

Assessing the Impact of Collective Marketing on Farm Income: The Case of Calamansi Farmers in Oriental Mindoro, Philippines

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ABSTRACT

Collective marketing has long been regarded as a critical strategy to strengthen the bargaining power and boost smallholder farmers' income. Collective marketing can reduce transaction costs and information asymmetries, allowing better access to output markets and increasing farm income. This study explores the determinants of the decision to participate in collective marketing and whether collective marketing increases farmers' net farm income. The study utilized farm-level data of 351 calamansi farmers from Oriental Mindoro, the Philippines' major calamansi producing province. An endogenous treatment regression model was used to analyze causality that links collective marketing to net farm income. The results of the analysis indicate that collective marketing positively and significantly influenced calamansi farmers' net farm income. The decision to join collective marketing activities depends on farmers' age, marketing cost, output price, access to credit, access to extension service, and distance to the nearest market. The endogenous treatment regression model estimates show that collective marketing resulted in higher net farm income compared to the counterfactual situation. The net farm income of calamansi farmers increased by PhP 21,619.40 per hectare due to collective marketing participation. Hence, collective marketing strategy could be used as a tool to boost the net farm income of calamansi farmers.

Keywords: collective marketing, net farm income, endogenous treatment regression, calamansi

INTRODUCTION

The agriculture sector still plays a critical role in the Philippine economy. The sector provides food for the people and the raw materials used in both the industry and services sectors (PSA, 2019). It also serves as the primary source of livelihood and income, particularly to smallholder farmers living in rural areas. Hence, it is not surprising that most of the programs and attempts of the government and other development agencies to advance the Philippine agriculture sector are still geared towards improving the productivity and income of these farmers. These programs come in various forms ranging from physical infrastructures (e.g., rural road infrastructure, irrigation) to access to credits and extension services. Substantial resources have also been channeled toward investment in agricultural research, technology dissemination, and adoption (WorldBank, 2020; NEDA, 2013).

However, despite all these programs, contribution of agriculture in the industry and service sectors, access to the market and low farm income remain a perpetual concern (Sumalde & Quillooy, 2015). This is because the agriculture sector in the country is mostly comprised of smallholder farmers cultivating less than five hectares of land, usually practice subsistence and/or semi-subsistence farming with poor economies of scale and bargaining power, limited access to information, low yield, limited marketable surplus, and low return (Sumalde & Quillooy, 2015; Montiflor, 2009). Smallholder farmers are constrained from expanding their production and marketing operations. These farmers solely rely on traders, who have better access to price and other market information (e.g., demand and supply situations, prices). They also have to settle for whatever price the local traders will set, hence disincentivizing farmers to sell more of their produce (Chanco, 2019; Cudis, 2019; Dejares,

2019; Lena, 2019, Sumalde & Quilloy 2015, Lamban *et al.*, 2013; Rola-Rubzen *et al.*, 2013; Montiflor, 2009; Montiflor, 2008; Real *et al.*, n.d.).

Collectively marketing has been regarded as one of the policy instruments that can help smallholder farmers strengthen their bargaining power (e.g., price-setting decision) and improve their income level (Mathenge *et al.*, 2010; Chaddad & Cook 2004). Collective action in marketing occurs when individual farmers act together, pool their resources, and act as a single seller in the market (Arouna, 2018). Collective marketing helps smallholder farmers reduce barriers to entry into lucrative markets by lowering transaction costs (Markelova & Meinzen-Dick, 2009). The premise is selling collectively brings more benefits than selling individually as individual farmers produce low volumes of outputs and often fetch low prices. Through collective marketing, farmers are provided with marketing services like market price information and the establishment of contracts (e.g., between farmers and potential buyers) to address challenges related to transaction costs, such as negotiation, search, and communications costs, for the collection and marketing of agricultural products (Valentinov, 2007; Markelova *et al.*, 2009). This marketing strategy also enables farmers to increase market power in negotiating the terms of sale of agricultural products and get better prices and higher income (Danau *et al.*, 2011; Yoo, 2015).

Collective Marketing Activities in the Philippines

Collective marketing is not a new concept in the Philippines. This strategy is being practiced in the country in different forms to facilitate the entry of smallholder farmers in the emerging institutional markets and building countervailing power by pooling to enable scale advantages and strengthen the negotiation position of producers. The range of possible collective marketing activities as identified by Montiflor (2008) includes: agreeing to grow the same variety of crop; uniform quality; group work to improve quality to meet the needs of a specified market will add value; weighing the goods and packing them in a standard way will attract a higher price, and group negotiations with traders for the sale of larger quantities of goods can improve the sale price significantly. In terms of general activities, Danau *et al.* (2011) identified collective marketing strategy to be grouped into two categories, namely collectivized marketing and pooling system. Collectivized marketing involves collecting outputs

and selecting markets that offer better prices and other terms or conditions of sale. The collectivized marketing activities include prospecting for buyers, collecting information about market conditions and the market's situation, negotiating terms of sale (e.g., defining the quality demanded for the produce, setting the terms of payment, etc.), monitoring transactions and compliance with commitments, keeping financial accounts, and redistributing earnings. On the other hand, pooling strategy includes technical actions such as collecting, sorting, grading, weighing, quality control, packing, and distributing products of bigger volume and better quality, making it possible to improve the farmers' bargaining positions in dealing with potential buyers resulting in higher prices received by farmers (Danau *et al.*, 2011; Yoo, n.d.)

Studies on Collective Marketing

There are a number of earlier studies conducted outside the Philippines, which have analyzed the impact of collective marketing. The methods used in these studies differ considerably. Some used propensity score matching (Kamdem *et al.*, 2013), while some used simple regression models (Arouna, 2018) and double hurdle models (Fischer & Qaim, 2014 and Ssajakambwe *et al.*, 2020) to measure the average treatment effect of collective marketing participation. Furthermore, some studies focused on specific commodities like rice, cocoa, banana, while others looked into several commodities.

Regardless of the focus, and approaches used, these studies found that collective marketing becomes instrumental in increasing bargaining power (i.e., price-setting) and income of smallholder farmers. For instance, according to Fischer & Qaim (2014), collective marketing of banana farmers in Kenya resulted in increased volume of output sold and higher income. Mango *et al.* (2017) also found that collective marketing participation positively and significantly affects farm income. Similarly, the study of Abdul-Rahaman & Abdulai (2019) found that collective marketing participation has positive and significant impact on net income of rice farmers in Ghana. Using propensity score matching (PSM), Kamdem *et al.*, (2013) found that collective marketing activities by cocoa farmers in Cameroun have helped increase the sale price of farmers. These results could be explained by the fact that collective market participation improves the bargaining power of farmers as sellers in the market, and, hence, they are likely to get higher prices for their produce collectively

than as individuals.

In addition, several studies analyzed collective marketing activities through cooperatives and farmer groups. For instance, in the Philippines, Sumalde & Quillooy (2015) found out that farmers' cooperative approach in the marketing system for hogs and cacao beans has positive impacts on the efficiency of the marketing system as they enable farmers to attain vertical integration and economies of scale in marketing. Collective marketing through clustering has also been found to have helped produce a quality product, increase volume of production, and help minimize transportation costs, thereby improving vegetable farmers' income in Mindanao (Montiflor, 2008). The study of Montiflor (2012) showed that farmers participating in collective marketing had higher volume of output sold as they were able to sell to supermarkets, hotels, other areas, and to their local cooperative. However, these studies, used descriptive and case study approaches, which provide only anecdotal evidence.

OBJECTIVES OF THE STUDY

Despite the many benefits of collective marketing in helping Filipino farmers get market access and improve farm income, its contribution is often understated. One of the reasons for this is the dearth empirical evidence that show the impact of collective marketing strategy. As of date, there were no empirical studies conducted yet that specifically analyzed the causal relationship between collective marketing and income in the Philippines. Further, while there have been studies that looked into the impact of collective marketing, there were no studies that consider the endogeneity problems associated with the choice of collective marketing participation. Therefore, to address the current gap in the literature, this study aims to investigate the effect of collective marketing on the income level of farmers using endogenous treatment regression model. More specifically, this study aims to address the following objectives:

1. to determine and analyze the impact of collective marketing on income of calamansi farmers; and
2. to identify and analyze the factors affecting the decision of farmers to participate in collective marketing initiatives.

METHOD

This study was conducted in Oriental Mindoro, Philippines. The calamansi industry in Oriental Mindoro provides an interesting example to analyze the impact of collective marketing as it provides income and livelihood to smallholder farmers. In analyzing the impact of collective marketing on income, endogenous treatment regression was used. The following subsections describe the study area, sampling technique and data sources, and empirical model used in this study.

Study Area

The province of Oriental Mindoro is located in Mindoro Island under MIMAROPA Region. It is composed of 13 municipalities and one city. Agriculture is the main economic activity in the province municipalities, and its principal agricultural products include rice, coconut, corn, and fruits (Oriental Mindoro, 2019).

The province is the top calamansi producing province in the Philippines, contributing 97% of regional production and 38% (37,957 metric tons) of the total national calamansi production in 2018 (PSA, 2020). Owing also to its superior quality calamansi, Oriental Mindoro provides income and livelihood opportunities to smallholder farmers as it is highly demanded by institutional buyers and consumers across the country (DA-PRDP, 2014).

Several government agencies, non-governmental organizations (NGOs), and private institutions have launched initiatives to improve calamansi production and marketing in Oriental Mindoro. Collective marketing is one of the initiatives identified to help improve farmers productivity, yields, and income. Government and their partner-agencies provide extension services to farmers and farming groups, grants have also been awarded to different farmers organizations (FOs) that consolidate the calamansi produce of their farmers-members including establishment of post-harvest facilities, and working capital knowledge, skills and experience in setting up and operating a collective enterprise, others also provide microcredit and loans (DA-PRDP, 2014).

Sampling Technique and Data Sources

Both primary and secondary data were used in this study. Primary data were obtained by administering a questionnaire. A pre-tested questionnaire was used to gather primary data from the selected respondents.

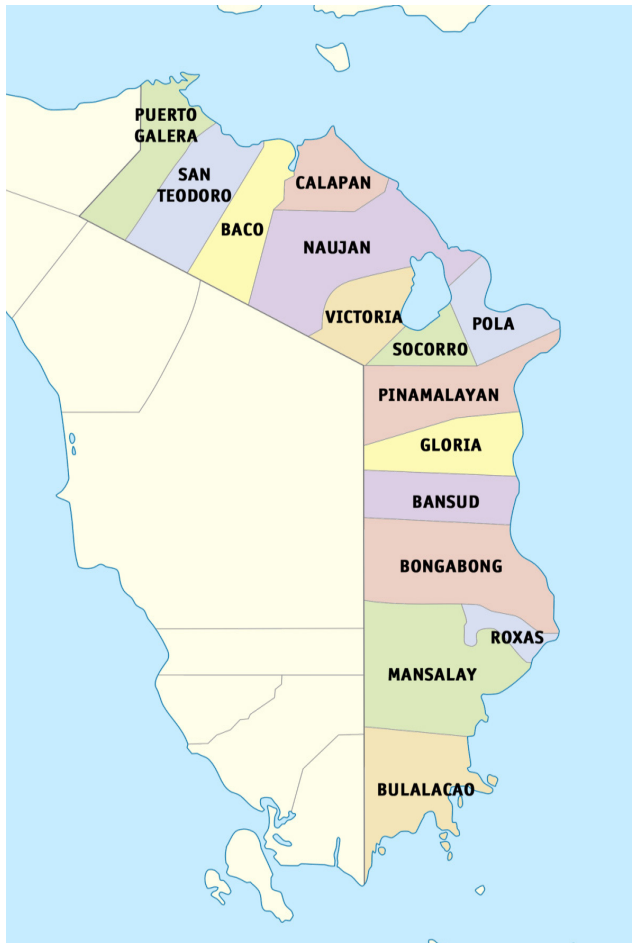


Figure 1. Map of Oriental Mindoro, Philippines

A multi-stage sampling procedure was used in this study to attain the desired number of respondents. This survey procedure is appropriate as this study is designed to evaluate the impact of collective marketing on income of calamansi farmers where population is drawn from heterogeneous group (collective marketing participants and non-participants).

The sampling procedure was done in three stages. The first stage was the selection of sample municipalities. The top three calamansi producing municipalities namely Naujan, Victoria, and Pola, were purposively selected among the 15 municipalities in the province. The second stage consists of a probability sampling of barangays. The list of barangays was obtained from the municipal agriculturist office. From the list provided by the municipalities, three barangays were randomly chosen from each municipality. The final stage is the selection of sample farmers from the selected barangays. This involves two steps. First, the list of calamansi farmers was obtained from barangay offices and identify collective marketing

participants and non-participants. Lastly, the respondents were randomly sampled from each group, resulting in 351 farmers (182 participants and 169 non-participants). The survey assessed the factors that influence smallholder farmers' decision to participate in collective marketing and its impact on farmers' net income. A semi-structured questionnaire covering information on the socio-economic, farm, institutional, and market characteristics were collected through personal interviews. In all instances, the sample respondents were informed about the goal of the study. They were made aware that they could withdraw anytime and that their confidentiality and anonymity will be protected.

Meanwhile, the secondary data used in this study were obtained from available reports, studies, and documents that provide information on calamansi marketing. In addition, data on production, area planted, climate conditions, and yield were obtained from OpenStat of Philippine Statistics Authority (PSA) and the provincial agriculture office.

EMPIRICAL ANALYSIS

In this study, endogenous treatment regression was used to estimate the causal effect of collective marketing on net farm income. The study developed a simple model of collective marketing participation. Following Abdul-Rahaman & Abdulai (2020) and Mango *et al.* (2017), the decision to participate in collective marketing is considered a dummy variable with two (2) values, 1 if the farmer participates in collective marketing, and 0 otherwise. An endogenous treatment regression model is used to determine the average treatment effect of participation in collective marketing activities on the income of calamansi farmers. This model also accounts for the problem of selection bias due to non-random assignment of the treatment (i.e., collective marketing participation). With non-random assignment, calamansi farmers may self-select to join collective marketing due to unobserved factors such as abilities and aspirations. These unobservable factors may affect income, which can result in error terms of the decision to participate in the collective marketing equation correlate with the outcome equation (net farm income in calamansi farming). In such a case, collective marketing is endogenous in the net farm income equation. Failure to address

the endogeneity problem may result in inconsistent estimates and lead to spurious, even biased conclusions (Gerber, 1998; Heckman, 1979).

The endogenous treatment regression model is composed of an equation for the outcome FI_i and an equation for treatment CM_i (StataCorp, 2020):

$$FI_i = \alpha x_i + \beta CM_i + \varepsilon_i \quad (1)$$

$$C_i = \begin{cases} 1, & \gamma w_i + \mu_i > 0 \\ 0, & \text{otherwise} \end{cases} \quad (2)$$

Where x_i are the covariates used for the outcome model, w_i are the covariates used for treatment assignment model and error terms ε_i and μ_i are bivariate normal with mean 0 and covariance matrix

$$\begin{bmatrix} \sigma^2 & \sigma\rho \\ \sigma\rho & 1 \end{bmatrix} \quad (3)$$

The covariates x_i and w_i are not related to the error terms.

The definition of variables in the endogenous treatment model are described in Table 1.

RESULTS AND DISCUSSION

Characteristics of the Sample Respondents

Reasons for Collective Marketing Participation and Non-Participation

Of the 351 respondents, 52% (182) were collective marketing participants, while the remaining 48% (169) were non-participants. When asked about their reasons for collective marketing participation, 84% of the participants cited that they sell collectively to get better prices, while 50% claimed to have gained higher bargaining power (see Figure 2). Others also mentioned that the choice was due to lower transaction costs (23%) and access to credit (8%).

On the other hand, when asked about their reasons for non-participation, 74% of non-participants mentioned that they are either friends or relatives of the existing traders in the area (see Figure 3). Moreover, 56% of the non-participants likewise cited the limited capacity of farmer organizations' (FOs)

Table 1. Description of variables in the linear regression with an endogenous treatment model

Variable	Type	Description
Dependent Variables		
Net Farm Income	Continuous	Net Farm Income from calamansi production (PhP/ha)
Collective Marketing	Binary	1 if the farmer joined collective marketing, 0 if otherwise
Identifying Variable		
Distance to Nearest Market	Continuous	Distance of farm to the nearest market (km)
Explanatory Variable		
Farmers' Age	Continuous	Age of farmer engaged in calamansi production (years)
Education	Continuous	Household head's highest level of education (years)
Household Size	Continuous	Number of family members in the household
Farm Size	Continuous	Total land area devoted for calamansi production (ha)
Farm Yield	Continuous	Volume of calamansi harvested per ha (kg/ha)
Access to Credit	Binary	1 if household has access to credit sources, 0 if otherwise
Access Extension Service	Binary	1 if household has access to extension service providers, 0 if otherwise
Output Price	Continuous	Price received by farmers for selling calamansi (PhP/kg)
Marketing Costs	Continuous	Costs incurred in marketing calamansi outputs (PhP/year)

Table 2. Socio-economic, market and institutional characteristics (continuous), by type of collective marketing participation 351 calamansi farmers in Oriental Mindoro

Variables	All Farmers	Participants	Non-Participants	Mean Difference
Age (years)	53.94	54.67	53.16	1.51 ^{ns}
Educational Attainment (years)	7.99	7.88	8.12	-0.24 ^{ns}
Household Size (heads)	3.95	3.99	3.90	0.09 ^{ns}
Farm Size (ha)	1.13	1.10	1.21	-0.14 ^{ns}
Marketing Cost (PhP/kg)	3.91	6.13	1.52	4.61 ^{***}
Output Price (PhP/kg)	7.66	9.39	5.92	3.47 ^{***}
Net Farm Income (PhP/ha)	29,480	44,121	14,838	29,282 ^{***}

^{*}, ^{**}, ^{***} Significant at the 10%, 5%, and 1% level, respectively.

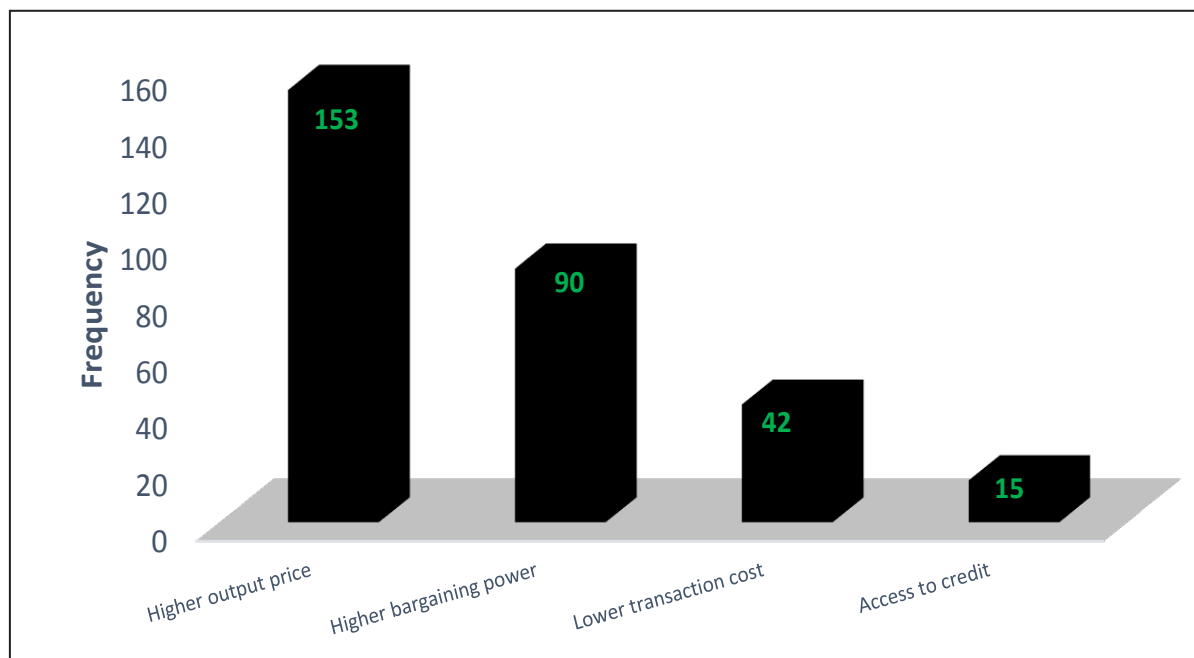


Figure 2. Reasons for collective marketing participation, 182 calamansi farmers, Oriental Mindoro, Philippines, 2019

processing facilities. The existing FOs in the area include cooperatives, farmers' associations, and farmers' federations. Other reasons cited were lack of awareness of collective marketing and negative perception that there are no benefits that could be derived from collective marketing participation.

Mean Comparison of Farmer Characteristics

Tables 2 presents the t-test of means of selected variables included in the model. The farmer-respondents' mean age and educational attainment were 54 and four years, respectively. The average

household size of farmer-respondents was four members. Results show that calamansi farmers were relatively younger than the average Filipino farmer, with mean age of 58 years. Further, calamansi farmers's household size was relatively smaller than the national average of 4.0.

On average, calamansi farmers owned or cultivated 1.13 has of land and sells 3,114.70 kg of calamansi in 2018. The mean cost and price received from selling a kilogram of calamansi were estimated at PhP 3.91 and PhP 7.66, respectively. On average, farmers earned PhP 29,480 per ha from calamansi

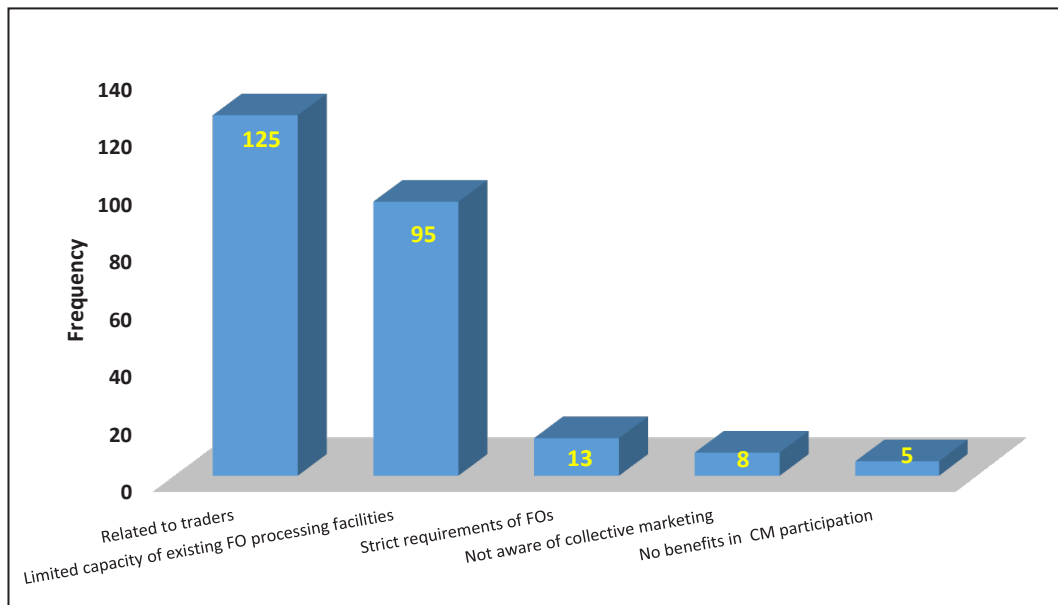


Figure 3. Reasons for collective marketing participation, 169 calamansi farmers, Oriental Mindoro, Philippines, 2019

production in 2018. This finding is consistent with the provincial average net return estimated at PhP 29,925 (DA-PRDP 2014).

Results of mean comparison show that no significant mean difference is observed between collective marketing participants and non-participants in terms of their household and farm characteristics such as farmers' age, years of education, household size, and farm size. This suggests that those household and farm characteristics might be uncorrelated with the decision to participate in collective marketing. Meanwhile, notable significant mean differences between the collective marketing participants and non-participants were found in marketing cost, output price, and net farm income. Compared to participants, non-participants had lower marketing costs. The collective marketing participants are also distinguishable in terms of output price and net farm income. Compared to non-participants, collective marketing participants have received higher output prices and generated higher net farm income. These findings are expected because collective marketing involves value-adding activities such as grading, sorting, and processing (e.g., calamansi juice and concentrate), which entails higher costs but results in higher prices.

Furthermore, Figure 4 show that only 40% (141 farmers) had access to credit while 39% (138

farmers) have access to extension services. The interview results revealed that farmers avail of credit from informal sources (e.g., friends, relatives, traders) and formal sources (e.g., cooperatives, farmers' federation and association, CARD Bank). The existing extension service providers, on the other hand, include government agencies (e.g., DA, DOST, DTI), NGOs (e.g., AsiaDHRRA, SEARCA), and the local government units (LGUs) of Oriental Mindoro.

It can also be observed from Figure 4 that collective marketing participants have greater access to both credit and extension services compared to non-participants. Given that the non-participants of collective marketing strategy often do not have access to extension service providers, they were not well-enlightened about the benefits of collective marketing. Limited access to credit could also mean limited capital for production and marketing operations.

However, the descriptive statistics in Tables 2 and 3 are not sufficient to conclude on the impact of collective marketing participation. Further, the above analysis does not account for other important unobservable characteristics (e.g., motivations, aspirations) of the farmers. The endogenous treatment regression model was employed to validate whether the difference in mean net farm income remains constant after controlling for all confounding factors.

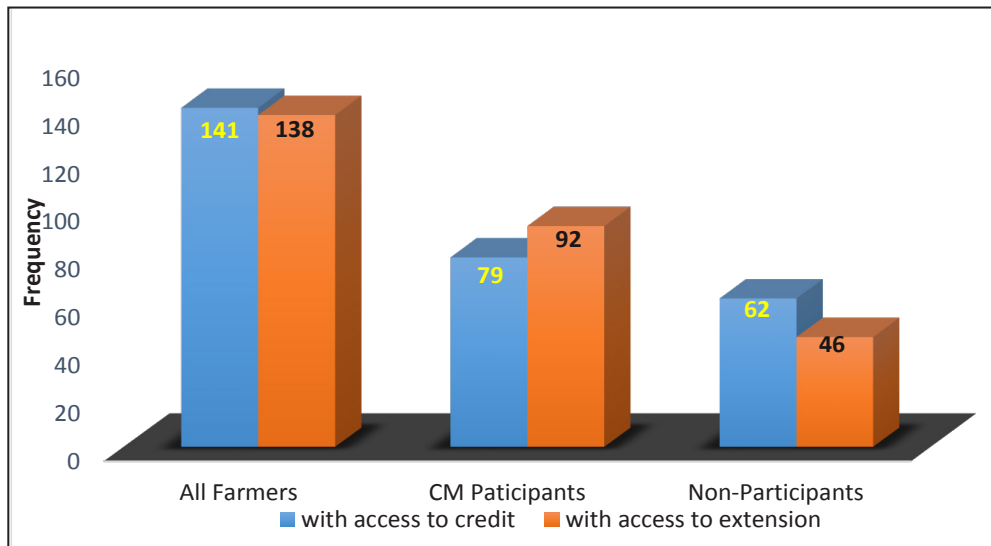


Figure 4. Institutional characteristics, by type of collective marketing participation, 351 calamansi farmers in Oriental Mindoro

To estimate the causal effect of collective marketing, it is necessary to consider that those participants might have achieved a higher level of net farm income even if they had not participated (Gerber, 1998; Heckman, 1979).

Robustness of the Endogenous Treatment Model

By employing the endogenous treatment regression model, determinants of collective marketing participation and the net farm income of calamansi farmers can simultaneously be generated. Table 3 summarizes the results of the endogenous treatment model.

As shown in Table 3, Wald $\chi^2(11) = 326.12$ is significant at a 1 percent level, implying that at least one of the socio-economic, institutional, and market determinants included in the model is significant. It also means that the inclusion of the variables creates a statistically significant improvement in collective marketing participation and net farm income.

The Wald test for joint independence of the two equations is also presented at the lower part of Table 3. The test statistic (4.09) implies a significant dependence between the treatment (collective marketing decision) and outcome (net farm income) equations, an evidence that the endogeneity problem exists, which is accounted for in the specification. This finding is also consistent with rho's coefficient (ρ , the correlation between the treatment-assignment errors)

and the outcome errors) equal to -0.305 , suggesting that unobservables that raise observed net farm income tend to occur with unobservables that lower collective marketing participation.

Determinants of Collective Marketing Participation

Farmers' decision towards collective marketing varies with farmers' age, access to credit, access to extension, marketing cost, output price, and distance to markets significantly influence farmers' decision towards collective marketing (see Table 3). Farmer's age had a positive and significant influence on collective marketing decisions. This is similar to the findings of Gebremedhin, Hoekstra, & Jemaneh (2007) and Heltberg & Tarp (2002) that older farmers are more likely to participate in collective marketing. This is because older farmers have developed the ability to comprehend and use available information to make informed marketing decisions.

Meanwhile, access to credit positively and significantly influenced farmer's collective marketing decisions. This is consistent with Ngeno's (2018) study, which found that farmers with credit access are more likely to join collective action in marketing. This follows the argument that credit access helps improve the farmers' financial capacity hence facilitating participation in group activities. Similarly, access to extension had a positive and significant influence on the decision to join collective marketing.

Table 3. Determinants of collective marketing decision and its effects on net farm income, 351 calamansi farmers, Oriental Mindoro Philippines

Variable	Collective Marketing Participation		Net Farm Income	
	Coefficient	Robust SE	Coefficient	Robust SE
Constant	-7.478***	1.386	-35,573.61***	9,284.813
Farmer's age	0.027***	0.009	68.59	114.165
Education	-0.056	0.049	10.76	327.454
Household size	0.023	0.088	1,136.79	742.875
Farm size	0.093	0.092	232.21	760.622
Farm Yield	<0.001	<0.001	3.88***	0.397
Access to Credit	0.958***	0.262	7,048.55***	2,176.453
Marketing Cost	0.563***	0.103	-4,139.95***	930.600
Output Price	0.052***	0.012	1,943.46***	171.995
Access Extension Service	1.720***	0.407	8,914.53***	2,454.128
Income from other sources	<0.001	<0.001	0.005	0.005
Distance to nearest market	0.200***	0.053		
Collective Marketing			21,619.400**	5,224.208
/athrho			-0.316**	0.156
/Insigma			9.886***	0.081
rho			-0.305***	0.141
Sigma			19,649.900	1,582.655
lambda			-6,002.081	2,675.158
Wald chi2			326.12***	
Wald test of indep. eqns.			4.09**	
Log pseudolikelihood			-4,003.491	
No. of Observations	351		351	

The dependent variable is income measured in PhP per hectare.
 *, **, *** Significant at the 10%, 5%, and 1% level, respectively.

This is similar to the findings of Simon, Ngigi, & Bett (2015), saying that extension service can encourage farmers to join in collective marketing activities.

In terms of the market factors, marketing cost, output price, and distance to the nearest market positively and significantly increase the probability of joining collective marketing. There is a positive relationship between marketing cost and collective action in marketing. This is because collective marketing involves the cost of transporting calamansi from the farm to the group collection centers. This is consistent with the study of Fischer & Qaim (2011), where participants have to bring their outputs to a designated collection site, where a group of farmers weigh, grade, and sort the fruits and then sell them in bulk quantities. Some farmer groups even extended their operations to the processing of calamansi. The processing activities entail more labor and input cost hence raising the marketing cost for calamansi.

As expected, output price positively and significantly affected farmers' decision towards collective marketing participation. This is in agreement with the study of Omiti *et al.* (2009), highlighting that better output price increases the probability of collective marketing participation. This is also consistent with Enete *et al.* (2009) and Ouma *et al.* (2010), noting that higher output price induces increased supply since it incentivizes farmers to increase output due to reduced average and transaction costs. Meanwhile, distance to the nearest market directly influenced collective marketing participation. This implies that farmers near a market are less likely to participate in group marketing. This is in line with the finding of Heltberg & Tarp (2002), showing that the closer to the nearest market, the less likely that they will join in collective marketing.

Impact of Collective Marketing on Net Farm Income

The causal effect of collective marketing on net farm income is presented in the third column of Table 3. Using the estimates of endogenous treatment regression, the effect of group marketing on farm net farm income of calamansi was simulated. For this purpose, the predicted net farm income of the farmers who joined collective marketing was compared with the same prediction assuming no participation. The causal effect increase from collective marketing participation was estimated at PhP 21,619.40 per hectare, a 73% increase in farmers' net farm income.

This could be because collective marketing enhances farmers' bargaining power, particularly in price-setting decisions. Hence, they are likely to get better prices for collectively selling their output than selling them individually. The finding is also consistent with the findings of several authors, citing that collective marketing boosts farm income (Johnson & Berdegué 2004; Alene *et al.* 2008; Jagwe, Machethe, & Ouma 2010; Ouma *et al.* 2010).

Table 3 further shows that the net farm income of calamansi farmers is also affected by other socio-economic, institutional, and market factors such as farm yield, output price, marketing cost, access to credit, and access to extension service. Net farm income is negatively affected by marketing cost but is positively influenced by farm yield, output price, access to credit, and access to extension services. Results also highlight that credit and extension services not only increases the probability of collective marketing participation but also the net farm income of calamansi farmers.

CONCLUSION AND RECOMMENDATIONS

Farm household survey data from 351 calamansi farmers in Oriental Mindoro, Philippines, were employed to analyze the causal effect of collective marketing participation on calamansi farmers' net farm income. An endogenous treatment regression model was used to better explain the impact of collective marketing. Participating in collective marketing increases the net farm income of farmers by 73% or PhP 21,619.40 per hectare.

Based on the above findings, it can be concluded that collective marketing does boost the net farm income of calamansi farmers. The findings also stress the need for appropriate policy formulation and implementation of programs and initiatives that can boost farmers' collective marketing participation, as this is expected to increase the net farm income of calamansi farmers.

It was found that access to credit and extension services significantly and positively influenced both calamansi farmers' decision to participate in collective marketing and calamansi farmers' net farm income. This study, therefore, recommends making credit and extension services accessible to calamansi farmers. Accessibility of credit will enable farmers to purchase required inputs and reduce too much reliance on traders to provide the necessary capital to perform several production and marketing activities.

This can be done by mobilizing farmer organizations (e.g., cooperatives, farmers' associations, farmers' federation) as lending conduits of government credit. Capacity building to enhance farmer organizations as effective conduits must be carried out or sustained for more efficient financial services for small farmers. Further, since some farmers are still not aware of collective marketing, it is recommended that the LGUs and other extension service providers include collective marketing as a topic in their seminars, trainings, and other forms of extension services for calamansi farmers. Future studies on the relationship of collective marketing on household income and expenditure, and multidimensional poverty can also be considered.

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