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Welfare Implications of Collective Action Among Dairy Buffalo Farmers in Selected Provinces in the Philippines

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ABSTRACT

This study analyzed the welfare implications of collective action, in the form of membership in rural-based organizations, among 351 dairy buffalo farmers in Batangas, Bohol, Cavite, Laguna, Isabela, and Nueva Ecija. Using household consumption expenditure per capita as an indicator of household welfare, results of the Linear Regression with Endogenous Treatment showed that membership in rural-based organizations and herd size increased welfare. The likelihood of the farmers in joining a rural-based organization was also determined to be positively and significantly affected by education, location dummy variables, and total transaction costs. Higher transaction costs incurred by the farmers induced a higher likelihood of membership. Overall, rural-based organizations play a significant role in linking farmers to suppliers, markets, and institutions. Members have taken advantage of reduced transaction costs, better technology transfer and adoption, convenient milk consolidation, and affordable credit services that ultimately improved the household welfare of the sample farmers.

Keywords: *endogenous treatment, collective action, consumption expenditure, transaction cost*

Introduction

The Philippines is approximately 99% import-dependent on milk supply (National Dairy Authority 2020). With the growing demand for milk in the country, the challenges faced by the stakeholders, along with the dependency on imports, is indicative of production and marketing inefficiencies that serve as major deterrents to achieving remarkable success in the dairy buffalo industry. Pervasive market imperfections such as price and technology information asymmetries, lack of network among established stakeholders in the industry, and credit constraints have been highlighted by a number of studies. Along with these challenges that hinder smallholder producers from active participation in the market, high transaction costs further aggravate the situation (Okoye *et al.* 2016).

With the majority of the country's farmers operating on a small scale, collective effort to reduce the inefficiencies and take full advantage of the available innovations and services and appropriate intermediaries is

necessary. In this regard, rural-based organizations (RBOs) can take part in reducing high transaction costs through access to reliable markets, bulking or processing services, storage facilities and equipment, cheaper input suppliers, and affordable credit services. RBOs, as defined by Angara (2008, p.7), are "composed of various sectors of the rural community such as farmers, fisherfolk, growers, seed producers, women, and youth." Such organizations are of varied forms, such as commodity associations, farmers' unions, cooperatives, associations, and groups.

As one of the most common forms of collective action, cooperatives serve as a

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catalyst in the supply chain of milk (Holloway *et al.* 2000). This type of organization can be oriented toward improving production, marketing services, livelihood, or even serve multiple purposes at the same time (Fischer and Qaim 2012). An even higher purpose of improving the welfare of the farmers was observed by Kumar *et al.* (2018) and Ahmed and Mesfin (2017). These studies recognized that the household income of smallholder dairy farmers increased, and the wellbeing of the agricultural households improved with the farmers' membership in cooperatives. However, these results cannot be generalized for all cooperatives. Some cooperatives were dissolved due to less market participation and the absence of welfare benefits to farmers (Awotide, Karimov, and Diagne 2016).

From a policy perspective, this study finds its worth in understanding how collective action addresses coordination problems and contributes to improving the welfare of households engaged in dairy buffalo farming. Specifically, the study assessed the implication of membership in rural-based organizations on household welfare and identified the factors that influence the dairy buffalo farmer's decision to join a rural-based organization. The assessment of the effect of transaction costs and collective action plays a crucial role in the smallholder farmers' potential to transition from subsistence to commercialized farming (Mmbando 2014). At present, there is hardly any work that empirically dealt with this local industry using the New Institutional Economics approach. The research gap in understanding the implications of membership in rural-based organizations to welfare has not been fully explored. Hence, the study was conducted.

Theoretical Framework

Building on the theoretical framework based on New Institutional Economics' two main branches, i.e., the Theory of collective action and Transaction Cost Economics, this study adopted the agricultural household model with transaction costs used by Cuevas and Clarete (2015). The study considered a farm household with ' M ' family members who make consumption, production, and labor supply decisions for a specific period. Each member decides how much time will be spent on on-farm activities, off-farm activities, and leisure to maximize utility. Let $L_i^f = (L_1^f, \dots, L_M^f)$ be the amount of family labor used on-farm, where L_i^f is the amount of time spent by the i^{th} family member on-farm, $i = 1, 2, \dots, M$. Let $L_i^o = (L_1^o, \dots, L_M^o)$ be the amount of family labor allocated for off-farm employment or activities that generate off-farm income R , which is a function of the net of the wage rate received (w_i^o) by the family members and transaction costs of marketed labor from off-farm employment (τ_i^o). The farm household uses total labor hours (L_i^t), composed of family labor L_i^f and hired labor L_i^h , and non-labor inputs N like commercial feeds, legumes, dairy buffalo, etc., to produce farm output Q . In this model, a farm household is considered a single unit that makes consumption, production, and labor supply decisions. The objective of the household is to maximize its utility from consuming commodities G and leisure l subject to time and budget constraints.

The value of an economic agent's objective function measures welfare, and in the case of an agricultural household, this is measured by the level of utility (Sadoulet and de Janvry 1995). Before the dairy buffalo household decides to be a member of a rural-based organization, the choice is evaluated such that its utility is maximized. To model the differences in utilities gained from membership (V_i) and non-membership (V_o) decisions, let welfare (W_i) be expressed as the difference between two indirect utility functions of the agricultural household. The Indirect Utility Function (IUF) as a function of the variables specified above applies for the IUF in equation (1):

$$W_i = V_{1i} - V_{0i} = \alpha (G_{1i} - G_{0i}) + \beta_i z_{ji} + \varepsilon_{ji} \quad (1)$$

where $\Delta G = f(\text{membership})$

G_{1i} = household consumption expenditure per capita of a rural-based organization member

G_{0i} = household consumption expenditure per capita of non-member

V_{1i} = farmer's utility from membership in rural-based organization

V_{0i} = farmer's utility from non-membership

z_{ji} = vector of observed factors that affect total utility

However, the difference in utilities is unobservable. Hence, the utility as a function of household consumption expenditure per capita (G_{ji}) was used. Thus, the dairy buffalo farmer's decision to join a rural-based organization (M_i) can be observable if:

$$M_i = \begin{cases} 1 & \text{if } W_i > 0 \\ 0 & \text{otherwise} \end{cases} \quad (1)$$

The dairy buffalo farmer is assumed to select the alternative that will maximize his utility. The farmer, therefore, will join a rural-based organization if the utility derived from membership will exceed that of non-membership. The extent to which membership in a rural-based organization contributes to household welfare was analyzed using the random utility (RU) model (Hanemann 1984), which describes a discrete choice behavior. Given such discrete alternatives, Baltas and Doyle (2001) emphasized that a random utility model determines an individual agent's preference through the realization of utilities. In this case, the model assumes that the farmer's decision to become a member of a rural-based organization is determined by selecting the alternative that maximizes his utility. With the objective of utility maximization, if the utility from membership is positive and higher than that of non-membership, the farmer chooses to be a member as shown in equations (1) and (2).

In line with Manski's (1977) structure of the random utility model, utility maximization is assumed subject to household resource constraints. Incorporating the transaction costs into the random utility framework, the choice variable specified in this model is membership in a rural-based organization. In an industry where smallholder agricultural farmers face high transaction costs, the formation of rural-based organizations is expected. High transportation costs, high risks of marketing perishable products such as milk, and dispersed markets are some of the transaction costs faced by the farmers and are indicative of the market gaps (Hueth and Jano 2016). In effect, small stakeholders, through their rural-based organizations, take part in information dissemination, input acquisition at reasonable prices, and maximization of market prices, which widely describe the central role of collective action (Seth 2009). This study further claimed that collective action is necessary for encouraging the farmers to proactively participate in the day-to-day operations and coordination of the RBO's activities with the aim of improving their production and marketing efficiencies. However, each farmer's actual utility level is unobservable. The only observable part of the utility function is the vector of variables (i.e., socioeconomic, location, and institutional factors) that may affect the farmer's total utility and a vector of β parameters to be estimated in the model.

Household income and household expenditure are the most common bases in welfare measurement (Haughton and Khandker 2009). Consumption is relatively less volatile than income, especially if there are temporary increases in current income. With the fluctuations in income present in one's lifetime, and the respondents' understatement of their real income, measuring welfare in terms of consumption is more appropriate (Atkinson 1992,

Getahun and Villanger 2017). It is also a good representation of household decisions in terms of allocating their resources. Thus, the empirical analysis for welfare in this study rested on the household consumption expenditure per capita to capture the economies of scale in consumption (Haughton and Khandker 2009).

Methodology

Place of Study and Data Description

The study used the data of the Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development (PCAARRD)-funded project, "Role of Cooperatives in Technology Adoption for Improved Production and Market Efficiency in Dairy Buffalo." The project identified six sites where PCAARRD interventions for dairy buffalo are located (see Figure 1). Municipalities in these provinces with the highest dairy buffalo production and PCAARRD interventions in place were chosen for the study (Cuevas *et al.* 2018).

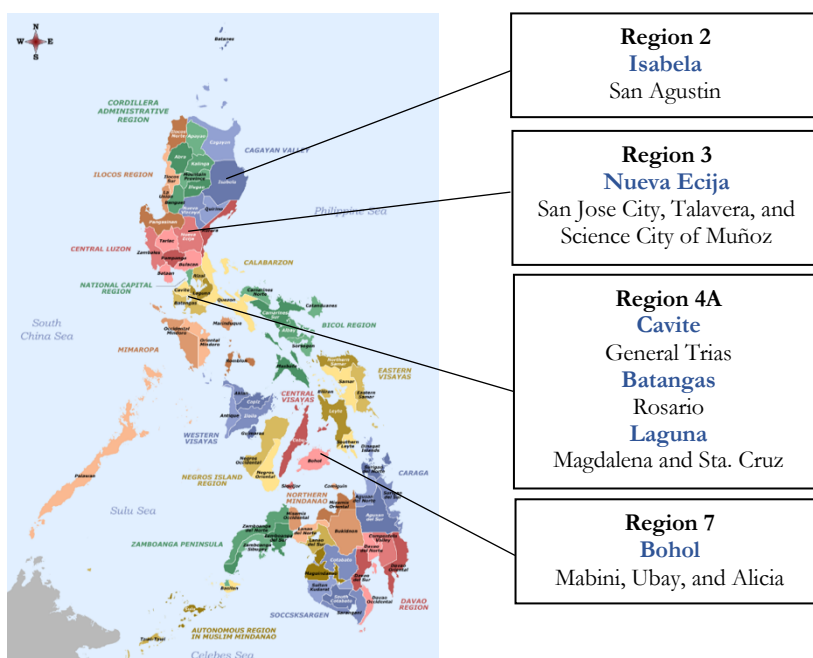


Figure 1. Location of Study Sites

According to Philippine Carabao Center (PCC) (n.d.), the 2017 top three milk-producing municipalities and recipients of PCAARRD interventions in Nueva Ecija are San Jose City (472,841 liters), Talavera (81,552 liters), and Science City of Muñoz (80,808 liters). In Bohol, Mabini (46,745 liters), Ubay (21,863 liters), and Alicia (7,878.30 liters) satisfied both criteria for site selection. Moreover, municipalities chosen for Region 4A were Rosario, Batangas; General Trias, Cavite; Magdalena, and Sta. Cruz, Laguna. Lastly, San Agustin, Isabela was the identified municipality for Region 2.

The project performed a farm household survey from June to August 2018 using a structured survey questionnaire covering the socioeconomic characteristics of the farmers, household profile, dairy farm characteristics, production and marketing information, transaction costs, membership in a rural-based organization, training, use of technology and

other information on the physical and institutional setting. In addition, this study incorporated questions about the income sources, household expenditure, assets of the farmers, and other factors that affect membership in the rural-based organization to achieve its objectives. The data from this farm household survey captured the production cycle, income, and household expenditure in 2017.

The project's respondents were randomly selected from the available list of dairy buffalo raisers provided by the municipal agriculture office and the veterinary offices of the selected survey sites. In the absence of a list, the study used the list provided by PCC. Using simple random sampling without replacement, the sample size of the project is 351 dairy buffalo farmers, where 249 of which are members of a rural-based organization and 102 are non-members. Out of the 351 farmers, 15 are from Batangas, 47 from Cavite, 40 from Laguna, 32 from Isabela, 84 from Bohol, and 133 from Nueva Ecija.

Linear Regression with Endogenous Treatment Model

Having individuals randomly assigned to treatments or interventions is considered the benchmark for research as its impact is attributed to the treatment (Liu and Borden 2019). However, employing random assignment is often difficult as the individuals' self-selection to participate in the intervention before the conduct of the study may have occurred due to their preferences, socioeconomic characteristics, or challenges faced, among others. For instance, the dairy buffalo farmers' decision to join rural-based organizations precedes the data collection of this study. There have been researches about the impact evaluation of specific government policies or interventions between the treatment groups and control (non-experimental) groups. Any group difference derived from a simple comparison of these groups may lead to biased and misleading findings.

The non-random assignment of individuals to treatments or self-selection leads to selection bias. Furthermore, endogeneity occurs when unobserved characteristics associated with the factors affecting the individual's decision to participate in the treatment may also influence the outcome variable (Scott and Brown 2011). In most cases, endogeneity is present due to the omitted variable bias and simultaneity bias. In order to address the potential endogeneity and selection bias, the study used Linear Regression with Endogenous Treatment Model, also known as the endogenous binary-variable model, as it "estimates the average treatment effect (ATE) and the other parameters of a linear regression model that also includes an endogenous binary-treatment variable" (Stata n.d., p. 4). This study's treatment and outcome variables are RBO membership and household consumption expenditure per capita, respectively. This method simultaneously estimates the treatment and outcome equations by analyzing the factors affecting RBO membership and the welfare implications of RBO membership to the dairy buffalo farmers' households. With this, endogeneity is controlled as the residuals from the treatment equation are included as a regressor in the outcome equation; thus, justifying this method's use.

Specifically, two equations comprised the Endogenous-Treatment Regression model, namely: 1) for the outcome household consumption expenditure per capita (W_i); and 2) for the treatment membership in a rural-based organization (M_i):

$$W_i = \beta + \alpha \text{SOCIO}_i + \gamma \text{LOC}_i + \phi M_i + \varepsilon_i \quad (3)$$

$$M_i = \begin{cases} 1 & \delta \text{SOCIO}_i + \pi \text{LOC}_i + \varphi \text{INSTI}_i + \mu_i \\ 0 & \text{otherwise} \end{cases} \quad (4)$$

where SOCIO_i , LOC_i , and M_i are the covariates used to model the outcome (W_i), SOCIO_i , LOC_i , and INSTI_i are the covariates used to model treatment assignment (M_i); and ε_i and μ_i are the error terms that are exogenous to the covariates.

The binary decision to obtain the treatment (M_i), which is membership in rural-based organizations, was assumed as a linear function of the vector of exogenous variables, i.e., socioeconomic ($SOCIO_i$), location (LOC_i), and institutional ($INSTI_i$).

$$M_i = \beta + \delta SOCIO_i + \pi LOC_i + \varphi INSTI_i + \mu_i \quad (5)$$

$$M_i = \begin{cases} 1 & \delta SOCIO_i + \pi LOC_i + \varphi INSTI_i + \mu_i \\ 0 & otherwise \end{cases}$$

where M_i is the dummy variable for membership in a rural-based organization, i.e., $M_i = 1$ means that the farmer decides to be a member and zero if otherwise, $SOCIO_i$, LOC_i , and $INSTI_i$ are the vector of socioeconomic, location, and institutional variables that determine membership in rural-based organizations, respectively and μ_i are random disturbances associated with membership in a rural-based organization. Specifically, $SOCIO_i$, LOC_i , and $INSTI_i$ include the following variables:

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

Variable	Description
$SOCIO_i$	
Education	Household head's highest level of education (years)
Farm Experience	Dairy buffalo farming experience of the household head (years)
Household Size	Number of family members in the household
Milking buffaloes	Herd size (number of milking heads)
Off-farm employment	1 if engaged in off-farm employment, 0 if otherwise
LOC_i	
Laguna	1 if household is located in Laguna, 0 if otherwise
Cavite	1 if household is located in Cavite, 0 if otherwise
Bohol	1 if household is located in Bohol, 0 if otherwise
Isabela	1 if household is located in Isabela, 0 if otherwise
Batangas	1 if household is located in Batangas, 0 if otherwise
$INSTI_i$	
Distance to information	Distance to the source of information (kilometers)
Total transaction costs	Transaction costs incurred by the household (PHP/year)

The farmer's discrete choice, whether to join a rural-based organization or not, is based on several factors affecting his decision. The selection of the variables used in this study, such as socioeconomic, sociodemographic, and institutional factors, were drawn from existing literature that analyzed the effects of membership in rural-based organizations on the welfare of farmers. Following the estimation of the treatment, M_i , the endogenous-treatment regression included this dummy variable for membership in a rural-based organization as one of the explanatory variables in estimating the outcome variable, i.e., household consumption expenditure per capita (W_i). In this study, annual household consumption expenditure per capita was used as the welfare indicator as it represents the agricultural household's decisions in terms of allocating their resources. The outcome variable W_i is a function of two more vectors of explanatory variables, i.e., $SOCIO_i$, and LOC_i that are believed to influence consumption expenditure per capita of household i . This is specified as follows:

$$W_i = \beta + \alpha SOCIO_i + \gamma LOC_i + \phi M_i + \varepsilon_i \quad (6)$$

In addition to the treatment, i.e., M_i , $SOCIO_i$ is comprised of farm experience, off-farm employment, and milking buffaloes, whereas LOC_i is comprised of Laguna, Cavite, Bohol, Batangas, and Isabela.

Results and Discussion

Effect of Collective Action on Household Welfare

The mean consumption expenditure for the whole sample of dairy buffalo farmers is PHP 173,745.09 per year. Based on the results shown in Table 2, members of rural-based organizations have higher total consumption expenditure per capita (PHP 40,895.88) than non-members (PHP 38,511.85) per year and the PHP 2,384.03 difference is statistically significant at 5%.

Table 2. Mean household expenditure of dairy buffalo farmers, selected provinces in the Philippines, 2017

Variable	Mean			Difference
	Members (<i>n</i> = 249)	Non-members (<i>n</i> = 102)	All (<i>n</i> = 351)	
Total household consumption expenditure (PHP/year)	179,265.943	160,267.722	173,745.094	18,998.221**
Household consumption expenditure per capita (PHP/year)	40,895.875	38,511.850	40,203.081	2,384.025**

Notes: Difference = (members) - (non-members)

**significant at 5% probability level

On average, the share of food to total expenditure for members and non-members were 52% and 49% to food, respectively. Following food were education, utilities, and transportation and fuel expenses, where households spent 14.65%, 10.45%, and 9.32% of their income, respectively. Other recorded expenditures of the farmers were medical expenses (4.51%), vices which include alcoholic beverages and cigarettes (3.76%), other miscellaneous items (3.23%), and clothing (3.10%).

As mentioned, household consumption expenditure per capita per year of members and non-members was used to measure household welfare. Membership in rural-based organizations was found to be positive and statistically significant at 1% (see Table 3). The parameter estimates of 51,381.82 implies that when the farmer is a cooperative member, the household consumption expenditure per capita increases by PHP 51,381.82 per year. Hence, it is emphasized that farmers who belong to a rural-based organization have higher household consumption expenditure per capita than non-members.

Table 3. Effect of membership in rural-based organization on household consumption expenditure per capita of dairy buffalo farmers, selected provinces in the Philippines, 2017

Variable	Coefficient	Standard Error
Farm experience (years)	149.382	183.778
Milking buffaloes (heads)	2,502.928***	789.809
Off-farm employment	3,165.953	11,817.960
Batangas	-6,865.487	9,584.565
Cavite	9,159.999	5,685.407
Laguna	19,781.230**	7,815.647
Isabela	-8,376.899	7,424.783
Bohol	-25,804.440***	6,940.466
Membership in rural-based organization	51,381.820***	16,573.880
Constant	-2,757.777	15,756.350
lambda	-28,504.123***	9,702.028

Note: ***, ** significant at 1% and 5%, respectively

This finding is further supported by the estimated lambda -28,504.12 that is statistically significant at 1%. This means that the variation in household consumption expenditure per capita is due to membership in rural-based organizations. These findings are consistent with the studies of Ma and Abdulai (2016), Shumeta and D'Haese (2016), and Ahmed and Mesfin (2017) that showed cooperatives play a significant role in improving the welfare of the farmers.

Cooperatives are often promoted to address market imperfections and increase the income and productivity of smallholder farmers. In the case of coffee farmers in Southwest Ethiopia, the cooperatives' provision of training and extension services to the farmers improved their productivity and income. The economic benefit it brought to its members through improved markets and competition and reduced transaction costs between cooperatives and traders paved the way for smallholder farmers to receive higher prices for their output. However, the findings of their case analyses contradicted the notion that cooperatives provide economic leverage for smallholder farmers (Shumeta and D'Haese 2016).

Other factors that significantly affect household consumption per capita are the number of milking buffaloes and location dummies for Laguna and Bohol. The results showed that household welfare is positively affected by the number of milking buffaloes at 1% level of significance. This implies that as the number of milking buffaloes or herd size increases by one head, the household consumption expenditure per capita increases by PHP 2,502.93. The positive relationship between the two variables can be explained by the increase in milk production brought about by an additional head of dairy buffalo, which thereafter leads to a higher volume of milk sold to buyers.

On the other hand, the location dummy variable for Laguna positively affects household consumption expenditure per capita at a 5% level of significance. This implies that farmers located in Laguna have higher consumption per capita than Nueva Ecija (base variable). On the contrary, Bohol negatively affects household consumption expenditure per capita at a 1% level of significance. This means that household consumption expenditure per capita in Bohol is significantly lower than in Nueva Ecija. These variables, with their limitations, were intended to capture the differences in farming conditions, market access, institutional support, infrastructures, and resource endowment that could have affected household welfare conditions. Hence, the results can only be inferred from the dairy buffalo farmers of the selected provinces in the Philippines.

Determinants of Membership in Rural-based Organizations

Parameter estimates of the linear regression with endogenous treatment were divided into two parts, i.e., the factors influencing the decision of the dairy buffalo farmer to join a rural-based organization (see Table 4) and the effect of collective action on household welfare (see Table 3). Out of the 12 variables included in the model, results showed that seven of which significantly affect the decision of the farmer to join a rural-based organization, namely: total transaction costs, education, and location dummy variables (i.e., Batangas, Cavite, Laguna, Isabela, and Bohol).

Table 4. Determinants of membership in rural-based organization of dairy buffalo farmers, selected provinces in the Philippines, 2017

Variable	Coefficient	Standard Error
Total transaction costs	4.090x10 ⁻⁵ **	2.090x10 ⁻⁵
Education	0.057**	0.027
Laguna	-0.839***	0.249
Isabela	0.868***	0.315
Bohol	1.606***	0.282
Batangas	1.057**	0.504
Cavite	0.429*	0.249
Household size	-0.066	0.043
Farm experience	-0.004	0.008
Milking buffaloes	0.034	0.034
Off-farm employment	0.300	0.585
Distance to information	0.007	0.006
Constant	-0.535	0.690

Note: ***, **, * significant at 1%, 5%, and 10%, respectively

The effect of total transaction costs and educational attainment of the household head on membership in rural-based organizations were positive and statistically significant at 5%. When farmers incur higher transaction costs in production and marketing, the likelihood of joining a rural-based organization increases. Ahmed and Mesfin (2017), Mmbando (2014), and Verhofstadt and Maertens (2015) confirmed that the farther the farmers to the nearest market, the more likely that farmers will join rural-based organizations. As the distance from the farm to the nearest market increases, the farmer faces higher transaction costs in transportation of produce and input acquisition, thus, the farmer becomes more dependent on a group and opts to sell to RBOs (Alemu and Adesina 2015).

In essence, high transaction costs, regardless of whether tangible or intangible, serve as the key barriers to market participation (Goetz 1992). The agricultural household model used in this study evaluated the effect of transaction costs in the production, consumption, and labor decisions of the family members. This model is based on Sadoulet and de Janvry (1995) and de Janvry, Fafchamps, and Sadoulet (1991) supporting the claim that the smallholders' market participation is mainly hindered by the presence of transaction costs, which are significantly the cause of market failures. Some of the transaction costs faced by farmers, such as distance to market, poor infrastructures, and lack of market information, hinder them from taking full advantage of the market channels around them (Jari and Fraser 2009). These create an unfavorable environment for the smallholder farmers since agricultural commodities are perishable.

Transaction cost economics sheds some light on how organizations deal with market failures. The transaction costs entailed in obtaining the information necessary to negotiate, acquire various services and inputs, participate in market exchange provide a means in identifying the institutions that will solve the problem in collective action, and bring individual and societal gains (Williamson 1971, North 1991).

Several transactions occur between the rural-based organization and its members since the members serve as the suppliers of milk. In order to reduce costs and lessen the frequency of transactions, short term contracts are replaced by long term contracts. The transaction frequency for rural-based organizations is considered medium or high through long-term contracts with no end term (Pereira 2016). With members serving as owners of the rural-based organization, the centralization of transactions upwards and downwards of the supply chain is possible. For instance, members search for markets and relevant prices, negotiate with buyers, and conclude contracts (Coase 1937) thus, centralizing these activities reduce individual costs.

On the other hand, the positive relationship of the educational attainment of the household head with membership implies that an additional year in schooling increases the probability of the farmer joining a rural-based organization. Findings of Abate, Francesconi, and Getnet (2013), Bernard and Spielman (2009), and Mojo, Fischer, and Degefa (2015) support this claim where farmers with a higher level of education tend to be more informed and knowledgeable about the benefits of membership to the farm enterprise. However, Ahmed and Mesfin's (2017) result showed that education is not a significant factor in determining cooperative membership, which can be attributed to the difference in method used by this study and the proportion of members' and non-members' years of schooling. Nonetheless, further research can be conducted to verify the relationship between education and membership in RBOs.

The location dummy variables for Laguna, Isabela, and Bohol were found to be statistically significant at 1%, whereas Batangas and Cavite were significant at 5% and 10%, respectively. The positive estimates for the location dummy variables mean that Nueva Ecija (base variable) has a lower share of rural-based organization members compared to sample farmers from Batangas, Cavite, Isabela, and Bohol. The negative coefficient of Laguna can be attributed to the fact that the share of non-members is higher than members. About 58% of the farmers in this province did not have access to credit, 15% did not have access to extension services, and 58% did not attend training about buffalo milk production for the last three years. Also, with Sta. Cruz, Laguna being the capital for *kesong puti* or white cheese, farmers sell their dairy buffalo milk to private buyers processing this product at a higher farmgate price instead of selling the raw milk to a cooperative.

The benefits of being a rural-based organization member were identified by the surveyed dairy buffalo farmers (see Table 5). Results of the rating showed that members considered having an improved knowledge in practices of dairy buffalo raising (4.57) as the most important benefit they received from being a member while improved milk quality (4.55) ranked second. Looking back, some dairy buffalo farmers experienced rejects from buyers due to low milk quality, but upon membership, the ownership of purebred or crossbred buffaloes and adoption of good management practices enabled them to achieve higher milk quality and volume.

Table 5. Benefits of membership in a rural-based organization of dairy buffalo farmers, selected provinces in the Philippines, 2017

Benefit	Rating
Improved knowledge in practices on dairy buffalo raising	4.57
Gained access to dairy buffalo technology	4.43
Increased milk collection	4.47
Improved farm income	4.52
Improved milk quality	4.55
Reduced input costs and marketing costs	4.24

Note: 1 – the lowest rating and 5 – the highest rating

Source: Cuevas *et al.* 2018, p. 79

Improved farm income ranked third because the farmers have a secure market for their milk. Instead of selling small amounts of milk to individual buyers with the dilemma of having milk losses due to spoilage, members sell large quantities of their milk to the cooperative. With higher milk quality, the members receive higher prices; thus increasing their farm income. Based on the results of the cost and return analysis conducted by Cuevas *et al.* (2018) on the same respondents, cooperative members generated a higher profit of PHP 10.68 per liter than non-members with PHP 9.78 per liter. The authors' calculated net return to cost ratio of cooperative members and non-members were 0.58 and 0.52, respectively. The higher net return received by cooperative members is explained by their more efficient production and marketing performance than non-members that led to lower costs incurred and higher

returns obtained. With higher returns, the possibility of purchasing more bundles of goods for consumption increases.

Among these benefits, increased milk collection, reduced input, and marketing costs were associated with the effect of transaction costs on membership. Increased milk collection entails a specific type of transaction cost (i.e., search cost). The transaction costs involved in milk production and marketing were estimated by asking the farmers the amount spent on transportation or communication costs. Aside from the monetary value, the time spent in this search was also requested as it relates to the perishability of raw milk. A sample scenario is finding the market for the milk produced. The opportunity cost of selling raw milk in retail is higher than wholesale, as it takes a lot of time to find a buyer considering that milk is a perishable product.

Ultimately, rural-based organizations play a key role in technology transfer and adoption, information dissemination, input acquisition, and consolidation of produce. This is consistent with the findings of Staal, Delgado, and Nicholson (1997) indicating that cooperatives lessen transaction costs such as opportunity costs of time, logistics and processing costs, search costs, and post-harvest losses. This type of organization can be oriented toward improving production, marketing services, livelihood, or even serve multiple purposes at the same time.

Summary and Conclusion

This study analyzed the welfare implications of collective action in the form of membership in rural-based organizations. The results of the study suggested that farmers who belong to a rural-based organization have significantly higher household consumption expenditure per capita than non-members. This finding confirms the influence of membership in RBOs on household welfare. The economic benefit it brought to its members through improved markets and competition and reduced transaction costs between rural-based organizations, traders, and its members paved the way for smallholder farmers to receive higher output prices. Membership in RBOs was also found to be significantly affected by transaction costs, education, and location dummy variables (Batangas, Cavite, Laguna, Isabela, and Bohol). Overall, rural-based organizations play a significant role in linking farmers to suppliers, markets, and research and development institutions. Its capability to offer consolidation and processing services have helped reduce the transaction costs faced by the farmers and overcome information asymmetries and barriers to access in assets such as storage facilities and equipment.

Recommendations

This study thereby recommends policy interventions that will promote the formation of more rural-based organizations in the dairy buffalo industry and encourage the farmers to engage in collective action to contribute to addressing the gap between local milk production and imports of the Philippines. As Omiti *et al.* (2009) noted, the promotion of market participation among smallholder farmers through cooperatives holds considerable potential for tapping opportunities to develop the agribusiness value chain. Scaling this study to other agricultural industries can provide insight on how the effect of collective action on the smallholder farmers' welfare varies across industries. Future research on the relationship of collective action on market participation, choice of market channel, and technology adoption of the farmers can also be considered.

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