



# Determinants behind farmer's participation in collective economic organizations in Vietnam: A study of small-scale shrimp farms

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**Abstract.** Promotion of cooperatives and cooperative groups in aquaculture is meant to uplift farmers by providing better input services while linking output market. Therefore, this paper empirically investigates the factors that influence small-scale shrimp farmers to participate in the collective economic organization and their intensity of participation by surveying 254 shrimp farming households in the Mekong River Delta's Soc Trang province, Vietnam. By using binary logistic model approach, it was determined that farmers with higher education level, longer farming experience, larger farming area, higher farm-gate price, closer to the collective economic organization's site, having loans and attending more training courses are more likely to participate in the collective economic organizations. The study also provides several implications of policies supporting the expansion of the collective economic production forms, thus, upgrade the small-scale shrimp farming industry.

**Key Words:** collective, cooperative, cooperative group, factor, participation, shrimp farm, Soc Trang.

**Introduction.** Collective economic organizations, including cooperatives and cooperative groups, are defined as "an autonomous association of persons united voluntarily to meet their common economic, social and cultural needs and aspirations through a jointly owned and democratically controlled enterprise" (International Cooperative Alliance 2022). This system is known as a horizontal coordination. According to Coles & Mitchell (2011), horizontal coordination, e.g. cooperative and cooperative group, has benefited small-scale producers and increased farm-level incomes and employment. The expansion of agricultural and aquaculture collective economic organizations have taken place in all regions across the world (Kassam et al 2011; Behera 2019).

The essential roles of collective economic organizations were stated out in various studies, among which Francesconi (2007), Coles & Mitchell (2011), Kassam et al (2011), Ha et al (2013), Sarkar et al (2022). Hence, organising small-holder aquaculture farmers into several forms of collective economic organizations is viewed as an effective means for small-holders to improve productivity, their bargaining power and cost savings for inputs and production processes, financial investments and management skills. Particularly, the collective economic organizations provide opportunities for members to enhance their productivity, from resources accessibility to technical knowledge (Bush & Oosterveer 2007; Ha et al 2013). Farmers who may motivate to engage in the collective economic organizations often gain useful knowledge by sharing farming experiences and adopting technical training. Most the of the collective economic organizations moved beyond a platform for sharing technical expertise: various input suppliers and processing enterprises joined (Ha et al 2013). Secondly, the economic rationale for small-holders participation in the collective economic organizations by derives from two features of the market, including economics of scale creation, and building up countervailing market power (Rao & Qaim 2011; Ha et al 2013). Economics of scale creation means that the collective economic organizations facilitates small-holders to reduce transaction costs and information asymmetries. Such collective economic organizations may offer a plenty of

services like centralized input contracts and sales of farm products (Antonova et al 2022). The collective economic organizations are fostering a requisite level of financial capacity needed, by providing credit, insurance, and receiving comprehensive external support from the government and non-government organizations (NGOs). They also boost income increases attributable to factors such as increased bargaining power (Coles & Mitchell 2011; Ha et al 2013; Antonova et al 2022). Lastly, farmers participate in the collective economic organizations since they want to ensure an output market and gain a stable income based more on the farm's characteristics, rather than on household's attributes (Simmons et al 2005; Behera 2019).

***Shrimp production and collective economic organizations in Vietnam.*** Vietnam is one of the largest producers and exporters of commercial shrimp in the Southeast Asia. By the year 2022, the total shrimp farming area and production reached more than 737,000 ha and 1,014.9 metric tons (MT), respectively. Shrimp products from Vietnam were consumed internationally, corresponding with 4.23 billion USD of the country's export value (VASEP 2023). The black tiger shrimp (*Penaeus monodon* Fabricius, 1798) and whiteleg shrimp (*Penaeus vannamei* Boone, 1931) are the main species of various brackishwater aquaculture systems in Vietnam. The majority of shrimp production is provided from the Mekong River Delta, where shrimp small-scale farming is predominant (Nhuong et al 2013; Ha et al 2013; Quyen et al 2020). A shrimp farm is considered being a small-scale one when it meets the definition of small-scale farming established by the Decree No. 56/2009/ND-CP (2009). According to the Decree, a small-scale shrimp farm operates with two ha, ten laborers and ultimate limited inputs, or less than two ha but using inputs more intensively. Consequently, it is found that shrimp production in the Mekong River Delta is dominated by small-scale producers. Small shrimp producers make up 80 to 95% of farming area and contribute to two-thirds of the total shrimp production (Nhuong et al 2013; Suzuki & Nam 2018; Quyen et al 2020).

With regard to the collective economic organizations, the Cooperative Law distinguishes two forms of collective economic organizations: cooperatives and cooperative groups (National Assembly of the Socialist Republic of Vietnam 2012). The cooperative, is defined as a collective economic organization formed by seven or more individuals, households and/or legal entities with mutual needs and benefits. They voluntarily contribute with property and labour to conduct certain works for improving the production efficiency and enhancing the living standard for members of the cooperative. The cooperative groups are a collective economic organization based on a farming cooperation contract under authentication of communal People Committee, which is formed "by two individuals or more who jointly contribute with assets and labour to carrying out certain works for mutual benefit and responsibility" (National Government of the Socialist Republic of Vietnam 2007; National Assembly of the Socialist Republic of Vietnam 2012). Whereas the cooperatives operate as a business, having a legal status, autonomy and self-responsibility for financial obligations within the scope of the charter capital, accumulated capital and other sources, the cooperative groups have less legal liability for members. Therefore it can then be seen a simpler form of a cooperative (National Government of the Socialist Republic of Vietnam 2007; National Assembly of the Socialist Republic of Vietnam 2012).

In Vietnam, collective agricultural organizations for economic purposes have a long history of establishment and development from the 1950s. This business model has experienced several stages of rises and falls (Khiem et al 2010). Farmers used to be strong resistance to 'old style' cooperative (with recent memories of the use of cooperative as an instrument of political control), but currently small-scale aquaculture farmers are rather motivated for joining a production cluster or farming group (Khiem et al 2010). Recognising the collective economic organizations' benefits, the Vietnamese government has promoted collective economic organizations by approving Cooperative Law in 2003, amendments in 2006 and 2012, aiming to promote the organisation and operation of the collective economic organizations, the so-called 'new-style cooperatives'.

The predominance of shrimp small-scale farming in Vietnam has meant that the collective economic organizations' development has remained a central strategy of the

government and other related NGOs to promote the collective economy and individual competitiveness (Khiem 2010; Ha et al 2013). The essential roles of the collective economic organizations in the economy and social development of the country have been confirmed by the Resolution No. 13-NQ/TW dated from March 18<sup>th</sup> 2002. Likewise, the Prime Minister issued the Decision No. 1804/QĐ-TTg dated on 13<sup>th</sup> of November 2020, approving the program to support the development of the collective economic organizations for the period of 2021-2025, with the goal of establishing new collective production organisations, improving the operational efficiency and management capacity of cooperative managers and building the collective economic organizations' operational environment through their connection with value chains and business (National Government of the Socialist Republic of Vietnam 2020). Therefore, the reorganisation of production in the direction of concentration, associated with the consumption market, advocacy for the establishment and capacity building of new cooperatives/cooperative groups is still one of the top targets in the management of aquaculture sector. By the year of 2022, there were 29,021 cooperatives and 119,248 cooperative groups, of which 19,384 cooperatives are operating in the agricultural sector. The scale and operational efficiency of agricultural collective economic organizations reached a total charter capital of 80,970 USD organization<sup>-1</sup> on average, with an increase of 3,044 USD organization<sup>-1</sup>, compared to 2021. Total assets increased by approximately 2.35 billion USD or by an average of 282,609 USD organization<sup>-1</sup> and 56% of the collective economic organizations are operated effectively, bringing an average income of 2,144 USD year<sup>-1</sup> (Vietnam Cooperative Alliance 2022).

In summary, it is of great importance to investigate factors influencing small-scale farms to participate in collective economic organizations. Therefore, this study attempts to examine determinants behind small-scale shrimp farmers' participation in collective economic organizations in Vietnam's Mekong River Delta. Shrimp production in the Mekong River Delta contributes with more than 93% to the shrimp culture (Quyen et al 2022; Vietnam Association of Seafood Export and Processing [VASEP] 2023). However, most shrimp producers are small-scale farms. This study contributes to establishing authority in the policy and decision making process of industry restructuring and organizing aquaculture small-holders in the collective economy.

## **Material and Method**

**Description of the study sites.** This study is based on multidisciplinary data that has been collected from the province of Soc Trang, one of the largest commercial shrimp production areas in the Mekong River Delta. Also, Soc Trang province is one of the pioneer areas in shrimp farms being operated by collective economic organizations. Shrimp farming in Soc Trang contributed with 201,000 MT and over 54,000 ha in 2022 to the country's economy. Intensive whiteleg shrimp farming systems shares represent more than 89% of the total shrimp production of the province.

The Vinh Chau, My Xuyen, and Long Phu districts (Figure 1) are the leading areas of dedicated shrimp farming (Soc Trang DARD 2023). The intensive system is defined by the use of artificial feeding and stocking with a relatively high density ranging from 40 to 120 post-larvae per m<sup>2</sup> and the average productivity could achieve 4.4 MT ha<sup>-1</sup> (Anh et al 2010). The Department of Fisheries (DoF) of the province has made considerable efforts in organising shrimp farmers within collective economic organizations, according to the governmental policies of encouraging the collective economy. The province currently has 37 established cooperatives with 893 members and over 1.813 ha, and also 146 aquaculture cooperative groups.

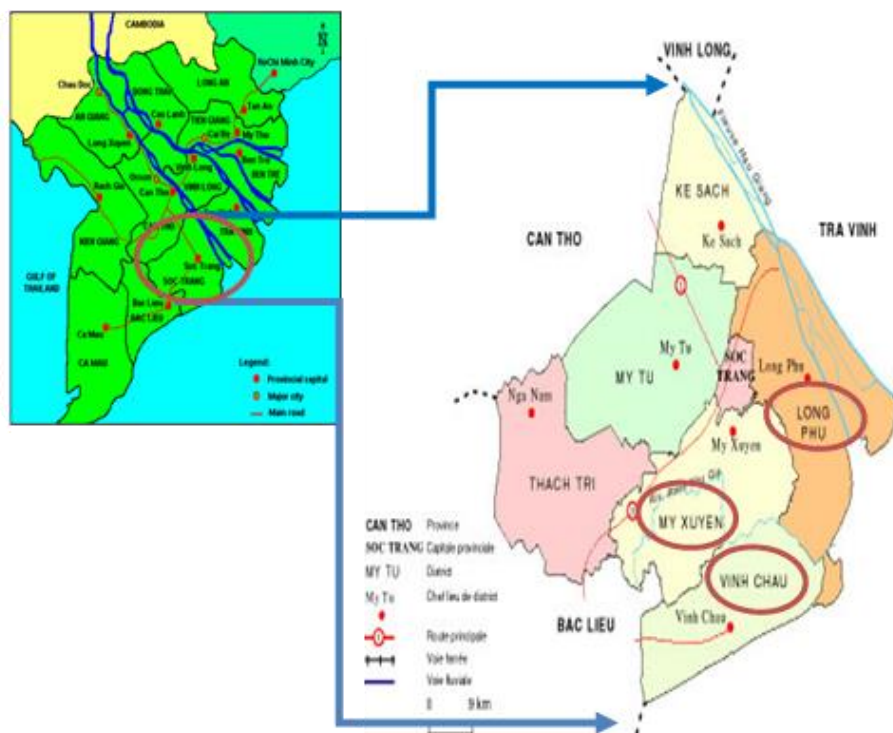


Figure 1. The location of the study sites Soc Trang province in the Mekong Delta, e.g. Vinh Chau, My Xuyen and Long Phu districts with circles.

**Data collection.** A multi-stage sampling method was applied in this study. In the first stage, interview was conducted with the Key Informant Panel (KIP) of senior specialists from the DoF. They were interviewed using a list of open-ended questions (semi-structured interview) to collect secondary data on shrimp farming status quo and information on shrimp collective economic organizations. During this stage, the specialists of KIP were also requested to provide a list of shrimp farming households, including members and non-members of the collective economic organization for selecting the respondents. Then, a pilot test (accounted for 10% of the sample size) was done in order to revise and validate the questionnaires for the household survey. After that, a mass face-to-face interview to the shrimp household was carried out.

In the second stage, household surveys were conducted with a structured questionnaire. A random sampling method using the randomize function in Excel was employed to select respondents from the provided list. As a result, 2 groups of farmers, including 154 members (belonging randomly to 4 cooperatives and 3 cooperative groups) and 100 non-members of the collective economic organizations ( $N = 254$ ) have been chosen for individual interviews. If the chosen shrimp farmers refused to respond the interview or were absent during the interview time, they would be replaced by other farmers at the same geographical location. The questionnaire was designed with variables of information on household characteristics, production operation practices, and financial variables, e.g. investment cost, production costs, cost structure and economic returns. The survey data allowed researchers to quantify factual differences between members and non-members of the shrimp collective economic organizations. SPSS software was used for compiling, cleaning and formatting the data. Logistic regression model is considered in this paper to test the hypothesis that farmer's decision to engage in the collective economic organizations can be affected by different farm and household attributes, and economic factors. There were two distinct objectives behind the analysis of determinants of farmers' participation in the collective economic organizations. One was to recognise the two categories of farmers (member and non-member) to be distinct in terms of certain characteristics such as age, education of the farmers, family size, size of landholding and others. The other was to identify the attributes of farmers who were likely to be in either the member or non-member category.

**Model specification.** The basic binary logistic regression model was used to describe the relationship between a dependent variable – represented by a dummy variable – and multiple independent variables (Ozdemir 2011; Pourghasemi et al 2013). The logistic regression algorithm applies the maximum likelihood estimation after transforming the dependent variable into a logic variable, representing the natural logarithm of the probability of occurrence of the dependent variable (Bai et al 2010; Pourghasemi et al 2013). The general model takes the form:

$$P(Y = 1) = \frac{e^z}{1 + e^z}$$

$$P(Y = 0) = 1 - P(Y = 1) = 1 - \frac{e^z}{1 + e^z}$$

Where:

P - the probability that the n<sup>th</sup> case will participate in the collective economic organizations;

z - the value of the non-observed variable for the n<sup>th</sup> case.

Therefore, the model assumes that z is a linear regression related to the  $X_n$  predictors. As logistic regression model, the generalised linear model extends the linear regression model by linking the range of real numbers to the range 0-1. The linear probability model might suffer from three problems: (1) the estimated probabilities lie out of the range of 0 and 1; (2) the variance of the error term is not constant but depends upon the explanatory variables; and (3) the model suffers from heteroscedasticity problem. Because of above problems, linear probability model is not recommended for such kind of discrete choice models (Maddala 1983; Behera 2019). To deal with such problems, logit has been designed to model the choice between two discrete alternatives. Because the cumulative normal distribution and logistic distributions are very close to each other, except at the tail, the result of these models would not be different, unless the samples are large. So a researcher could select one of the two arbitrarily. Hence, in order to observe the households' decision to participate in the collective economic organizations, logistic distribution (Logit) model was selected. Specification of the logit model is given in the following equation (Behera 2019; Quyen et al 2022):

$$\text{Log}_e \left( \frac{P(Y_n=1)}{P(Y_n=0)} \right) = z = B_0 + B_1X_1 + \dots + B_nX_n + u$$

Where:

z - a binary choice, taking the value 1 if the farmer participates in a collective economic organization, and otherwise 0 (0 = non-participant; 1 = participant);

$B_0$  - a constant;

$X_n$  denotes the value of the n<sup>th</sup> independent variable explaining the correlation with the dependent variable; the term u denotes the error of the model;

$B_n$  is the estimated parameter.

The  $B_n$  is correlated to odds ratio  $\text{Exp}(B_n)$  directly under the equation:

$$\text{Exp}(B_n) = \frac{\partial (Y=1/X)}{\partial X} = P(1 - P)B_n.$$

The SPSS automatically computes the value of  $\text{Exp}(B_n)$  through an iterative maximum likelihood method, applied when running the model, where n is the number of independent variables.

**Empirical model and expected data.** In this study, the logit regression model was employed to examine the factors influencing farmers' decisions to participate in the collective economic organizations. Because of the binary choice, employing the logit model for the analysis was deemed preferable. A farmer can be described as someone who is able to participate in the collective economic organizations based on the probability of P (Y=1) being greater than 0.5. Conversely, if P (Y=1) is less than 0.5, they are deemed as being ineligible to participate in the collective economic organizations.

The factors as to why a farm household chooses to participate in the collective economic organizations depends on many explanatory variables, which could be classified into three groups: (1) farm households' characteristics (A) that are reflected by the

education level  $X_{edu}$ , age  $X_{age}$ , farming experience  $X_{exp}$  and labour of farm households  $X_{lab}$ ; (2) households assets and income (B) which will be captured by the landholding rate  $X_{lan}$ , ratio of shrimp income over the total income  $X_{inc}$ ; (3) market attributes and information (C) represented by the farm-gate price  $X_{pri}$ , distance to the collective economic organization's site  $X_{dis}$ ; access to credit  $X_{cre}$ ; and extension service on collective economy  $X_{tra}$ . Therefore, the following model was used to predict the adoption of collective economic organization by the participants (Hensher & Greene 2003). Specification of the logit model is given in the equation:

$$\text{Log}_s \left( \frac{P(Y_n=1)}{P(Y_n=0)} \right) = B_0 + B_1 X_{edu} + B_2 X_{age} + B_3 X_{exp} + B_4 X_{lab} + B_5 X_{lan} + B_6 X_{inc} + B_7 X_{pri} + B_8 X_{dis} + B_9 X_{cre} + B_{10} X_{tra} + u$$

## Results

**Reviews of major variables.** Table 1 provides descriptive statistics of the independent variables used in the logit model.

Table 1  
Descriptive statistics of variables in the Binary Logistic Regression: non-participant vs. participant in the collective economic organizations

Notation	Variables	Explanation (unit)	Mean (Std. Dev.)		
			Non-participant	Participant	Pooled sample
$X_{edu}$	Education level	Schooling years (years)	6.75 (2.18)	8.88 (3.1)	7.52 (2.56)
$X_{age}$	Age	Age of household head (years)	48.5 (11.8)	52.5 (13.7)	49.4 (8.9)
$X_{exp}$	Farming experience	Number of years of shrimp farming (years)	14.7 (6.95)	17.7 (8.39)	16.4 (7.56)
$X_{lab}$	Family labour	Family working population (people)a	2.00 (1.26)	2.22 (0.84)	2,10 (1.02)
$X_{lan}$	Farming land area	Shrimp farming area (ha)	0.75 (0.51)	0.80 (0.63)	0.77 (0.64)
$X_{inc}$	Shrimp income	Ratio of shrimp farming income in the total income of the household (%)	75.2 (8.96)	82.2 (9.50)	80.2 (9.12)
$X_{pri}$	Selling price	Selling price at the farm gate of the harvested commercial shrimp at average size of 60 inds.kg <sup>-1</sup> (USD)	4.34 (1.03)	4.47 (1.05)	4.42 (1.06)
$X_{dis}$	Geographical distance	Distance to the headquarter of cooperative or cooperative group (km)	6.64 (1.20)	5.12 (1.82)	5.80 (1.62)
$X_{cre}$	Credit access	Famers having loans (0 = No; 1 = Yes)	0.02 (0.08)	0.54 (0.45)	0.30 (0.41)
$X_{tra}$	Training	Farmers participation in trainings on collective economy (0 = No; 1 = Yes)	0.59 (0.35)	0.97 (0.01)	0.75 (0.30)

USD 1 = VND 23.200 (2022); a labour age ranges from 15 to 60 years old for male and 15 to 55 years old for female.

The table indicated that education level of the collective economic organization's participants is higher than that of non-participants. On average, the age of shrimp farmer in the pooled sample is around 49.4 years. The collective economic organization's participants are older in age than the non-participants. Similarly, the collective economic organization's participants have longer shrimp experience than the other group. The average number of working members per family is around 2 people in the pooled samples. It is observed that family size of collective economic organization's participants and non-participants is around 2 members. Regarding shrimp farming area, farmers belonging to the collective economic organization operate larger farming land area than the non-participants, at 0.8 and 0.75 ha, respectively. Most surveyed farmers have shrimp farming activity as a main livelihood source that contribute with about 80% of the total income. Participating in the collective economic organization could provide a premium price for participant through the centralised sale contract (Behera 2019; Antonova et al 2022). The result showed that members of collective economic organization obtained a higher selling price, USD 4.47 kg<sup>-1</sup> as compared to USD 4.34 kg<sup>-1</sup> for non-members. Concerning the geographical distance of farmer's production site to the nearest headquarter of the collective economic organizations, it is observed that non-participants travel more distance, more than one km, to access the site of collective economic organization. Evidence from the survey demonstrated that members of collective economic organization's have better access to credit providers compared to non-members. Similarly, the percentage of collective economic organizations members attending training on collective economy is higher than non-members.

**Results of the regression.** To determine certain characteristics that influence farm households to join in the collective economic organizations, a logit model has been used. The results of variable and model fitness in the estimated logistic regression are reported in Table 2. Logistic regression is estimated with dependent variable of "Yes" (Y=1=participant) as the base (Duyen et al 2019). The model is generally prone to the biasing effect of collinearity, therefore it is essential to test for collinearity. If the degree of multi-collinearity increases, the regression model estimates of the coefficients become unstable and the standard errors can be inflated. Here, SPSS has been used that can detect multi-collinearity problem. Observing the value of VIF (Variance Inflation Factor) and tolerance (VIF<sup>-1</sup>) tests may report the problem of multi-collinearity. As a rule, a variable whose VIF values are greater than 10 and tolerance value are less than 0.1 may merit further investigation (Trong & Ngoc 2008; Hair et al 2013). Fortunately, VIF values generated are less than 10 and tolerance values are greater than 0.1 (Table 2).

Table 2  
Variables and model's goodness of fit

<i>Variables</i>	<i>Name of variables</i>	<i>Measure unit</i>	<i>VIF</i>	<i>1.VIF<sup>-1</sup></i>
<i>X<sub>edu</sub></i>	Education level	Years	1.17	0.889
<i>X<sub>age</sub></i>	Age	Years	1.37	0.729
<i>X<sub>exp</sub></i>	Farming experience	Years	1.15	0.872
<i>X<sub>lab</sub></i>	Family labour	People	1.12	0.889
<i>X<sub>lan</sub></i>	Farming land area	Ha	1.52	0.656
<i>X<sub>inc</sub></i>	Shrimp income/total income	%	1.36	0.732
<i>X<sub>pri</sub></i>	Selling price	USD	1.20	0.830
<i>X<sub>dis</sub></i>	Geographical distance	Km	1.46	0.686
<i>X<sub>cre</sub></i>	Credit access	0 = No; 1 = Yes	1.12	0.889
<i>X<sub>tra</sub></i>	Training	0 = No; 1 = Yes	1.11	0.9
Log-likelihood			117.34	
Cox and Snell R <sup>2</sup>			0.61	
Nagelkerke R <sup>2</sup>			0.78	

VIF (Variance Inflation Factor) gives the result of multi-collinearity test; Log-Likelihood is a criterion to measure the model's goodness of fit; the logistic regression Cox and Snell or Nagelkerke R<sup>2</sup> is an analogous statistic to the coefficient of determination R<sup>2</sup> in linear regression.

The measure of the model's goodness of fit was based on Chi-square statistics of the Log-Likelihood test. The smaller the statistics were, the better the model became. The results of -2 Log-Likelihood and the Chi-square test is shown to be well fitted and statistically significant at the 1% level. The Nagelkerke R<sup>2</sup> was 0.78, getting close to 1 (Table 2). This means that the model is assumed to be well fitted.

Table 3  
Probability of farmer's participation in shrimp cooperative/cooperative group

<i>Variables</i>	<i>Coefficient</i>	<i>S.E.</i>	<i>Wald Chi-square</i>	<i>p-value</i>	<i>Exp (B)</i>
Intercept	-1.987	0.786	6.399	0.010	0.137
<i>X<sub>edu</sub></i>	0.155	0.068	5.272	0.022**	1.168
<i>X<sub>age</sub></i>	-0.051	0.067	0.082	0.460	-2.950
<i>X<sub>exp</sub></i>	0.062	0.028	4.934	0.046**	1.064
<i>X<sub>lab</sub></i>	1.289	0.002	0.001	0.230	1.592
<i>X<sub>lan</sub></i>	0.022	0.001	0.000	0.026**	2.220
<i>X<sub>inc</sub></i>	0.122	0.035	0.192	0.340	3.540
<i>X<sub>pri</sub></i>	0.006	0.000	0.000	0.098*	1.660
<i>X<sub>dis</sub></i>	-1.492	0.512	-0.506	0.003***	-2.950
<i>X<sub>cre</sub></i>	3.780	1.314	6.432	0.001***	2.930
<i>X<sub>tra</sub></i>	0.944	0.381	6.157	0.013**	2.571
				Actual non- participants	Actual participants
	Predicted non-participants			76	125
	Predicted participants			24	29
	Percent correct (%)			76.00	81.17
	Total percent correct (%)			78.92	

\*, \*\*, \*\*\* denote the statistical significance of the explanatory variables model at P-value = 10%, 5% and 1%, respectively; the coefficient is the parameter of the ten explanatory variables in regression model, as described in the text; S.E. = Standard error; Exp (B) is the parameter used to estimate the odd of the participation.

A good model should have a minimal opportunity of misclassification (Hosmer & Lemeshow 2000; Trong & Ngoc 2008). The model predicted 76 out of 100 cases (76.00%) accurately as non-being member of the collective economic organizations. Simultaneously, in the 154 observed participation cases, the model predicted 125 cases accurately, which accounted for 81.17%. Therefore, the total percentage of accuracy was 78.92 %, which indicates a good model (Table 3). The results of this study are in line with the broad argument that the decision to join in the collective economic organizations or not is influenced by the simultaneous interaction of various factors. Of the ten regressors, seven are found to be statistically significant at different P-values. The estimated coefficients measure the change in predicted log odds of participation in the collective economic organizations for a unit change in independent variable. A positive coefficient means that the odds of observing a higher participation in the collective economic organizations rises with a higher value for the independent variable. A negative coefficient has an exponential value between 0 and 1, which decreases the odds.

As presented from the Table 3, the educational level of the household head (*X<sub>edu</sub>*) has a positive impact on the probability of participating in the collective economic organizations. Better educated farmers often have a better awareness of the collective economy. Therefore, it is logical that if farmers have a higher level of education, they are expected to participate more in the collective economic organizations. A one-year increase in schooling results in an increased probability to participate in collective economic organizations membership. Another vital factor affecting the decision to join in the collective economic organizations that was positively significant is farming experience (*X<sub>exp</sub>*). Specifically, the odds ratio for this variable suggests that one year increase in shrimp farming experience results in an increase in the odd ratio of the probability of participation in the collective economic organizations. This finding may be explained that farmers who has long experience have more understanding about collective economy and



cooperative. The variable of farming area ( $X_{lan}$ ) has positive effect on the dependent variable. The probability of being a collective economic organization membership increased as the farming area increased. Specifically, the odds ratio of the farming area increase in line with a unit increase of the farming area. The variables of shrimp selling price ( $X_{pri}$ ) (P-values = 0.1), having loans for shrimp farming ( $X_{cre}$ ) (P-value = 0.01), and having training on the collective economy ( $X_{tra}$ ) (P-value = 0.01) are found to be significant in estimating the probability to participate in a collective economic organization. The odds ratio of selling price shows that farmers who sell shrimp at a higher farm-gate price are more likely to participate in the collective economic organizations. Similarly, farmers who have accessed credits and awareness on the collective economy are more likely to participate in the collective economic organization. Farmers living and operating at a longer distance to the collective economic organizations' site are less likely to participate. This may be due to the fact that longer distance may cause more transaction costs (including time consuming and information cost), discouraging farmers to enter into the collective economic organizations.

**Discussion.** In this study, factors that influence the probability of respondents' decision to participate in the collective economic organizations were identified, i.e. educational level, farming experience, farming area, ratio of shrimp income in the total income, selling price at the farm-gate, distance to the collective economic organizations' site, having access to the credit and training on collective forms. Education level, farming experience and prior participation to trainings are important determinants of farmers' decision to adopt the collective economic organizations (P-values = 0.05) as these factors increase the awareness on the collective economy. In addition, it is easier to train more educated and longer experience farmers to understand and join in the collective economic organizations. These results are similar to the findings of Veldstra et al (2014), Duyen et al (2019), Behera (2019) and Quyen et al (2022). Duyen et al (2019) and Behera (2019) argued that the likelihood of participation in the collective economic organizations raises in farmers informed about the collective economy via trainings. When farmers are informed about the benefits of joining in collective economic organizations, they had a higher willingness to link with, as well as to access the external support from NGOs and authority (Behera 2019; Thuyen 2020). Likewise, the provision of necessary information on the collective economic organizations is important to encourage farmers to join in the mode of production. Noteworthy, most of the farmers who participated in the collective economic organizations possessed a larger farm, which is in line with Singh (2002), Kumar (2006) and Behera (2019). Surprisingly, an increase in the farm-gate selling price determined only a slight increase in the likelihood of participating in the collective economic organizations, in line with the findings of Wilson & Hart (2000), Bai et al (2011) and Duyen et al (2019). This can be explained that the premium price when joining the collective economic organizations may not be attractive enough for farmers. In other words, the price discrimination between members and non-member of the collective economic organizations is insignificant (Bai et al 2011; Ha et al 2013). This might also suggest that economic incentive is not a primary reason for farmers' participation in the collective economic organizations or that these do not primarily encourage premium price and income, but rather affect aquaculture and fishing yield (Dewi & Iskandar 2019; Quyen et al 2020). The shrimp farmers who have loans are likely to join the collective economic organizations because they have strong motivation to earn money for paying debt and interest. In addition, members of the collective economic organizations benefit from an easier access to financial resources offered or mediated by the collective economic organizations, based on the operational policies (National Assembly of the Socialist Republic of Vietnam 2012). While establishing horizontal linkages, farmers can be supported to borrow a certain amount of money to buy specific input material for shrimp farming, e.g. feed, post larva, equipment, etc. with a preferential interest. Ha et al (2013) stated that this policy is an important determinant of farmers' decision to participate in the collective economic organizations.

**Conclusions.** In order to inform the policy makers in their support to the collective economy, this study examines factors influencing the farmers' decision to participate in the shrimp collective economic organizations of a targeted area. The analysis reveals that participation in the collective economic organizations is mainly driven by the educational level, farming experience of the household head, landholding size for shrimp farming, farm-gate price, distance to the collective economic organizations sites, having loans and training participation. Amongst these abovementioned factors, the distance to the cooperation site had the highest coefficient of the odd of the collective economic organizations participation.

Based on the results of the binary logistic estimation, some policy implications have been made. Farmers with better education levels, longer farming experience, larger landholding size for shrimp farming have better potentials to join in the collective economic organizations. Surprisingly, farm-gate price is not a primary factor influencing farmer's decision to participate in the collective economic organizations. Also, the results indicate that farmers who already know about the collective economy, being previously informed via multiple trainings, are less likely to refuse participation in the collective economic organizations. Hence, it would be beneficial to offer various trainings and to upgrade the infrastructure and the network of the collective economic organizations. Importantly, this study contributes to the goal of expanding the collective economy of small-scale shrimp farms and of the Vietnamese aquaculture sector, in general.

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