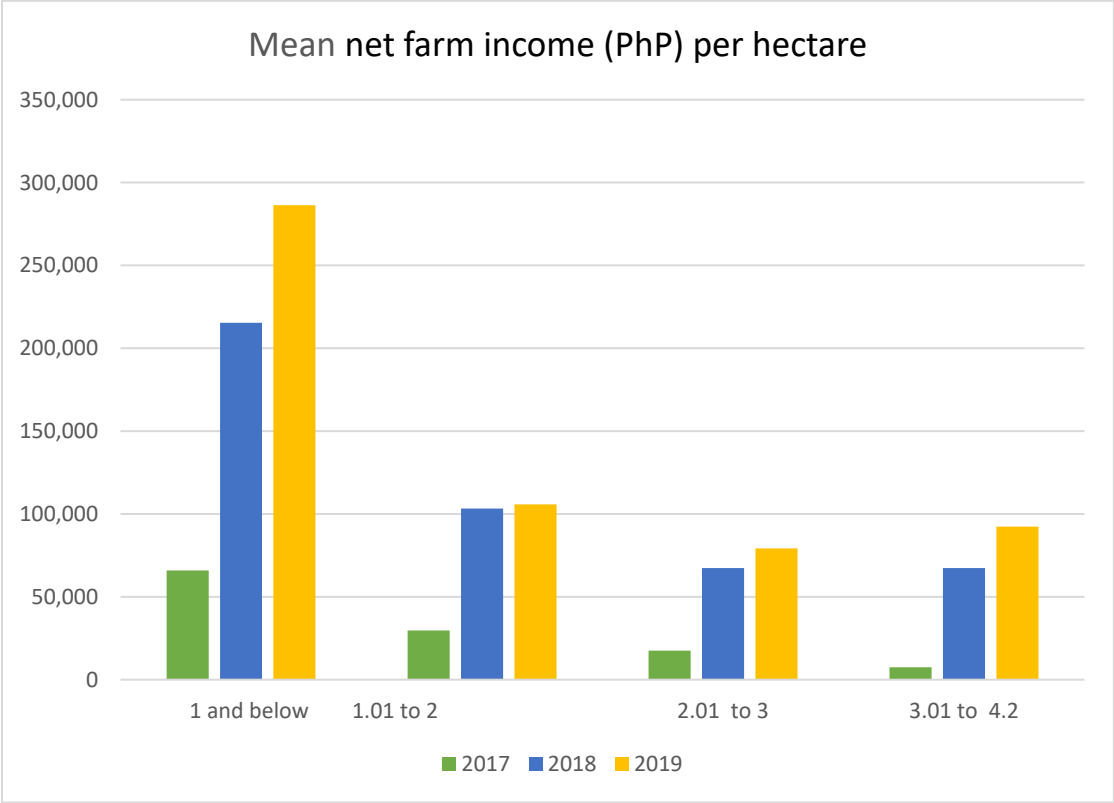


Figure 18. Family farming net income, Maragondon 2017-2019

The mean net farm income across farming experience and farm area was also determined as shown in Table 5. In 2017, those farmers with at most 20 years of farming experience and tilling 1.01 to 2.0 hectares have higher income but for those with 21 years and above farming experience, the small-sized farms apparently did better. It is worth noting that those with higher farming experience were able to utilize their farms efficiently, particularly those who are operating one hectare and below. For instance, in 2017, from 84,100 it has increased by about 126.63% (PhP190,600) in 2018 and by 269.2% (PhP310,500) in 2019. It seems that when the experience is taken into consideration, participants with more than 5 years to over 20 years of farming experience and with one hectare or less earned higher net income per square meter or per hectare in 2018 and 2019.

Table 5. Mean net farm income by farm experience and farm area, Maragondon, Cavite, 2017 – 2019

Farm Experience (years)/ Farm Area (ha)	Frequency	2017	2018	2019
		Mean Net Income/ha	Mean Net Income/ha	Mean Net Income/ha
5 and below				
1.0 & below	1	6,800	-13,300	81,400
1.01 - 2.00	2	21,500	82,900	11,000
2.01 – 3.00	-	-	-	-
3.01 – 4.20	-	-	-	-
6 – 20				
1.0 & below	12	48,300	29,080	28,400
1.01 - 2.00	1	61,000	90,700	86,300
2.01 – 3.00	3	1,900	51,500	77,700
3.01 – 4.20	1	7,400	67,300	92,400
21 and above				
1.0 & below	18	84,100	190,600	310,500
1.01 - 2.00	10	27,400	106,600	107,400
2.01 – 3.00	12	21,300	71,200	79,500
3.01 – 4.20	-	-	-	-

The percentile distribution helps to locate the participants' farm income position in the total farm income distribution. See Table 6. For example, 10% of the participants earned less than PhP34,860 annual farm income in 2017, PhP44,765 in 2018, and PhP59,722.50 in 2019. The disparity of farm income between the 10<sup>th</sup> percentile and the 90<sup>th</sup> percentile is wide. Specifically, the 90/10 farm income inequality ratio — the farm income earned by participants in the 90th percentile (those earning more than 90% of other participants) compared to the total farm income of participants at the 10th percentile (those earning higher than the bottom 10%). Dividing the income of participants at the 90th percentile with those of the participants at the 10th percentile creates the 90/10 farm income inequality ratio of 7.35 in 2017 which has decreased to 6.75 in 2018 and 6.95 in 2019. Despite the slight decrease in farm income disparity, the farm income between the 90<sup>th</sup> remained at about six times the farm income of the participants at the 10th percentile.

The farming system and farm area by net farm income per hectare over three years (2017, 2018, & 2019) are presented in Table 7. The mean net farm income is highest among farmers using the integrated farming system and farming one or less hectare. This has been consistent over the three years. Net farm income has increased from PhP85,000/ha in 2017 to PhP290,100/ha in 2019. These figures are equivalent to approximately PhP708.33/ha per month in 2017 to about PhP24,175/ha per month in 2019. In 2017 and 2018, integrated farming was found to be viable or profitable for small-sized farms, however, mixed cropping was more profitable for one hectare and less in 2019. This may be because of reported infestation in livestock in that year. To sum it all, small farms are evidently more viable than large-sized farms. This can be attributed to the farmers' tendency to intensify production and maximize the utilization of land by planting more crops and combine it with small and large animals and putting more attention to employing farm practices that will optimize production.

Table 6. Farmers' total farm income (PhP) by percentile distribution, Maragondon, Cavite, 2017 - 2019

Percentile (%)	2017		2018		2019	
	Mean	Smallest	Mean	Smallest	Mean	Smallest
1	24,370	24,370	7,050	7,050	36,000	36,000
5	31,133	25,620	46,403	32,400	61,861	44,278
10	34,860	30,900	66,360	44,765	91,121	59,723
25	59,485	31,365	119,871	48,040	147,358	64,000
50	92,100		233,938		239,893	
	Mean	Highest	Mean	Highest	Mean	Highest
75	145,728	270,795	327,407	555,320	393,055	540,080
90	256,225	282,600	448,518	583,900	528,300	633,180
95	276,698	290,470	569,610	734,140	586,630	854,905
99	292,000	292,000	745,535	745,535	858,040	858,040
Mean	111,233		248,724		281,153	
Std. Dev	74,188		163,088		183,640	
Variance	5.50E+09		2.66E+10		3.37E+10	
Skewness	1.12		0.99		1.13	
Kurtosis	3.29		4.04		4.27	

Table 7. Farming system, farm area, and net farm income of family farms per hectare, Maragondon, Cavite, 2017 - 2019

Farm System/ Farm Area (ha)	Frequency	Mean	Std.Dev	Min	Max
Integrated		2017			
1 and below	20	85,000	122,000	-35,000	495,000
1.01 - 2.0	9	32,000	41,000	-24,000	107,000
2.01 - 3.00	12	19,000	16,000	-4,000	55,000
Mixed Cropping					
1 and below	11	32,000	63,000	-58,000	17,600
1.01 - 2.0	3	24,000	34,000	-4,000	61,000
2.01 - 3.00	3	10,000	34,000	-12,000	49,000
3.01 - 4.2	1	7,000	[0]	7,000	7,000
Monocrop					
1 and below	1	51,000	[0]	51,000	51,000
Integrated		2018			
1 and below	20	284,200	321,300	6,300	1,449,200
1.01 - 2.0	9	100,060	87,800	-8,900	272,000

2.01 - 3.00	12	67,500	52,100	-4,200	191,002
Mixed					
1 and below	11	105,900	114,800	-16,300	361,400
1.01 - 2.0	3	111,500	19,400	90,700	129,000
2.01 - 3.00.	3	66,400	47,100	12,700	100,700
3.01 - 4.2	1	67,300	0	67,300	67,300
Monocrop					
1 and below	1	44,400	0	44,400	44,400
Integrated					
2019					
1 and below	20	290,100	279,300	-66,600	804,400
1.01 - 2.0	9	114,100	83,500	-400	286,000
2.01 - 3.00.	12	81,700	62,300	2,400	238,700
Mixed Cropping					
1 and below	11	303,500	381,000	-45,300	1,265,300
1.01 - 2.0	3	81,000	23,200	55,700	101,100
2.01 - 3.00.	3	69,100	65,000	25,000	143,800
3.01 - 4.2	1	92,400	0	92,400	92,400
Monocrop					
1 and below	1	20,500	0	20,500	20,500

Table 8 shows the net farm income per hectare by percentile distribution. It was revealed that the net farm income levels have remained mostly negative for farmers between 1 – 10 percentiles over the last three years which suggests that farm profitability on a per hectare basis has been negative at these lower percentiles. However, profitability at the 50<sup>th</sup> percentile (median) was PhP 22,100, PhP98,800, and PhP99,200 per hectare for 2017, 2018, and 2019, respectively. Farmers above the 50<sup>th</sup> percentile are doing very well. For instance, at a higher percentile (75<sup>th</sup>), the profitability per hectare ranged from an average of PhP55,400 to PhP207,400 in 2017 to an average of PhP256,400 to PhP748,800 per hectare in 2019.

Table 8. Net farm income per hectare of family farmers by percentile distribution, Maragondon, Cavite, 2017- 2019

Percentile, %	Net Farm Income					
	Average	2017 Smallest	Average	2018 Smallest	Average	2019 Smallest
1	-57,600	-57,600	-16,300	-16,300	-66,600	-66,600
5	-18,100	-34,700	-6,600	-10,300	-6,200	-45,300
10	-5,500	-24,400	6,000	-8,900	12,000	-11,900
25	4,600	-11,900	43,100	-4,200	46,900	-400
<b>50</b>	<b>22,100</b>		<b>98,800</b>		<b>99,200</b>	
	Average	Largest	Average	Largest	Average	Largest
75	55,400	207,400	175,100	472,300	256,400	748,800
90	115,000	208,700	377,000	477,000	563,100	761,600
95	208,000	228,200	474,700	557,100	755,200	804,400

99	494,900	494,900	1,449,200	1,449,200	1,265,300	126,5,300
Mean	456,000		153,500		195,200	
Std. Dev	81,500		214,600		250,200	
Variance	663,900		4,606,400		6,259,000	
Skewness	3.31		3.99		2.13	
Kurtosis	17.16		23.46		7.90	

## VIII. Comparing Profitability by Food Security

The viability of the family farms, measured by profitability, was compared profitability in terms of food security in 2017 when the project has commenced (Table 9), and in 2019 (Table 10), when the project has ended. It was hypothesized that those who are food secure have more profitable farms than those who are not. The results indicate that there is no statistically significant difference ( $p > .05$ ) between the mean net farm income per hectare for farmers who reported food insecure and food secure (PhP54,600 vs PhP40,300). Surprisingly, the mean net farm income of farmers who reported food insecure is higher than the mean net farm income of farmers who reported to be food secure in 2017.

In 2019, the results indicate that there is a statistically significant difference ( $p < .05$ ) between the mean net farm income per hectare for farmers who reported food insecure and food secure (PhP64,900 vs PhP227,800). In other words, the farmers who reported food secure have a higher mean net farm income than farmers who reported to be food insecure in 2019.

Table 9. Two sample *t*-test comparing profitability by food security (2017)

Variable	Observation	Mean	Std. Err.	Std. Dev.	95% Conf. Interval	<i>p</i> -value
Food Insecure	22	54,600	2.38	11.18	0.51 -10.42	.51
Food Secure	38	40,300	0.95	5.84	2.11 -5.95	
Combined	60	45,600	1.05	8.15	2.45-6.66	
Difference		14,200	2.19		-2.97 -5.82	

Table 10. Two sample *t*-test comparing profitability by food security (2019)

Variable	Observation	Mean	Std. Err.	Std. Dev.	95% Conf. Interval	<i>p</i> -value
Food Insecure	12	64,900	2.12	7.33	1.83 -11.15	.04
Food Secure	48	227,800	3.87	26.81	14.99 - 30.56	
Combined	60	195,100	3.23	25.02	13.06 - 25.98	
Difference		-162,900	7.86		-32.02 - 0.56	

## IX. Determinants of Households' Food Security

Table 11 shows the determinants of food security of participants. In terms of robustness and correctness of the model, the non-significance ( $p = 0.47$ ) of Hosmer–Lemeshow test is used as an indication of goodness of fit. The overall predictive power and how well the data fit of the model is considered high at 73.3% (correctly predicted 10 farmers out of 22 classified as food insecure and correctly predicted 34 farmers out of 38 classified as food secure). However, the pseudo-Nagelkerke  $R$  Square (0.282) is relatively low. It is the closest to  $R$ -square in regression and may indicate the extent to which the model might be a good fit.

Two out of seven variables are found to be significantly associated with food security. The few variable predictors could be an indication of how food security was defined in this study. The variable proportion of crop income to the total farm was found to be significant and positively correlated with the participant food security classification with an odds ratio = 155.13. It predicts that the proportion of crop income would increase the odds (about 155 times) of being food secure while holding all other explanatory variables constant.

Table 11. Determinants of household food security, IIRR Family Farming Project in Maragondon, Cavite, 2017-2019

Variable	Odd Ratio	Std. Error	95% Conf. Interval
Household size	0.88	0.17	0.64 - 1.21
Household head age	1.00	0.03	0.94 - 1.06
Access to road	2.43	0.78	0.53 - 11.14
Proportion of crop income	155.13*	3.01	0.42 - 5.71
Log net farm income per capita	1.70	0.41	0.76 - 3.79
Gender of household head	0.81	1.26	0.07 - 9.59
Access to insurance	0.23**	0.77	0.05 - 1.01
Constant	0.02	4.51	
2 Log likelihood	64.985		
Cox and Snell R Square	0.206		
Nagelkerke R Square	0.282		
Hosmer and Lemeshow Test	Chi2(8)=7.68 ( $p= .47$ )		
Test of model Coefficients	Chi2(7)=13.88( $p= .05$ )		
Overall correct prediction	73.30%		

Note: \*\* (sig 5%) \* (sig. 10%); Food security (2017)

The variable access to crop insurance was found to be significant and negatively correlated with the household food security classification of the participant with an odds ratio = 0.225. The odds of being food secure is 77% ( $(0.225-1) * 100$ ) lower for participants who have access to crop insurance than participants who do not have access to crop insurance. The sign is contrary to what was expected because access to credit in any form has been hypothesized to be positively associated with food security. It predicts that a participant with access to crop insurance is less likely to be food secure while holding all other explanatory variables constant.

Both access to road and net farm income per capita are positively associated with food security but are not significant. Household size and gender (male) of the household head participant are negatively and insignificantly associated with food security.

## X. Determinants of Family Farmers' Farm Income

Table 12 shows that the diagnostics appear to be in order. The non-significance of Shapiro-Wilk test confirms the normality assumption. Standardized residuals greater than 3 and less than -3 are usually considered good. The standardized residual lies within acceptable limits and indicates that the model was fairly well fit. The Cook's distance, a measure of the overall impact of each observation on the fitted values is considered acceptable as a good fit acceptable as a good fit if the value is less than 1. The *R*-square was found to be low, but the *F*-test ( $p = .000$ ) suggests a good model fit.

The findings show that the coefficient of household size was negative and significant. It implies that farm income per capita will be less for farmers with many household members as compared to farmers with few household members. These findings with respect to the household size turned out to be consistent over three years (2017 -2019). Similarly, access to road is negatively related to farm income, however, the coefficient is not significant. Access to road was hypothesized following literature to be positive and significant. It has been noted to be an important factor in increasing farm income (increased efficiency) as the distance of farm to market decreases.

Table 12. Determinants of households' farm income, Maragondon, Cavite, 2017 – 2019

Variable	2017		2018		2019	
	Coefficient	Std.Error	Coefficient	Std.Error	Coefficient	Std.Error
Constant	9.12***	0.86	9.327***	1.03	10.33***	0.90
Household size	-0.17***	0.04	-0.169***	0.05	-0.19***	0.05
Age of the farmer	0.01	0.01	0.021**	0.01	0.01	0.01
Access to road	-0.29	0.20	-0.28	0.24	-0.32	0.21
Access to crop insurance	0.48*	0.17	0.86***	0.21	0.59***	0.18
Gender of the participant (Male)	0.61*	0.33	0.43	0.40	0.41	0.35
Diagnostics	Range		Range		Range	
Std. Residual	-1.95--1.75		-3.74 --1.83		-2.29--2.09	
Cook's Distance	000 --0.11		000--0.18		000--0.87	
<i>R</i> -square	.35		.37		.38	

<i>F</i> -test	df(5)=5.74	<i>p</i> = .00	df(5) =6.29	<i>p</i> = .000	df(5)=6.58	<i>p</i> = .000
Shapiro – Wilk	df(60)=0.99	<i>p</i> = .75	df(60)=0.97	<i>p</i> = .21	df(60)=0.96	<i>p</i> = .069

Note: \*\*\* (1% sig.); \*\* (5% sig.); \* (10% sig.), dependent variable=log farm income per capita.

In terms of the impact of support to farmers, access to crop insurance was positively and significantly associated with farm income per capita. Crop insurance may help farmers cope with economic loss due to the vagaries of weather. However, the mechanism or pathway of crop insurance as a mitigating factor for risk was not explored in this paper.

The age of the participants was positively and significantly associated with farm income per capita in 2018 and not in 2017 and 2019. This might indicate that older farmers were more efficient (perhaps due to experience) as compared to relatively younger farmers. Similarly, the gender (male) of the farmers was an important factor related to farm income per capita in 2017, but not in 2018 and 2019 which means that being female was associated with relatively decreased farm income per capita in 2017.



## Summary, Conclusions, and Implications

The important contribution of non-farm income to the total family income of the farm households was highlighted in 2017. When the IIRR project has commenced, their total family income was low and even shared mostly by the off-farm employment, which suggests that they cannot economically survive with the farm income alone. With the IIRR intervention, their farm income has improved and the share of farm income to total family income has significantly increased. The farming households in the three barangays are responsive to change which can be manifested by the significant increase in farm income, both gross and net, as well as the proportion of farm income to the total farm income during the three years under study. While the response to technology was not directly explicitly covered in the paper, it can be implicitly deduced that the farmers are responsive to the IIRR project interventions.

Results suggest that family farms in Maragondon are viable or profitable, especially for the small-sized farms. It is also worth noting that mixed cropping and integrated farming are better sources of income over monocropping. This only shows that small farms are more productive than large-sized farms. It has been

documented lately that almost all sectors in the economy dwindled as a result of the pandemic, especially the manufacturing and services sectors. Surprisingly, the agriculture sector has been alive amidst the crisis, with a 1.2% growth in the second quarter of 2020 to 1.6% in the 3<sup>rd</sup> quarter of the current year (Habito, 2020). Therefore, the key solution to economic growth is more diversification in agriculture and more value-adding like processing which will give products higher shelf-life and will open up opportunities to higher exportation of agri-based products.

The farm income is affected primarily by the household size and access to crop insurance. Expectedly, farm income per capita will be higher as the number of family members in the household decreases. Access to crop insurance proved to be a very important support to farmers but the details on this were not analyzed in an in-depth manner in this paper. Nevertheless, this is a good recommendation to the farmers to avail of the crop insurance to help them cope with the economic losses caused by the force majeure. Another interesting revelation is that those small-sized farms adopting the integrated farming system gave the family the highest farm income. This can be a wake-up call for those who own bigger farms who are not maximizing the use of their resources. Though the optimum combination of crops and animals was not determined in the study because of too diverse kinds of crops planted, the integrated farming system still proved to be very viable. It is not the practice of this farming system alone that makes the farm viable but the experience of the farmers in this craft can be a contributor. It is worth noting that farmers with higher years of farming experience recorded higher farm income, both gross and net.

It was also revealed in the paper that only a few farmers are young. The tendency is for these young people to turn away from agriculture in spite of the availability of land to utilize. It seems plausible that young people now prefer more to be into white-collar jobs or even in call centers than tilling the land and make it more productive. Therefore, agriculture should be an attractive occupation or employment for young people to get them back to agriculture. Since young people are now techy, agriculture should be modernized by applying technology in agriculture to have application-based platforms and to connect farmers to buyers and other stakeholders. Thus, the rural population is a very important driver of economic growth. There is a need to turn agriculture into a better opportunity for young people to turn them back to agriculture. This will also make the local economy in the countryside more attractive.

Looking at the macro perspective, if the landholdings in Cavite and other parts of the country will be tapped intensively, then agriculture will regain its role as a driver to economic growth. Since the farm landholdings are decreasing over time, farm diversification is the ultimate answer to optimize production. There is also a need to look at the interface between agriculture and industry and the agriculture and service sectors as well. According to the PSA Labor Force Survey, agriculture, hunting, and forestry shared 20% of the total employment in the country with only 8.53 M and only 6.5% contribution to total gross domestic product or GDP (PSA, 2020). Thus, agriculture has a big role to play in stimulating economic growth. Now that the country transcends to a new normal, the economy can be propelled by modernizing agricultural activities and its productive capacity can further be enhanced by strengthening its link with service and industry. The great challenge now is how to increase the efficiency of farms, not only in Cavite but in the country as well. These farms in Maragondon are just solid examples of the viability of family farms if proper attention and support are given. Future research on the sustainability of upland farms can also be conducted. The sustainability concept is too diverse and needs to balance economic indicators with social and ecological issues which prevent this study from going into the sustainability concerns. Hence, another round of evaluation of family farms that will consider the triad of viability, sustainability, and resilience is imperative.



## Challenges of Family Farming

From the foregoing results, the following are the challenges of family farming:

1. Access to year-round on-farm water resources hampers the development and full potential of family farms. Farmers are prevented to intensify and diversify to new crops especially if they entail adequate water supply like vegetable and fruit trees at the growing development stage. While drought-tolerant varieties and crops (corn, root crops, pineapple, and legumes) were provided to interested farmers to check their adaptability and susceptibility, the occurrence of prolonged drought and intermittent rainfall also affected some of the crops.
2. Access to land and security of tenure also affects the sustainability of production and income of farmers. Land market speculation is very high in Maragondon and nearby towns due to the increasing demand for land. Buyers are taking advantage of lower land value in these communities.
3. Changes in the onset of rain, rainfall pattern and volume received in the past three years affected the cropping pattern and productivity of farmers. Either they opted to delay their planting or wait for the next cropping season to prevent crop losses while others took risks. Some farmers suffered crop losses and damages.

4. Adoption of some farming technologies is slow due to perceptions of some farmers that these are labor-intensive and require additional resources and expenses. Lack of available labor, high labor cost, access to farm implements, aging, and sickly farmers also prevent them from trying or adapting technologies, and further development of farms.
5. Lack of agricultural technicians regularly visiting the farms and providing extension support and services delink the latter to governments' available services and programs. This is due to a lack of qualified agricultural personnel hired by the LGUs. Usually, the farmers are the ones going and visiting the offices and asking for available seeds. Problems on crops and livestock diseases, infestation, damages, and losses are not reported and acted immediately. Occasional attendance of assigned ATs during FLGs provided opportunities for exchanges of farm situations and challenges.
6. Low prices of farm products but the high cost of planting materials, external inputs, and equipment/facilities deter them from producing more crops and diversify. Since many farmers are cash strapped, they lack access and capital to invest in good quality inputs.
7. Lack of price support and market link affects the productivity and income of family farmers. Buying and market prices are dictated by middlemen and traders depending on the available supply and demand. Similarly, the absence of a market link also discourages family farming to engage in value-adding and processing of agricultural products.
8. Non-prioritization of local government units on agriculture is reflected in low budget allocation, lack of local agricultural technicians, lack of agricultural policies and programs to support and strengthen the sector.



## Lessons Learned

1. Family farms continue to intensify the production of crops for their food consumption and income sources gave access and control to productive resources and assets.
2. Direct provision of inputs like seedlings, planting materials, and stocks of livestock helped farmers improve their access and control to productive/natural resources which are essentials in sustaining food production and livelihoods. Likewise, their access to different varieties and species i.e., drought-tolerant or resistant crops also increased the biodiversity of farms also helped in adapting and managing the changes in environmental conditions brought about by climate change.
3. Capacity-building activities enhanced farmers' skills, knowledge, and understanding about agriculture, technologies and innovations, their farming situation, opportunities, and potentials which helped them develop their farms according to their existing capacities, needs, and vision.
4. Conduct regular or monthly FLG meetings provided farmers with platforms and mechanisms for knowledge sharing and learning exchanges on their farming experiences, innovations, experiments, challenges, and practices. Likewise, the presence of assigned AT in some meetings provided them easy access to the

government's support services like farmer registration, crop insurance, artificial insemination and vaccination of livestock, and the announcement of available seeds or planting materials.

5. Regular field visits and provision of extension services of project staff also provided them access to technologies, innovations, and advice on farm and livestock management advice. These also enhanced family farmers' skills and knowledge of developing and managing their farms.
6. Improving the nutrition-contribution of agriculture through the promotion of nutrition-dense food like root and tuber crops and vegetables coupled with capacity building and provision of direct inputs helped farming households and other community members improved if not sustained their food production and sources of diverse food.
7. Building partnerships and networking with different key stakeholders and service institutions provided additional resources and technical expertise that helped in the project implementation.
8. Existing capacities of family farmers (land, water, labor, implements, capital, knowledge) are important factors in developing and maximizing the potentials of their farms. Intensification, diversification, and integration minimizes potentials risks in crops and livestock production also affect farm productivity and income. Aging farmers see the potential of growing fruit-bearing trees so by the time they are old and can no longer do farm activities, they can still reap from the fruit trees.
9. Farmers invest in small livestock and large ruminants because they require less labor, feeding, and management but augment their income and serve as savings in times of emergencies. Farmers commonly practice *paiwi* system for easier raising and management and to earn extra income. Women farmers are mostly engaged in swine and poultry raising.
10. Farmers are encouraged to produce more crops if the market and price are acceptable. Continuous mentoring, follow-up, and marketing support are needed to help the farmers further develop their family farms and establish their enterprise.
11. Women farmers actively participate in capacity building activities when provided with opportunities and available platforms.



## Recommendations

The Covid-19 pandemic proves that agriculture remains the backbone of the country's economy. The agriculture sector posted a 1.6% percent growth rate compared to the manufacturing and services sectors which were negatively affected by lockdowns. There are lots of potentials to further develop and sustain the viability of family farming to achieve food security, increase income, and make livelihood resilient provided with critical accessible and available resources and support services.

1. Government should invest and promote simple rainwater saving technologies and facilities to family farms during the rainy season to help them conserve an ample supply of water and be used during the dry cropping season.
2. Allot a bigger budget for the promotion and adoption of farm diversification and sustainable farming practices to increase the yields at lesser expenses and without harming the environment. Multistorey cropping systems integrated with livestock provide food and sources of income for families. Likewise, farm resources like fertilizer crops, forage, and conservation practices which are readily-available need further innovations, technology development, and processing for wider adoption and use.

3. Implement ordinances and enabling policies to protect farmlands from conversion and market speculations such as provisions of more incentives, inputs, and support services to family farmers to encourage them to produce more and invest in agriculture especially the younger generation.
4. Strengthen the provision of extension services, farm advisories, and technical assistance to family farmers and associations by increasing the budget allocated for agriculture and hiring of qualified agriculture technicians. There is a need to conduct regular field visits, monitoring, and meeting to pro-actively support and assist family farmers in their pressing and urgent concerns.
5. Strengthen the participation of women, men, and young farmers in the research and development of technologies to include their traditional knowledge, cultural practices, aspirations, and agro-climate condition for faster utilization and easier adoption.
6. Develop and implement holistic programs for value-adding, processing, and enterprise of family farmers which will include targeting, assessment, training, mentoring, market-link, and financial literacy to build their track record. Providing small grants as start-up capital will also encourage enterprise development.
7. Establish and support mechanisms for family farmers' seed exchange, community seed banks, nurseries, propagation centers, and storage to ensure and sustain farm diversity, conservation, and ready access of farmers to planting materials. To sustain DA's Plant, Plant, Plant program and prevent dependence on external inputs, the government should invest in LGUs nursery establishment including training of farmers on seed selection, saving, and production coupled with necessary facilities, implements, and technologies.
8. Promote and provide mechanization and post-harvest facilities that are appropriate to family farming and women-friendly technologies to address lack of labor, high cost of labor, and wastage.
9. Implement laws and policies that promote and compel LGUs to directly procure farmers' products especially during emergencies, directly link farmers to producers by providing logistics and transportation services from farms to markets, and provide price support especially during the times when prices are very low.
10. Encourage young members of family farming to develop digital platforms for knowledge sharing and exchanges, product promotion, and direct marketing and selling of farmer's produce to consumers. The government must address the digital divide and provide rural communities with reliable access to digital technologies.
11. Proper and right selection and targeting of participants in training and seminars should consider women since they are also engaged in on-farm and off-farm activities. Likewise, young farmers should also be prioritized to encourage them and explore their interests in different facet of agriculture.
12. Develop and maintain gender-disaggregated database of farmers, profile, their cropping plan, volumes, and harvest for easier farm/commodity clustering and consolidation and market access.

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