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Abstract: Since the application of the Vietnam Law on Cooperatives in 2012, cooperative models have been interested in practice because it has brought about more profitable results, income and higher quality of life for cooperative members than individual production farmers. Understanding the factors influencing the production decisions to join a cooperative is a challenge for researchers and policymakers in Vietnam. Based on the theoretical framework of economic theory and practice in Vietnam, the study conducted a field survey of 450 rice farming households in the Mekong Delta in Vietnam and used Binary Logistic regression analysis. The results show that some influencing factors include: Gender of household head; Distance from the cooperative to the nearest central market; Level of contact with agricultural extension officers; Access to credit; Scale of rice land; Feel the benefits brought; Education level; Supporting policies; and Age of household head.

Key words: rice cooperative, binary logistic regression, decisions to join cooperatives, The Mekong Delta, Vietnam

JEL codes: D

### 1. Introduction

The most outstanding achievement of agricultural development in recent years is the development of rice. From an average annual food import of 900,000 tons in the period 1976-1980 (Vietnam Ministry of Agriculture and Rural Development, 2014), Vietnam has become the world's leading rice exporter (second place after India). In 2020, Vietnam exported 6.15 million tons of rice, reaching a sustainable turnover of 3.07 billion USD for rice production (Ha Anh, 2021). The rice supply of Vietnam not only solves the domestic demand but also plays a role in meeting the food demand for the whole world. Contributing to this achievement, the Mekong Delta, Vietnam plays a decisive role with 50% of rice production, 95% of the country's rice exports (Duyen, 2021). The number of cooperatives in the Mekong Delta accounts for 12% of the whole country and 60% of cooperatives that operate effectively (Vietnam Ministry of Planning and Investment, 2020). However, rice producers still have to cope with fluctuations in prices, income and risks of abnormal conditions of the environment - weather and especially the

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fierce competition of the international import market in the context of the global economic crisis. One of the main causes of the above problem is that most of the farmers are still small and scattered under the form of household production. Since 2012, with the new Vietnam Law on cooperatives with many innovations, cooperative models such as cooperatives have been interested in practice because they have brought more profit, income and higher quality of life results than aqua culture production. However, very few studies systematically examine the efficient nature of cooperative versus individual production. In the context of global integration associated with sustainable development, improving competitiveness and stabilizing the income of farmers, especially rice farmers, is a challenge for the country, in which development is a challenge. Developing an effective and appropriate cooperative model plays an significant role in confronting these challenges. The issues raised are also challenges for researchers and policymakers in Vietnam. This article focuses on three main contents: (1) Identifying factors affecting the farmer's production decision to join a cooperative; (2) Developing an econometric model for the above relationships; and (3) Suggesting policies to attract individual farmers to the cooperatives.

#### 2. Theory Overview

#### 2.1 Concepts

Agricultural cooperatives: Agricultural cooperatives are a form of cooperation of independent farmers. Cooperatives were established to protect members against often the monopolistic trading enterprises. In Western Europe, such as the Netherlands and Denmark, these cooperatives emerged on a voluntary basis (Meulenberg, 2000). Cooperatives have a distinct set of characteristics: Cooperative activities are tied to the market, but the surplus - generated by the cooperative - goes to farmer members of the cooperative, in proportion to their product being delivered/purchased to/from cooperatives, after deducting the cooperative's operating expenses and the reservation fund. In general, the main economic objective of agricultural cooperatives in the economic activities is to improve the income of the members through advantages such as reducing production costs and also reducing and internalizing the transportation costs, with better information flows about consumer and cooperative needs, can also lower the risks of economic and technological uncertainties and thus reduce transaction costs (Harte, 1997: Ollila & Nilsson, 1997: Rover, 1999: Hendrikse & Verman, 2001: Szabó & Fertő, 2004). The internationally recognized principles of cooperation are: private legal entities; co-owner; members establish and cooperate voluntarily with each other in production, business and job creation activities; cooperation between cooperatives; and care about the community. Basically, a cooperative is an economic organization jointly owned and controlled by the cooperative members whose benefits are distributed equitably on the basis of the use of its resources and the contributions of each members (Barton, 1989). According to the new Vietnam Law on cooperatives in (Vietnam National Assembly, 2012), a cooperative is a collective economic organization, jointly owned by legal entities, voluntarily established and by at least 7 members. mutual assistance in production, business and job creation activities to meet the common needs of members on the basis of autonomy, self-responsibility, equality and democracy in management of cooperatives. The difference between the new Law on cooperatives and the former Law on cooperatives in 2003 shows that a cooperative is not an enterprise but a collective economic organization, co-owned with legal entities operating with the goal of benefit and not profit; Cooperatives are economic organizations of disadvantaged people who share the same needs and interests, unite and support each other in resisting market pressure to protect themselves and develop production and business activities, creating jobs and aiming for the common interests of members and the community.

#### 2.2 Foundation Theory

The theory of division of labor: According to Smith (1997), division of labor and labor cooperation are two sides that agree with each other in a labor process. The division of labor must be such that labor cooperation can take place, and labor cooperation must be based on the division of labor. If you want the labor process to be closely linked and increase labor efficiency, the division of labor must be reasonable. The greatest improvement in labor productivity and much of the skill, ingenuity, creativity, and good judgment appears to be due to the division of labor. Inheriting Smith's theory of division of labor, Marx (1988), said that division of labor is divided into two basic types: social division of labor and division of labor in craft industries. These two forms of division of labor have a close relationship, serving as a common basis for all commodity production. The way labor is organized with a reasonable division of labor will promote the production process of craft industries to be many times more productive than before and form production specialization.

Theory of linkages: Economic linkage is a form of cooperation and coordination of activities conducted by economic organizations on a voluntary basis in order to promote the production and business process to develop in a beneficial direction for the parties to the association, within the framework of the laws of the State. The purpose of economic linkages to support each other between the associated parties is to create stability for economic activities, which is implemented through operating regulations to conduct production and business division in order to well exploit the potentials and advantages of the participating parties to create a common consumption market and protect each other's interests. In terms of the market economy, the cooperation model is essentially a form of economic linkage. Linking forms include: horizontal link; vertical link and integrated link.

- Horizontal linkages: are the cooperation of actors in the same stage of the production process in the same or different industries (Rehber, 2000; Gibbon & Ponte, 2005). In agriculture, horizontal linkage represents the link between farmers such as production cooperative groups, agricultural production and trading cooperatives. The benefits of the form of cross-linking are exploiting the advantages of production scale, reducing production costs, increasing profits for stakeholders and especially increasing the bargaining power of the market compared to producing individual farmers.

- Vertical linkages: are linkages between actors at different successive stages in the production process (Rehber, 2000; Gibbon & Ponte, 2005). In agricultural production, vertical linkage represents the link between farmers and suppliers of seeds, agricultural materials, plant protection, credit, processing and product consumption. This form of association in Vietnam is popular with the "big field" model. The benefits of vertical linkage are reduction of chain costs, risk reduction, farmers' access to market information and capital resources, science and technology, and assurance of product consumption and specialized exploitation, specialization in the division of labor (Christopher & Jonathan, 2009).

Vertical - horizontal linkages: are the linkages that coordinate both vertical and horizontal, linking actors at different stages and linking actors at different successive stages during production (Rehber, 2000). This form of association in Vietnam is popular with the cooperative model.

Theory of reasoned action: The theory of reasoned action (TRA) by Ajzen & Fishbein (1980) argues that behavioral intentions lead to behavior and intentions are determined by individual attitudes, with the influence of subjective norm (The influence of others also leads to their attitudes). In which, attitude and subjective norms are important in behavioral intention. This model is used to predict how individuals will behave based on their pre-existing attitudes and behavioral intentions. The high correlation between behavioral intention and behavior

has been confirmed in many studies (Sheppard *et al.*, 1998). However, there is still much debate about the relationship between behavioral intention and actual behavior, because under certain circumstances, behavioral intention does not always lead to actual behavior.

Theory of planned behavior: The theory of planned behavior (TPB) by Ajzen (1991) states that the intention to perform a behavior will be influenced by three factors such as attitude towards the behavior, subjective standards and perceived behavioral control. Thus, TPB was developed from the theory of rational action and overcomes the limitation that human behavior is completely controlled by reasons. There are three basic determinants in this theory: (i) The personal factor is the individual's attitude towards the behavior regarding the positive or negative of performing the behavior; (ii) Regarding the person's intention to perceive social pressure, because it copes with the perception of pressure or normative compulsion, it is called subjective norm; and (iii) Finally, the determinant of self-efficacy or the ability to perform the behavior, called cognitive behavioral control. The theory shows the importance of attitude towards behavior, subjective norm and cognitive behavioral control leading to the formation of a behavioral intention.

**Useful perception theory:** According to the useful perception theory, in agriculture, new technical measures or solutions are often perceived to carry more risks than traditional methods and will be barriers to application selection decisions when farmers will be uncertain about effectiveness and usefulness and will tend to delay application in order to wait for trial results (Feder et al., 1985). Thus, Feder & O'Mara (1981) showed that through access to official information, experiencing the results helps farmers feel that the level of risk and uncertainty decreases while they realize the effectiveness and usefulness of the application and thereby increase the probability of choosing the application.

The underlying theories above are relevant to this study in explaining the effectiveness of the cooperative model over individual production because of exploiting specialization in division of labor, advantages of scale, market, and access to resources: capital, technology, improve market bargaining power, have a market for agricultural products and also explain the reasons that individual farmers participate in the cooperative model.

#### 2.3 Empirical Studies Related To Factors Affecting the Decision To Join Agricultural Cooperatives

Research on cooperatives in China reveals education level, risk tolerance, acreage size, operating costs, geographical location and crop types, cooperative membership size, perceived on the role and performance of cooperatives are factors affecting the decision to join agricultural cooperatives (Zheng et al., 2012; Wenyi et al., 2013). Research on cooperatives in Ethiopia shows that the factors affecting the decision to participate in agricultural production cooperatives include: age, education level, access to credit, access to training and education support, age of the household head, need to access agricultural inputs, farmers' perceptions of the adequacy/attractiveness of dividends distributed, perception of the socioeconomic importance of cooperative primary, trust in cooperative management committees, households' need to access cooperatives as a market output (Nugusse et al., 2013; Msimango & Oladele, 2017; Gashaw & Kibret, 2018). Research on cooperative organizations in rural Nigeria shows that influencing factors include: higher income; age (young), gender (male); area scale (small); agricultural extension contact; educational level; marital status, cultural status, household size and occupation; gender inequality; inadequate finance, loan repayment pressure, lack of credit (Ogunleye et al.; 2015; Awotide et al., 2015; Echukwu & Nwankwo, 2021).

Since the 2000s, many studies have been conducted around the world, South Africa (Msimango & Oladele, 2017); Croatia (Nedanov & Zutinic, 2018); Turkey (Karl et al., 2006); Iran (Arayesh, 2011); Malawi (Maonga et

al., 2017); Cameroon (Balgah, 2019) shows that the factors affecting the decision to participate in agricultural cooperatives include: gender, age, contact with agricultural extension, access to transport services and services, government, improving profits, benefiting from cash, subsidizing inputs and services provided by agricultural cooperatives, better access to capital markets and creating opportunities to use allocate investment capital into cooperatives through the application of modern technology in agriculture. Research results in Vietnam also show that influencing factors include: cultural level, scale of arable land, access to credit, social capital, access to extensions and access market (Luu Tien Dung, 2019).

From the 2000s up to now, the synthesis of empirical studies shows that there are six groups of factors affecting the decision to join agricultural cooperatives of farmers: Human capital; Physical capital; Social capital; Feel useful; Market access; Government assistance policy. The study conducted a survey of 20 management experts in the agricultural sector in Can Tho city and Soc Trang Province to identify specific groups of factors to suit the characteristics of Vietnam agriculture.

Human capital: Gender; Age; and Education level of the household head.

Physical capital: Scale of land for rice cultivation and Access to credit.

Social capital: Household heads participate in farmer associations, unions, farmer clubs; and the level of contact with agricultural extension staff.

Useful perception: The household head feels the benefit; The role of cooperatives in the economy and society.

Market access: Distance from cooperative to local markets.

Government support policy: Investment in rural infrastructure; Invest in the application of new technologies in rice production and processing; Borrowing from official credit institutions; and Access to market information.

#### 3. Research Model & Hypothesis

Theoretical reviews and empirical studies are needed for further research to extend the theory, provide more empirical evidence and theoretical policy implications related to the factors influencing the decision to join a cooperative. Previous studies highlight insights into the impact of factors influencing the decision to join an agricultural cooperative and measure relationships using different and independent quantitative models such as statistical tests, linear regression or separate regression models, but do not provide an adequate basis for a comprehensive analytical framework on factors for decision to join rice producing cooperatives. Therefore, the aim of this study was to extend the findings from previous studies and integrate analysis of the relationships in the Binary Logistic Regression model. This study selected the research model for the Mekong Delta in Vietnam as follows:



Figure 1 Research Model

Hypotheses: Based on empirical studies, the study proposes the following hypothesis:

H1: The gender of the household head affects positively the decision to join cooperatives;

H2: The age of the household head affects positively the decision to join cooperatives;

H3: The educational level of the household head affects positively the decision to join cooperatives;

H4: The scale of rice land of the farmer household affects positively the decision to join cooperatives;

H5: A household's ability to access credit affects positively the decision to join cooperatives;

H6: Participation in farmer associations, unions, farmers' clubs affects positively the decision to join cooperatives;

H7: The level of contact with agricultural extension staff affects positively the decision to join cooperatives;

H8: Perceived benefits from cooperatives affect positively the decisions to join cooperatives;

H9: Perceived socio-economic role of cooperatives affects positively the decision to join cooperatives;

H10: The distance from the cooperative to local commercial centers affects positively the decision to join cooperatives;

H11: Government support policies have a positive impact on the decision to join cooperatives;

No	Variables	CODE	Units	Expectation
Ι	Dependent variables The decision to join cooperatives	Y	Yes = 1; No = $0$	
II	Independent variables			
1	Human capital			
	Gender of household head	X1	Female = $0$ ; Male = $1$	+
	Age of household head	X2	Number of years	-
	Education of household head	X3	Years of schooling (1–12)	+
2	Physical capital			
	Area of rice land	X4	1000 m <sup>2</sup>	+
	Access to credit	X5	Yes = 1; No = $0$	+
3	Social capital			

Table 1 Definitions of Variables and Expectations

	Join farmer associations, farmer unions, extension clubs	X6	Yes = 1; No = $0$	
	Participation level with agricultural extension staff	X7	Number of contact times with extension in a crop	+
4	Useful perception			
	Perception of the benefits from cooperatives	X8	Yes = 1; No = $0$	+
	Perception of the socio-economic role of cooperatives	X9	Yes = 1; No = 0	+
5	Market accessibility			
	Distance from the cooperative to the nearest central market	X10	Km	-
6	Government assistance policy	X11	Yes = 1; No = 0	+

## 4. Research Design

#### 4.1 Quantitative Model

Form of the research model: Y = f(X1, X2,...,X11)General form of the linear regression model:

$$Y = B_0 + \sum_{i=1}^n B_i X_i + u$$

Xi: Independent variables; Y: Dependent variable; u: Residuals.

According to Howitt & Cramer (2011), when the dependent variable is a dummy variable (Dummy variable, Y = 1; Y = 0), the appropriate model is the Binary Logistic regression model. In this study, the dependent variable is a dummy variable, the Binary Logistic regression model is applied in this study.

Thus, the appropriate model is the Binary Logistic regression:

$$Ln\left[\frac{P(Y=1)}{P(Y=0)}\right] = B_0 + B_1X_1 + B_2X_2 + B_3X_3 + ... + B_{11}X_{11}$$
(1)

Of which:

 $P(Y=1) = P_0$ : The probability of households selects new technology application.

 $P(Y=0) = 1 - P_0$ : The probability of households did not select new technology application.

X*i*: Independent variables (*i*: from 1 to 11); Ln: Log of base e (e = 2,714). Odds coefficient (O<sub>0</sub>):

$$O_0 = \frac{P_0}{1 - P_0} = \frac{P(Decision \text{ to participate})}{P(Decide \text{ not to participate})} (O_0: \text{ Odds Coefficient})$$

Substitute  $O_0$  into the Equation (1):

$$LnO_0 = B_0 + B_1 X_1 + \ldots + B_{11} X_{11}$$
(2)

The Odds log is a linear function with the independent variables Xi (Cox, 1958).

Equation (2) has the form of a Logit function, estimating the regression coefficients by the Maximum Likelihood (ML) method.

#### 4.2 Data Collection and Processing

We conducted a survey of 450 observations in sixdistricts of three provinces in the Mekong Delta in Vietnam to represent agro-ecological regions, including: An Giang, Can Tho, Soc Trang Provinces. Soc Trang with alluvial freshwater ecosystem, mangrove ecosystem and sand dune ecosystem in estuary and coastal areas; Can Tho with an alluvial freshwater ecosystem, the cradle of the Mekong Delta. An Giang with alluvial freshwater ecosystems and flooded forests is typical for the western region of Hau river. In each area, 50% of the observations were individual producers and 50% of the observations were rice farming households in the cooperatives.

All respondents were identified as heads of households, with convenient stratified sampling, conducted from March 2018 to March 2019. After data processing, 420 observations were made ensure suitability and use for data analysis. All data processing was carried out based on SPSS version 21.0 software. Data were collected through direct interviews with detailed questionnaires to test the research model and hypotheses.

#### 5. Result

#### 5.1 Describe the Characteristics of the Survey Object

Gender and decision on new technology application: In 420 surveyed households, the male head of the household accounts for the majority (83%). The household head decided to join the cooperative at 62%.



Figure 2 Gender of Household Head (%)



Figure 3 Participation in Cooperatives (%)

Table 2The Mean Value of the Measures

	Mean	Std. Deviation
Years of schooling (1-12)	8	3.249
Age of household head (Years)	41	11.033
Number of contact times with extension in a crop	2	1.181
Distance to the nearest central market (Km)	5	2.064
Scale of rice land (1000 m <sup>2</sup> )	3	1.088

Table 2 shows that the average age of the household head is 41; Education level: 8th grade; Scale of agricultural land: 3000 m<sup>2</sup>; Number of contact times with agricultural extension officers: 2 times per production crop; Distance from the house to the nearest central market: 5 Km.

Borrow money from formal credit institutions: 66.4% of households borrow from formal credit institutions.



Figure 4 Status of Loans to Credit Institutions (%)

Participation in farmer associations, unions, farmer's clubs, agricultural extension: 71.4% of households participate.



Figure 5 Status of Joining Associations (%)

### **5.2 Regression Results**

Table 3   Variables in the Equation								
	В	S.E.	Wald	Sig.	Exp(B)	95% C.I.	for EXP(B)	
						Lower	Upper	
X1	2.514	1.072	5.497	0.019	12.354	1.510	101.046	

Factors Influencing	Rice Farmers'	Production De	cisions to Join	<b>Cooperatives:</b>	A Case Study i	in the Mekong	Delta, Vietnam
X2	-0.062	0.031	4.195	0.041	0.939	0.885	0.997
X3	0.829	0.193	18.473	0.000	2.291	1.570	3.344
X4	1.299	0.427	9.266	0.002	3.666	1.588	8.463
X5	2.540	0.835	9.261	0.002	12.675	2.469	65.058
X6	1.732	1.101	2.475	0.116	5.653	0.653	48.914
X7	1.722	0.447	14.826	0.000	5.593	2.328	13.434
X8	1.992	0.911	4.778	0.029	7.333	1.229	43.766
X9	0.115	0.761	0.023	0.880	1.122	0.252	4.985
X10	-0.547	0.222	6.103	0.013	0.578	0.375	0.893
X11	2.193	0.887	6.108	0.013	8.960	1.574	50.993
Constant	-14.892	3.351	19.745	0.000	0.000		
R <sup>2</sup> Nagelkerke	0.941						
Omnibus Tests	0.000						

Wald's test shows that there is a variable X6 and X9 with Sig. > 0.05; The remaining variables all have Sig.  $\leq$  0.05. The sign of the regression coefficients is consistent with the hypothesis. R<sup>2</sup> Nagelkerke = 0.941, so 94.1% of the change in the dependent variable is explained by the independent variables of the model. Omnibus testing with Sig.  $\leq$  0.05, overall, the independent variables are linearly correlated with the dependent variable. Thus, the independent variables that have a statistically significant impact on the Y variable "Decision to participate cooperatives" include: X1, X2, X3, X4, X5, X7, X8, X10, and X11.

 Table 4
 Level of Impact of Factors Affecting the Decision to Participate

				Initial probability $P_0 = 10\%$	
	В	e <sup>B</sup>	Pi (%)	Probability Change (Absolute Value)	Position
X1	2.867	17.588	51.21	41.21	1
X2	-0.057	0.945	9.57	0.43	9
X3	0.809	2.246	18.62	8.62	7
X4	1.314	3.722	28.45	18.45	5
X5	2.888	17.949	38.78	28.78	4
X7	1.723	5.599	47.34	37.34	3
X8	2.747	15.597	19.78	9.78	6
X10	-0.604	0.547	49.75	39.75	2
X11	2.693	14.771	6.63	3.37	8

Note: How to calculate Pi in Appendix.

In Table 4, the order of impact on "Decision to participate cooperatives" is strongest to lowest: X1 (Gender of household head); X10 (Distance from Cooperative to the nearest market); X7 (Number of contact times with extension in a crop); X5 (Access to credit); X4 (Rice land area); X8 (Perception of the benefits from cooperatives); X3 (Education level); X11 (Government assistance policy); and X2 (Age of household head).

Table 5   Hypothetical Results							
Hypothesis	Impact			Estimate	S.E.	Sig.	Decision
H1	Y	<	X1	2.514	1.072	0.019	Fit
H2	Y	<	X2	-0.062	0.031	0.041	Fit
Н3	Y	<	X3	0.829	0.193	0.000	Fit
H4	Y	<	X4	1.299	0.427	0.002	Fit
H5	Y	<	X5	2.540	0.835	0.002	Fit
H6	Y	<	X6	1.732	1.101	0.116	Rejected

_	Factors Innuench	ig Rice Farmer	s rrouuction	Decisions to Jo	in Cooperatives:	A Case Study	in the wiekong	Delta, vietnam
	H7	Y	<	X7	1.722	0.447	0.000	Fit
	H8	Y	<	X8	1.992	0.911	0.029	Fit
	Н9	Y	<	X9	0.115	0.761	0.880	Rejected
	H10	Y	<	X10	-0.547	0.222	0.013	Fit
	H11	Y	<	X11	2.193	0.887	0.013	Fit

The results presented in Table 5 show that: except for H6 and H9, remains hypotheses are accepted at a confidence level of over 95%.

# 5.3 Predicted Scenario for a Change of Joining Cooperatives

After removing X6 and X9, the model's regression equation:

Y = -14.721 + 2.867X1 - 0.057X2 + 0.809X3 + 1.314X4 + 2.888X5 + 1.723X7 + 2.747X8 - 0.604X10 + 2.693X11 + 2.(3)

	Table 6         Statistical Value of Variables and Scenarios					
	Minimum	Maximum	Scenario 1	Scenario 2		
X1	0	1	0	1		
X2	20	63	63	20		
X3	1	12	1	12		
X4	2	5	2	5		
X5	0	1	0	1		
X7	0	4	0	4		
X8	0	1	0	1		
X10	1	13	13	1		
X11	0	1	0	1		

# Table 6 Statistical Value of Variables and Sconari

Scenario 1 (SCE1): Xi are independent variables with the lowest values according to the theoretical model expectations.

Scenario 2 (SCE2): Xi are independent variables with the highest values according to theoretical model expectations.

Table 7 Forecast With Scenario of Impacting Factors

		1 0		
			Values of var	iables
No	Variables	Regression coefficient (B)	SCE 1	SCE 2
1	X1	2.867	0	1
2	X2	-0.057	63	20
3	X3	0.809	1	12
4	X4	1.314	2	5
5	X5	2.888	0	1
6	X7	1.723	0	4
7	X8	2.747	0	1
8	X10	-0.604	13	1
9	X11	2.693	0	1
10	Constant	-14.721		
	LogOdds		-22.727	14.343
	e <sup>logOdds</sup>		0.000000	1694672

1+e <sup>logOdds</sup>	1	1694673
*E(Y/X1): Probability that $Y = 1$ occurs is when the independent variable X has	a	
specific value Xi (%).	0	100
See Appendix: *How to calculate E(Y/Xi).		

Substitute the **SCE1**values into Equation (3), resulting in Log Odds. If the household has the following conditions, this household has a probability of "Decide to participate cooperative" of 0%.

X1 = 0 (Household head is female); X2 = 63 (Age of household head); X3 = 1 (Education level); X4 = 2 (Scaleof rice land); X5 = 0 (Access to credit); X7 = 0 (Number of contact with Extension staff officer); X8 = 0 (Perception of the benefits from cooperatives); X10 = 13 (Distance from the cooperative to the nearest central market); and X11 = 0 (Government assistance policy).

Substitute the SCE2 values into equation (3), resulting in LogOdds. If the household has the following conditions, this household has a probability of "Decide to participate cooperative" of 100%.

X1 = 1 (Household head is male); X2 = 20 (Age of household head); X3 = 12 (Education level); X4 = 5 (Scaleof rice land); X5 = 1 (Access to credit); X7 = 4 (Number of contact with Extension staff officer); X8 = 1 (Perception of the benefits from cooperatives); X10 = 1 (Distance from the cooperative to the nearest central market); and X11 = 1 (Government assistance policy).

#### 6. Discussion and Implication

Firstly, the study has identified six groups of factors affecting the decision to participate cooperative: Human capital, Physical capital, Social capital, Useful perception, Market accessibility, and Government assistance policy.

The group of factors "Human capital" includes: Gender, Age, Education level. This result is similar to the results of a study on agricultural cooperative in Nigeria by Awotide et al. (2015).

The group of factors "Physical capital" includes: Scale of rice land and Access to credit. This result is similar to the results of Zheng et al. (2012) on cooperatives in China and Geremew & Gobena (2019) on agricultural cooperatives in Ethiopia.

The group of factors "Social capital" includes: Participation in farmer associations, farmer unions, agricultural extension clubs and level of contact times with agricultural extension officers. This result is similar to the results of studies on rural areas in Tanzania (Berresaw et al., 2013).

The group of factors "Useful perception" and "Market accessibility" includes: Perception of the benefits from cooperatives" and "Distance from the cooperative to the nearest central market". This result is similar to the results of studies on agricultural cooperatives in Ethiopia (Gashaw & Kibret, 2018) and Luu Tien Dung (2019) on agricultural cooperatives in Vietnam.

The group of factors "Government assistance policy" is similar to the results of studies on agricultural cooperatives in South Africa (Msimango & Oladele, 2017).

Second, the study has determined the level of impact of each factor from strong to weak: Gender of household head; Distance from Cooperative to the nearest market; Number of contact times with extension in a crop; Access to credit; Scale of rice land; Perception of the benefits from cooperatives; Education level; Government assistance policy; and Age of household head.

This result implies that in order to improve the ability of farmer households to join cooperatives, they need to pay attention to: (i) Investment in human capital in rural areas; (ii) Encourage farmers to participate in farmer

associations, unions, extension clubs and improve the quality of agricultural extension services in rural areas; (iii) Continue to invest in roads and a system of trade and service centers in rural areas; and (iv) continue to improve policies to support cooperative development, especially to encourage the application of new technologies to rice production.

### 7. Conclusions and Research Limitations

The present study aims to expand the theoretical framework and provide evidence in empirical results on the behavior of rice farmers participating rice producing cooperatives with evidence from the Mekong Delta in Vietnam. The findings highlight the strong role of factors influencing decision to participate cooperatives through Binary Logistic regression analysis model.

The study has certain limitations. The survey subjects were only taken from tree provinces in the Mekong Delta in Vietnam which limits the generalizability of the study. Future research should examine different provinces and regions in Vietnam and make comparisons to improve the generalizability of the findings. Moreover, this study only considers 11 factors affecting to decide participating cooperatives, there are other factors that influence that this study has not mentioned.

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#### Appendix

Calculate *P<sub>i</sub>*:

Assuming the initial probability of a household decides to participate cooperative is ( $P_0$ ), the probability that this household will be P*i* due to the effect of the variable X*i*. According to Agresti (2007), P*i* is defined as follows:

 $e^{\mathrm{Bi}}$ : Impact coefficient of X*i* 

Predicted scenario for a change of poor households:

According to Agresti (2007), the predictive form of the model:

$$P_i = \frac{P_0 \times e^{B_i}}{1 - P_0 (1 - e^{B_i})}$$

$$E(Y / Xi) = \frac{e^{LnOdds}}{1 + e^{LnOdds}}$$

E (Y/X*i*): The probability that Y = 1 occurs when the independent variable X has a specific value X*i*.

 $LnOdds = B_0 + B_1X_1 + B_2X_2 + B_3X_3 + ... + B_{11}X_{11}$ 

 $E(Y \mid Xi) = \frac{e^{B0+B1X1+B2X2+B3X3+..+B11X11}}{1+e^{B0+B1X1+B2X2+B3X3+..+B11X11}}$