Global Journal of Arts Humanity and Social Sciences
ISSN: 2583-2034

GSAR PUBLISHERS
GLOBAL SCIENTIFIC AND ACADEMIC RESEARCH

OPEN ACCESS

Global Journal of Arts Humanity and Social Sciences
ISSN: 2583-2034
Abbreviated key title: Glob.J.Arts.Humanit.Soc.Sci
Frequency: Monthly
Published By GSAR Publishers
Journal Homepage Link: https://gsarpublishers.com/journal-gjahss-home/

Volume - 4 | Issue - 1 | Jan 2024 | Total pages 41-50 | DOI: 10.5281/zenodo.10507181

The determinants of adoption of good agricultural practices by small farmer agricultural cooperatives in Vietnam's Mekong delta

BY

Hoang Vu Quang

Institute of Policy and Strategy for Agriculture and Rural Development, Vietnam

Article History
Received: 05- 01- 2024
Accepted: 11- 01- 2024
Published: 13- 01- 2024
Corresponding author
Hoang Vu Quang

Abstract

Promotion of the application of Good Agricultural Practices (GAP) by agricultural cooperatives is an important solution to improve sustainable agricultural production of small farmer household in the Mekong Delta of Vietnam. In collective application of GAP, cooperatives can help their farmer members to overcome disadvantages if every small farmer applies GAP individually. This study has as objective to quantify the factors impacting probability of GAP application of agricultural cooperatives in the Mekong Delta. Based on survey data from 57 cooperatives in rice, fruit, and aquaculture sectors in 7 provinces of Mekong Delta region, the study result finds the factors that have statistically significant and highly positive impact as educational level of cooperative's leader, existence of agricultural technicians in cooperative, cooperative's participation in marketing of agricultural products, and external technical support.

Keywords: Agricultural cooperative, good agricultural practices, Logit model, farmer.

1. INTRODUCTION

Mekong Delta region plays an important role in agri-food production and exports of Vietnam, contributing 90%, 65%, and 70% of the country's rice, fruit, and aquaculture exports, respectively. However, region's agriculture is facing big challenges comprising of strong international trade competition, small farmer-based production system, and severely negative impact of climate change. Despite these challenges, Vietnam has now exported its agri-food products to more 180 countries, even to high-end markets with strict food safety standards and traceability such as EU, USA, and Japan. Mekong Delta is also severely impacted by climate change and rising sea water level (Khoi and Chi, 2017). Mekong Delta has nearly 2.38 million of small farmer households, in which 46.5% of farmers with agricultural land less than 0.5 ha and 40.4% have from 0.5 to under 2.0 ha (GSO, 2018). This makes it difficult to apply the technology and to develop value chain link. The Government of Vietnam has implemented various policies to support farmers to overcome these challenges (Prime Minister, 2020). Among those, Good Agricultural Practices (GAP) is an important measure and encouraged for application by agricultural cooperatives (Prime Minister, 2012; MARD, 2018).

The application of GAP brings several benefits to farmers, including improving farmer's knowledge and skills (Xuan and Ngoan, 2014), increasing productivity and technical efficiency (Dinh, 2020), reducing used chemical fertilizer (Bairagi *et al.*, 2018), increasing profit (Xuan and Ngoan, 2014; Bairagi *et al.*, 2018; Quang *et al.*, 2020; John, 2013), protecting environment and coping with climate change (Quang *et al.*, 2020). Thanks to traceability system and third-party certification, application of GAP ensures transparency, accountability, and social trust in product quality management. Therefore, GAP-certified products are perceived by consumers as safe, hygiene, and good health (Xuan and Ngoan, 2014; Thai and Pensupar, 2015) and they are willing to pay higher price for GAP products (Thai and Pensupar, 2015). Ass result, GAP can promote export of agricultural products (Fiankor *et al.*, 2017), facilitate access to high-price markets as supermarket, clean product stores and farmers applying GAP are more sustainable than farmers with conventional practices (Stuart *et al.*, 2018).

Although bringing benefits to producers, consumers, and community, individual small farmers are struggling with the application of GAP standards (Wiggins *et al.*, 2010; Kariuki et al., 2012). Individual farmer need more resource investment (Thang, 2028; Trang, 2020; Quang *et al.*, 2020) while it is not easy for them to access to commercial credit (Gaiha and Thapa, 2008; Quang, 2016; Annor *et al.*, 2016), to participate in value chain and have contract farming with trading companies (ILO, 2012). The cost of GAP application for small farmers is higher, resulting in higher production cost and limit their opportunity to have contract farming with enterprises. It may lead to the possibility of being excluded from the market (Amekawa, 2009).

Agricultural cooperatives prove to be a good model to help small farmers to overcome the challenges in GAP application. Some studies (Abebaw and Haile, 2013; Zhang *et al.*, 2020; Ma and Abdulai, 2019; Cafer and Rikoon, 2018; Chagwiza *et al.*, 2016; Manda *et al.*, 2020) indicated that cooperatives can play an important role in accelerating small farmers in adoption of agricultural technologies, improving access to credit, overcoming financial barriers, and lessening the risks of investment. The membership status of farmer household in agricultural cooperative can significantly influence the probability of VietGAP adoption (Loan *et al.*, 2016) because the cooperative can facilitate joint investments and consequently reduce the cost of investing in GAP assets such as grading shed, protective gear, shower rooms, disposal pits, incinerators, hessian coolers, packaging crates, soil testing kits and establishing food traceability systems (Gichuki *et al.*, 2020).

Some studies examined the factors impacting the adoption of GAP standards of individual farmers (Loan *et al.*, 2016; Trang, 2020; Dinh, 2020; Thang, 2028; Quang *et al.*, 2020). However, study on factors influencing GAP application by agricultural cooperatives is not received many attentions. Jin and Zhou (2011) used logit model to identify the factors impacting the adoption of food safety and quality standards of China's agricultural cooperatives. The authors only find the significant impact of cooperative size, perception and attitude toward standards, reputation, expected cost and benefit, and the destination market on cooperatives decision to adopt standards.

This paper explores the factors influencing GAP adoption by agricultural cooperatives in Vietnam's Mekong Delta. Specifically, the study emphasizes on cooperative's internal factors such as cooperative size, membership, manager capacity, value chain participation. The study enriches cooperative literature by providing the evidence of the importance of internal factors as management capacity and involvement in marketing activities in driving GAP application of small farmer-based cooperatives.

2. RESEARCH METHOD

2.1. Model

A cooperative has two alternatives, either to apply or ignore any GAP standards. For each alternative, the cooperative receives a utility level. To simplify, it is assumed that cooperative's utility receiving in case of convention production (non-applied GAP) is zero and a cooperative adopts GAP standards only when it's utility in case of GAP application (U_{GAP}) is superior than utility of GAP non-application or higher than zero

$$Y = \begin{cases} 1 \ (applied\ GAP) & if\ U_{GAP} > 0 \\ 0 \ (non\ applied\ GAP) & if\ U_{GAP} \le 0 \end{cases} \quad (1)$$

It's assumed that cooperative's utility resulting from GAP application is a function of several variables that reflect the attributes of cooperative and external factors

$$U_{GAP} = \beta X + \varepsilon \quad (2)$$

where X, β, and ε are respectively variable vector, parameter vector, and stochastic term. As several previous studies used Logistic model to identify the factors impacting the adoption of GAP (Sitorus *et al.*, 2020; Laosutsan *et al.*, 2019; Jin and Zhou, 2011), it is also applied in this study. Consequently, it is assumed that stochastic term follows an i.i.d logistic distribution with mean 0, and the conditional probability of GAP application (Y=1) or GAP non-application (Y=0) can be expressed as

$$P(Y=1|X) = \frac{1}{1+e^{-\beta X}} = \Lambda(\beta X) \quad (3)$$

$$P(Y=0|X) = 1-\Lambda(\beta X) \quad (4)$$

The likelihood function of logistic distribution can be written as

$$L = \prod_{i}^{n} \left[\Lambda(\beta X)\right]^{y_i} \left[1-\Lambda(\beta X)\right]^{1-y_i} \quad (5)$$

The parameter vector β in (5) can be estimated through maximizing log-likelihood function (Greene, 2011) and the marginal effect of a variable X_i on the probability of GAP application is measured by (6)

$$\frac{\partial P_i}{\partial X_{ij}} = \beta_j P_i (1-P_i) \quad (6)$$

2.1. Data source

Mekong Delta region in South of Vietnam has 13 provinces, and its main agricultural production is characterized by rice, fruit, and aquaculture. Region's cooperatives in crop and aquacultural sectors account for 63.8% of total agricultural cooperatives. So, the cooperatives of these sectors are selected for the study. The data used in the paper is collected from 57 agricultural cooperatives in 7 provinces of Mekong Delta (Figure 1). Selected provinces are representative for main agricultural production systems of selected products. 57 studied cooperatives represent 4.3% of crop and aquaculture cooperatives. The cooperatives were randomly selected from the list of cooperatives provided by the Provincial Department of Agriculture and Rural development. Out of 57 surveyed cooperatives, it has respectively 28, 19, and 10 cooperatives in rice, fruit, and aquaculture sectors.

Data is collected by direct interview of cooperative managers and by consulting annual financial report of the cooperatives. The

interview is conducted in months from June to July of 2020 and the data collected is for the year 2019.

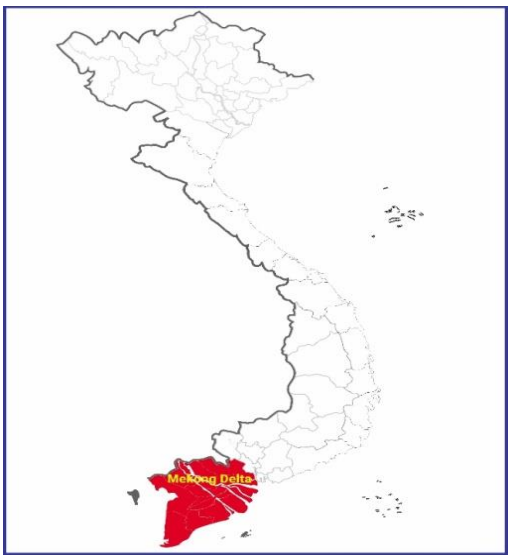

Figure 1: Mekong delta of Vietnam.

2.3. Variables

The study focuses only on cooperatives of three sectors as rice, fruit, and aquaculture and GAP standards applying in these sectors, including VietGAP (Vietnamese Good Agricultural Practices), GlobalGAP, Organic, SRP (Sustainable Rice Platform), ASC (Aquaculture Stewardship Council), MSC (Marine Stewardship Council), and BAP (Best Aquaculture Practices) (Quang, 2021a).

The adoption of GAP can be influenced by many factors. At farmer level, these factors can be farm size (land area), income/net profit received from GAP application, farmer's perception on market need, public support, educational level of farmers, sold price of GAP certificated product, contract farming (Loan *et al.*, 2016; Thang, 2028; Dinh, 2020; Trang, 2019; Pham *et al.*, 2021; Quang *et al.*, 2020; Hoang, 2020; Hobbs, 2003; Laosutsan *et al.*, 2019). For the cooperatives, Jin and Zhou, (2011) examines the impact on the adoption of food safety and quality standards of China's agricultural cooperatives by following variable: cooperative size, perception and attitude toward standards, reputation, expected cost and benefit, and the destination market, availability of support, price premium, customer attraction.

This study hypothesizes that cooperative's decision on GAP application is affected by following variables:

(1) Member size (MEMB). When a cooperative has large membership, it may face two opposite effects. On the one side, large members can increase farmland area of cooperative's members that adopt GAP. Thanks to that, per ha unit cost for application, assessment, and issue of GAP certificate is reduced. On the other side, large members can lead to high diversity of preference, and it may be difficult in getting consensus in application of GAP. It is expected that the number of members prevail in adoption of GAP standard.

(2) Cooperative with enterprise as member (COMP). Cooperatives in Vietnam are permitted to have enterprises as members, with the same rights and obligations as farmer members, under the current Law on Cooperatives. This arrangement can provide advantages to cooperatives as well as enterprise. Cooperatives with enterprise members can be more favorable in their operations. Enterprise members may also send qualified staff to participate in cooperative management, contribute more chartered capital (up to the authorized capital contributed by one member), and provide quality agricultural inputs to cooperative members (Quang *et al.*, 2020). So, presence of company members can increase cooperative's probability in GAP application. Enterprise member can also benefit from cooperative as they can obtain advantages in the form of reduced transaction costs, maximization of output, and the ability to tap into high-value markets (Ghauri *et al.*, 2021; Mazzarol *et al.*, 2013). In this study, the cooperatives with enterprises members have only one to four enterprises while average number of memberships of these cooperatives is 131.

(3) Presence of agricultural technicians in cooperative (TECH). Agricultural production with GAP standards is more complicated than conventional production process (Quang *et al*., 2020), and consequently, cooperatives need supervise and give technical support their members in GAP application to ensure that GAP production process is well strictly followed. The cooperatives with agricultural technicians can be more favorable for GAP application.

(4) Educational level of cooperative Chairperson (EDUC). Cooperative's performance is largely influenced by competence and behavior of their managers, particularly those of cooperative leader (Garnevska *et al.*, 2011; Bratton, 1986). As majority of cooperatives Chairperson in our sample holds the role cooperative's director altogether, the variable of educational level of Chairperson is used as an indicator to reflect competence of cooperative's leader.

(5) Age of cooperative chairperson (AGE). This variable capture experience of cooperative's leader. It is expected that senior age of leader, the lower probability of GAP application as people with seniority can hesitate in innovation and application of new technology.

(6) Farmland area of cooperative members for selected production (LAND). It is assumed that the larger the area of agricultural land, the higher the probability that the cooperative applies GAP.

(7) Asset value of cooperative (ASSET). Some studies found that farmer's income impacts GAP adoption because agricultural production with GAP standard requires more investment (for example, investment for improving internal road, irrigation system, toilet, etc.) and costs for assessment and issue of GAP certificate (Huy and Quang, 2019; Quang, 2017). It is assumed that a

cooperative with high asset value will be more favorable for GAP application.

(8) Cooperative has activity on marketing and distribution of agricultural products (COMM). Many supermarkets in Vietnam require that fruit and vegetable must be certificated as safety product (GAP) to be put on the shelves. It is expected that a cooperative participating into marketing of agricultural products is more interested in GAP application to facilitate sell agricultural product of their members in niche markets with higher prices as supermarkets, stores.

(9) Cooperative has contract farming with enterprise (LINK). The cooperative signs the contract with the enterprise to market agricultural products of their members. When cooperatives have contracts farming, they can receive supports from enterprise as later can invest in advance for cooperative members the agricultural inputs with quality, provide training and guidance on production technique, and buy agricultural products with higher price (Quang, 2021b). GAP application is facilitated by contract farming because, without contract farming, the enterprises are so difficult to find GAP-certificated products on the spot market (Quang *et al.*, 2020).

(10) Cooperative received training on marketing (TRAIN). It is assumed that marketing training for cooperative's managers increases the possibility that cooperative participates in agri-product supply chain. GAP-certified products are more favorable in access to markets with higher price, so marketing training can increase probability of GAP application.

(11) Received technical support by cooperative (SUPT). Some studies found significantly positive impact of external support on GAP adoption of farmers (Schreinemachers *et al.*, 2012; Pham *et al.*, 2021; Dinh *et al.*, 2019; Dinh, 2019). Jin and Zhou (2011) have also tried to quantify impact of external support on adoption of food safety and quality standards by China's cooperatives. External supports can reduce the cost of GAP application, therefore external technical supports are understood to have a positive impact on GAP application by agricultural cooperatives.

(12) Specificity of production sectors. 3 sectors of rice, fruit, aquaculture would have different GAP standards and the cost for application of these GAP (including cost for evaluation and certificate issue) could be largely different. The different production characteristics can influence the business of cooperatives in these sectors. This can imply the difference in business of cooperatives in the sectors. Consequently, these factors influence cooperative's GAP adoption.

(13) Characteristics of provinces. Most of GAP-certified products are consumed in big cities like Ho Chi Minh or exported by commercial enterprises usually located in Ho Chi Minh city. The different distance from Mekong delta's provinces to Ho Chi Minh City may influence the cost of transportation and preservation of agricultural products from production to consumption. Therefore, dummy variables for the provinces in the study were used as proxies to reflect the difference among provinces.

The considered factors reflect cooperative size (number of memberships, farmland area), capacity of cooperative managers (educational level, age, training), organizational structure (cooperative with enterprise as member, existing technician), production resources (asset value), and external supports (technical supports). The value of variables in the model is presented in Table 1.

Table 1: Descriptive statistics of variables.

Variable	Definition	Mean
Y	= 1 if cooperative applies GAP standard = 0 otherwise	0.58
MEMB	Average number of members of one cooperative	131
COMP	=1 if cooperative has enterprises as it's member; 0 otherwise	0.14
TECH	= 1 if cooperative has agricultural technician; 0 otherwise	0.33
EDUC	= 1 if cooperative leader has educational level of university or above; 0 otherwise	0.53
AGE	Age of Cooperative Leader	55
LAND	Land area of cooperative members for selected products (ha)	159.3
ASSET	Asset value of cooperative (billion VND)	1.688
COMM	= 1 if cooperative organizes activity of distributing product for its members; 0 otherwise.	0.37
LINK	= 1 if cooperative has contract farming with enterprises for production and marketing of its member's products; 0 otherwise.	0.75
TRAIN	= 1 if cooperative is trained on marketing; 0 otherwise.	0.88
SUPT	=1 if cooperative received technical supports; 0 otherwise.	0.53

Variable	Definition	Mean
RICE	=1 if cooperative in rice sector (base category)	0.49
FRUIT	=1 if cooperative in fruit sector; 0 otherwise	0.33
AQUA	=1 if cooperative in aquaculture sector; 0 otherwise	0.18
KGIA	=1 if cooperative in Kien Giang province (base category)	0.16
CMAU	=1 if cooperative in Ca Mau province; 0 otherwise	0.09
BTRE	=1 if cooperative in Ben Tre province; 0 otherwise	0.16
BLIEU	=1 if cooperative in Bac Lieu province; 0 otherwise	0.14
DTHAP	=1 if cooperative in Dong Thap province; 0 otherwise	0.14
VLONG	=1 if cooperative in Vinh Long province; 0 otherwise	0.16
LGAN	=1 if cooperative in Long An province; 0 otherwise	0.16

3. RESULT

To detect presence of multicollinearity among explanatory variables, two tests are used as tolerance and variance inflation factor (VIF). A value of tolerance close to 1 indicate that there is little multicollinearity while a value close to zero suggests that multicollinearity can be a threat. There is no format cutoff value to use with tolerance for determining presence of multicollinearity (Midi *et al.*, 2010). It is suggested that tolerance value of 0.1 or less is considered the presence of multicollinearity (Myers, 1990; Menard, 2002; Senaviratna and Cooray, 2019). In our Logit model, tolerance value of explanatory variables ranges from 0.24 to 0.71 and consequently, it can be considered non-presence of multicollinearity in retained model. For VIF test, the VIF value ranges from 1 (noncorrelated coefficients) to infinity (perfect correlation). Like tolerance, there is no format cutoff value of VIF to use for determining presence of multicollinearity. It is suggested that a VIF value exceeding 10 are often regarded as indicating presence of multicollinearity (Marquaridt, 1970; Midi *et al.*, 2010). In our model, VIF value take from 1.4 to 4.1 and much less than 10. That indicates multicollinearity is not a serious problem in retained Logit model.

The result of estimates and marginal effect of variables is presented in Table 2. In general, the model is relatively well as McFadden Pseudo R^2 value of 0.62 and 87.7% of decision of GAP application is correctly predicted.

Table 2: Estimate and marginal effect of variables impacting application of GAP standards by agricultural cooperatives.

Variable	Coef.	Std. Err.	Marginal effect
MEMB	-0.003	0.009	-0.0003
COMP	5.817	3.857	0.3158
TECH	5.536	2.956*	0.3453
EDUC	5.886	2.965**	0.3335
AGE	-0.08	0.130	-0.0067
LAND	0.001	0.007	0.0001
ASSET	-0.3587	0.210*	-0.0298
COMM	7.555	3.496**	0.4527
LINK	1.018	1.650	0.0852
TRAIN	2.351	3.467	0.1756
SUPT	3.248	1.721*	0.2787
Sectors			
RICE (base sector)			
FRUI	10.566	4.858**	0.5463
AQUA	2.414	2.679	0.1615
Provinces			
KGIA (base province)			
CMAU	-3.835	3.840	-0.1946
BTRE	-16.398	7.008**	-0.5821
BLIEU	-5.132	3.062*	-0.2611
DTHAP	2.112	3.324	0.1183
VLONG	-9.205	4.364**	-0.3912
LGAN	-2.407	3.767	-0.1212
Constant	-4.724	7.246	
Observations: 57			
Pseudo R2: 0.62			
Log-likelihood: -14.66			
Correct Predictions: 87.7%			

** p<0.1, ** p<0.05, *** p<0.01*

Educational level of cooperative's leader (EDUC) has significantly positive impact on GAP application of agricultural cooperatives.

The impact of educational level is relatively large as marginal effect of this variable is 0.33. It means that cooperatives whose leader with educational level of university or above increase their probability of GAP application by 33.3% if ceteris paribus.

The existence of agricultural technical staff (TECH) in the cooperative has positive impact on the probability of GAP standard application at significant level of 10%. Impact of this factor is also relatively high. The cooperatives with technicians have higher probability of 34.5%, ceteris paribus, than cooperatives without technicians.

The results indicate that the asset value of a cooperative (ASSET) has a significant but negative effect on the probability of applying GAP. Descriptive analysis shows that cooperatives applying GAP standards have an asset value of VND 1,513 million, while those not applying have an asset value of VND 1,928 million. The estimated result can be explained by: (i) the investment cost for applying GAP is not a significant challenge for cooperatives since the average investment for applying GAP is VND 9.7 million, which is equivalent to only 11.6% of the total cost for applying GAP and 0.64% of the asset value of the cooperative. Furthermore, 88.4% of the remaining investment cost for GAP application is covered by external sources such as public support, development projects, and private stakeholders with contract farming with cooperatives. These external supports include technical training, infrastructure and equipment, and fees for assessment and issuance of GAP certificates. A study by Quang et al. (2020) also found that the majority of rice and fruit production cooperatives in the Mekong Delta received external support for their application of GlobalGAP, organic, VietGAP, etc.; (ii) when cooperatives have higher assets, they may be more interested in higher-profit activities for cooperatives, such as post-harvest (handling, processing) or non-farming activities. Although the cooperative's assets may reduce their probability of applying GAP, the impact is minor. For instance, if a cooperative's assets increase by VND 1 billion (equivalent to a 60% increase in the asset value of the cooperative), the probability of applying GAP reduces by only 3%.
The participation in marketing and distribution of agri-food (COMM) have significantly positive impact on probability of GAP application of cooperative and the effect of this variable is rather high. In average, the cooperative involved in distribution has higher probability of GAP application than cooperatives without distribution activity by 47.3%, ceteris paribus. The result is right in Vietnam's context of agricultural cooperative development and rapid evolution of supermarkets (Reardon et al., 2012) to which the cooperatives can market their products. Presently, agricultural cooperatives in Vietnam are mainly providing agricultural inputs and services. 91.2% of agricultural cooperatives in this study provides inputs and services as seed, seedling, fertilizer, pesticide, irrigation, tillage, pesticide spray, etc. However, agricultural cooperatives must increasingly compete with input manufacturing companies, distribution agents, and individuals in providing agricultural inputs and services to farmers. That pushes agricultural cooperatives to develop post-harvest activities such as preliminary processing and marketing to increase added value of agricultural products for members and attract the farmers to join cooperatives. Therefore, the participation of agricultural cooperatives in Vietnam in post-harvest activities has been increasing in recent years. As many supermarkets require that agricultural products must have GAP certificate to be distributed in their system. Cooperatives involving in marketing of agricultural products are more inclined to apply GAP standards to be more opportune to put their products on supermarket shelves. In this study sample, there is in 2016 only 17.5% of cooperatives involved in marketing activities of agricultural products, but this rate is 36.8% in 2019. In the group of cooperatives applying GAP, 54.6% of cooperatives have marketing activities compared to 27.3% of cooperatives that do not apply GAP. The main marketing form of cooperatives is that cooperatives source and provide their products to supermarkets and convenience stores for them to retail. In cases where the cooperative also has retail operation, it generally limits its sales to the local area where it operates in using its headquarters as a sales outlet. This approach minimizes the investment in marketing logistics. Cooperatives having commercial activities can ensure stable market and selling price for GAP-certified products and then encourage their members to apply GAP as study of Nhan et al., (2016) find that the unstable market and selling price of GAP-certified products are the main reasons for farmers in the Mekong Delta to abandon the application of GlobalGAP in star-apple production, for instance.

Technical supports (SUPT) for cooperatives have positive impact at significant level of 10% on probability of GAP application. Accordingly, the cooperatives with external technical support have higher probability of GAP application of 27.9% than cooperatives without technical supports, ceteris paribus. Technical supports can include training on production techniques, instructing the use of appropriate fertilizers, pesticide, and technical measures on the field. As GAP technical process is more complicated than conventional production, external technical supports make cooperatives confident in GAP application.

Among 3 selected agricultural sectors (rice, fruit, aquaculture), the probability of applying GAP of fruit cooperatives is higher than those of rice and aquaculture cooperatives and there is not statistically different probability between in rice and aquaculture cooperatives. This result can come from the fact that the additional profit from GAP application in fruit production is much higher than those from GAP application in rice production as findings in some studies (Quang et al., 2020; Quang and Khang, 2017; Hien et al., 2020a; Hien et al., 2020b). Study of Quang et al., (2020) shows that in comparison with traditional production, application of GlobalGAP in rambutan production in Mekong Delta brings additional profit of VND 100 million/ha, in dragon fruit of VND 114.4 million/ha while rice production with organic standard brings only VND 9 million/crop (2 crops/year), with SRP standard of VND 4.9 million/ha/crop. Quang and Khang (2017) also find that rice production with GlobalGAP standard brings for farmers an additional profit of VND 4 million/crop. For aquaculture, Hien *et al.*, (2020a) found that the application of VietGAP in whiteleg shrimp farming in the Mekong Delta brings an additional increase

of profit about VND 35 million/ha in compared to non-VietGAP. Another study of Hien *et al.*, (2020b) in comparing the economic efficiency of pangasius farming in Mekong delta under 4 different standards as VietGAP, ASC, GlobalGAP, and conventional production found that there is not statistically significant difference of profit among 4 standards. In addition, the fruit cooperatives are more actively involved in post-harvest activities such as collecting, preliminary processing, and product marketing as shown in Table 3. As above-mentioned the cooperatives with marketing activities have more probability of GAP adoption.

Table 3. Percentage of cooperatives have business activities.

Activity	GAP coops	Non - GAP coops
Agricultural input provision	87.9	66.7
Trainings for member	69.7	45.8
Production service provision	30.3	54.2
Harvest and transportation services	45.5	41.7
Collecting product	51.5	25.0
Preliminary processing	42.4	16.7
Processing	12.1	0.0
Marketing	54.5	12.5

The result also justifies that location of provinces have impact on probability of GAP application of agricultural cooperatives as cooperatives in some provinces have lower probability of GAP adoption.

This study does not find statistically impact on cooperative's probability of GAP application of variables such as members size of cooperatives (MEMB), land area of cooperative (LAND), age of cooperative's leader (AGE), enterprise members (COMP), and contract farming (LINK). The size of the cooperative (number of members and land area) does not significantly affect the GAP application. This result can be explained by the fact that the large part of the cost of GAP adoption is supported by external sources. Then, unit cost per ha is not affected by land area and number of members. The average age of the cooperative leader is quite high (55 years old) and there is no difference between the two groups of cooperatives (GAP application and GAP non-application). This may be because most cooperative leaders are farmers, and the GAP application relies mainly on agricultural technician and/or external support. Above-analysis mentioned positive influence of agricultural technical staff (TECH) on the probability of GAP application. The insignificant influence of 2 variables COMP and LINK may be due to predominant role of cooperative's marketing activity. 54.5% of GAP application cooperatives have agrifood marketing activity in comparison to 12.5% in the non-GAP cooperatives as shown in Table 3.

4. CONCLUSION

It is shown that the application of GAP standards brings several benefits to agricultural producers, but small individual farmer households encounter several disadvantages in GAP application. Agricultural cooperatives are considered as an efficient model to help small farmers to overcome these disadvantages. Although encouraged, many agricultural cooperatives in Mekong Delta region do not apply GAP standard. Based on data surveyed from 57 cooperatives in rice, fruit, and aquaculture sectors in 7 provinces of Mekong delta, this study aims to identify the factors that influence the probability of GAP application by small farmer-based cooperatives in Mekong Delta. This study examines internal factors of cooperatives as member size, organizational structure, capacity of managers, available resources of cooperative, business activities as well as external factors as technical support, contract farming with enterprise, and training.

The result shown the factors that have statistically significative and highly positive impact on probability of GAP application by agricultural cooperatives in Vietnam's Mekong Delta are educational level of cooperative's leader, availability of agricultural technicians in cooperatives, cooperative's involvement in the marketing of agricultural products, and external technical supports for cooperatives. That implies that public support policies should focus on the improvement of these factors for agricultural cooperatives aiming to promote their probability of GAP application.

ACKNOWLEDGEMENTS

Data used in this paper come from a study funded by the Ministry of Agriculture and Rural Development of Vietnam that author presided and carriied out. The author is grateful for this financial support and thanks to colleagues from Institute of Policy and Strategy for Agriculture and Rural Development for their participation in collecting data.

REFERENCES

1. Abebaw, D. & Haile, M. G. (2013). The impact of cooperatives on agricultural technology adoption: Empirical evidence from Ethiopia. *Food Policy,* 38, 82-91. DOI:10.1016/j.foodpol.2012.10.003.
2. Annor, B. P., Mensah-Bonsu, A., & Jatoe, J. B. D. (2016). Compliance with GLOBALGAP standards among smallholder pineapple farmers in Akuapem-South, Ghana. *Journal of Agribusiness in Developing and Emerging Economies, Vol. 6, No. 01*, pp. 21-38. doi:10.1108/JADEE-05-2013-0017
3. Amekawa, Y. (2009). Reflections on the Growing Influence of Good Agricultural Practices in the Global South. *Journal of Agricultural and Environmental Ethics,* 22(6), 531-557. DOI: 10.1007/s10806-009-9171-8.
4. Bairagi, S., Mishra, A. K. & Giri, A. (2018). Good agricultural practices, farm performance, and input usage by smallholders: Empirical evidence from Nepal. *Agribusiness,* 35(3), 471-491. DOI:10.1002/agr.21577.
5. Bratton, M. (1986). Farmer organizations and food

production in Zimbabwe. *World Development,* 14(3), 367-384. DOI: 10.1016/0305-750x(86)90075-6.

6. Cafer, A. M. & Rikoon, J. S. (2018). Adoption of new technologies by smallholder farmers: the contributions of extension, research institutes, cooperatives, and access to cash for improving tef production in Ethiopia. *Agriculture and Human Values,* 35(3), 685-699. DOI: 10.1007/s10460-018-9865-5.
7. Chagwiza, C., Muradian, R. & Ruben, R. (2016). Cooperative membership and dairy performance among smallholders in Ethiopia. *Food Policy,* 59, 165-173. DOI:10.1016/j.foodpol.2016.01.008.
8. Dinh, P. T., (2020). The development of litchi in GAP standards in Bac Giang province. Ph.D. thesis in Vietnam National University of Agriculture.
9. Dinh, P. T., Hung, P. V. & Huong, N. V. (2019). Development of Lychee Production Following GAP Standards in Bac Giang Province. *Vietnam Journal of Agricultural Science*, 17(9), 754-763.
10. Fiankor, D.-D. D., Flachsbarth, I., Masood, A. & Brümmer, B. (2017). Does GlobalGAP certification promote agrifood exports? GlobalFood Discussion Papers, RTG 1666: "GlobalFood", Universität Göttingen, GlobalFood Discussion Papers No. 112. [online accessed 8/11/2021] http://hdl.handle.net/10419/171994.
11. Gaiha, R. & Thapa, G. (2008). Supermarkets, Smallholders and Livelihoods Prospects in Selected Asian Countries. *In:* Jha, R. (ed.) *The Indian Economy Sixty Years After Independence.* Palgrave Macmillan, London.
12. Garnevska, E., Guozhong, L. & Shadbolt, N. M. (2011). Factors for successful development of farmer cooperatives in Northwest China. *The International Food and Agribusiness Management Review,* 14(4).
13. Ghauri, S., Mazzarol, T. & Soutar, G. N. (2021). Why do SMEs join Co-operatives? A comparison of SME owner-managers and Co-operative executives views. *Journal of Co-operative Organization and Management,* 9(1). DOI:10.1016/j.jcom.2020.100128.
14. Gichuki, C. N., Han, J. & Njagi, T. (2020). The Impact of Household Wealth on Adoption and Compliance to GlobalGAP Production Standards: Evidence from Smallholder farmers in Kenya. *Agriculture,* 10(2). DOI:10.3390/agriculture10020050.
15. Greene, W. H. (2011). *Econometric Analysis*. Pearson Education Limited, Edinburgh Gate, Harlow, Essex CM20 2JE, England.
16. GSO (2018). *Result of the rural, agricultural and fishery cencus 2016*, Stattistical Publisher.
17. Hien, H. V., Phuongng, Đ. T., Quyen, N. K., Khoi, L. N. D. & Yagi, N. (2020a). Comparison of production efficiency between white leg shrimp intensive VietGAP and non-VietGAP applied systems in Soc Trang province. *Journal of Vietnam Agricultural Sciences and Technology,* 1(110), 97-102.
18. Hien, H. V., Sanh, N. V. & Phuong, N. T. (2020b). Analysis of production efficiency of standard certified pangasius (pangasianodon hypophthalmus) farms in the Mekong Delta, Vietnam [Origin in Vietnamese: Phân tích hiệu quả sản xuất của các cơ sở nuôi cá tra (pangasianodon hypophthalmus) đạt tiêu chuẩn chứng nhận ở đồng bằng sông Cửu Long, Việt Nam]. *Tạp chí Khoa học trường Đại học Cần Thơ,* 36(3B), 112-120. DOI:10.22144/ctu.jvn.2020.060.
19. Hoang, H. G. (2020). Exploring farmers' adoption of VietGAP from systemic perspective: implication for developing agri-food systems. *British Food Journal,* 122(12), 3641-3661. DOI:10.1108/BFJ-09-2019-0724.
20. Hobbs, J. E. (2003). *Incentives for the Adoption of Good Agricultural Practices* (GAPs). Background paper for the FAO consultation on Good Agricultural Practices, Rome.
21. Huy, H. M. & Quang, H. V. (2019). Cooperation in rice production in SRP standard: linkage model in rice production of Gentraco company. *Science and Technology Journal of Agriculture and Rural Development, Ministry of agriculture and Rural Development, Vietnam*, 3+4/2019, 273-280.
22. ILO (2012). *Value chain development briefing paper 2. The role of coopeartives and business associations in value chain development*. [Online accessed 8/11/2021] https://www.ilo.org/empent/areas/value-chain-development-vcd/WCMS_182602/lang--en/index.htm.
23. Jin, S. & Zhou, J. (2011). Adoption of food safety and quality standards by China's agricultural cooperatives. *Food Control,* 22(2), 204-208. DOI:10.1016/j.foodcont.2010.06.021.
24. John, K. M. (2013). Global GAP Standard Compliance and Smallholder Pineapple Farmersâ€™ Access to Export Markets: Implications for Incomes. *Journal of Economics and Behavioral Studies,* 5(2), 69-81. DOI:10.22610/jebs.v5i2.381.
25. Kariuki, I. M., Loy, J.-P. & Herzfeld, T. (2012). Farmgate Private Standards and Price Premium: Evidence From the GlobalGAP Scheme in Kenya's French Beans Marketing. *Agribusiness,* 28(1), 42-53. DOI: 10.1002/agr.20286.
26. Khoi, D.K. & Chi, D. K. (2017). *Developing and testing a framework for measuring climate change-related loss and damage in Vietnam's agricultural sector*. Study report.
27. Laosutsan, P., Shivakoti, G. P. & Soni, P. (2019). Factors Influencing the Adoption of Good Agricultural Practices and Export Decisions of Thailand's Vegetable Farmers. *International Journal of the Commons,* 13(2), 867-880. DOI:10.5334/ijc.895.
28. Laosutsan, P., Shivakoti, G. P. & Soni, P. (2019). Factors Influencing the Adoption of Good Agricultural Practices and Export Decisions of Thailand's Vegetable Farmers. *International Journal of the Commons,* 13(2), 867-880. DOI:10.5334/ijc.895.

29. Loan, L., Pabuayon, I., Catelo, S. & Sumalde, Z. (2016). Adoption of Good Agricultural Practice (VietGAP) in the Lychee Industry in Vietnam. *Asian Journal of Agricultural Extension, Economics & Sociology,* 8(2), 1-12. DOI:10.9734/ajaees/2016/19948.
30. Ma, W. & Abdulai, A. (2019). IPM adoption, cooperative membership, and farm economic performance. *China Agricultural Economic Review,* 11(2), 218-236. 10.1108/CAER-12-2017-0251.
31. Manda, J., Khonje, M. G., Alene, A. D., Tufa, A. H., Abdoulaye, T., Mutenje, M., Setimela, P. & Manyong, V. (2020). Does cooperative membership increase and accelerate agricultural technology adoption? Empirical evidence from Zambia. *Technological Forecasting and Social Change,* 158, 120160.
32. MARD (2018). Plan No. 6355/KH-BNN-KTHT dated 17th August 2018 of Minister of Agriculture and Rural Development on cooperative development in applying high-tech in production and marketing of agri-products [Origin: Kế hoạch số 6355/KH-BNN-KTHT ngày 17 tháng 8 năm 2018 của Bộ trưởng Bộ Nông nghiệp và Phát triển nông thôn về phát triển hợp tác xã ứng dụng công nghệ cao trong sản xuất và tiêu thụ nông sản đến 2020].
33. Marquaridt, D. W. (1970). Generalized Inverses, Ridge Regression, Biased Linear Estimation, and Nonlinear Estimation. *Technometrics,* 12(3), 591-612. DOI:10.1080/00401706.1970.10488699.
34. Mazzarol, T., Limnios, E. M. & Reboud, S. (2013). Co-operatives as a strategic network of small firms: Case studies from Australian and French co-operatives. *Journal of Co-operative Organization and Management,* 1(1), 27-40. DOI:10.1016/j.jcom.2013.06.004.
35. Menard S. (2002). Applied Logistic Regression Analysis, 2nd edition, A Sage 12 University paper.
36. Midi, H., Sarkar, S. K. & Rana, S. (2010). Collinearity diagnostics of binary logistic regression model. *Journal of Interdisciplinary Mathematics,* 13(3), 253-267. DOI:10.1080/09720502.2010.10700699.
37. Myers RH. (1990). Classical and modern regression with applications. PWS-Kent Publishing Company.
38. Nhan, T. Q., Tham, N. T. H. & Hang, N. T. T. (2016). Causes of farmers Who abandon Star-Apple "Lo Ren" production with GlobalGAP standard in Chau Thanh district, Tien Giang province. *Vietnam Journal of Agricultural Science,* 14(9), 1457-1465.
39. Pham, H.-G., Chuah, S.-H. & Feeny, S. (2021). Factors affecting the adoption of sustainable agricultural practices: Findings from panel data for Vietnam. *Ecological Economics,* 184, 107000. DOI:10.1016/j.ecolecon.2021.107000.
40. Prime Minister (2012). Decision No. 01/2012/QĐ-TTg dated 9th January 2012 of Prime Minister of Vietnam on support policy for application of good agricultural practices in agriculture, forestry, and fishery.
41. Prime Minister (2020). Decision No 324/QĐ-TTg dated 2nd Mars 2020 of Prime Minister of Vietnam approving comprehensive program of sustainably agricultural development in adaptation to climate change of Mekong delta until 2030, vision to 2045.
42. Quang, H. V. & Khang, V. T. (2017). Evaluating management system of rice quality and application of standards in rice production in Mekong delta. Study report submitted to GIZ in the project "Better Rice Initiative Asia", April 2017.
43. Quang, H. V. (2016). Study and recommendation of policy and solutions for cooperative develoment in agricultural sector [Origin: Nghiên cứu đề xuất chính sách và giải pháp phát triển hợp tác xã trong nông lâm ngư nghiệp]. Study report funded by and submitted to Ministry of Agriculture and Rural Development of Vietnam.
44. Quang, H. V. (2017). Private-Public cooperation in rice production-consumption linkage: Lessons learnt from Better Rice Initiative Asia project in Việt Nam, *Science, and Technology Journal of Agriculture and Rural Development*, Ministry of Agriculture and Rural Development, Vietnam, No.23, 12-20.
45. Quang, H. V. (2021a). Guide for cooperatives in organization of agricultural production with certificated standards [Origin: Tài liệu hướng dẫn hợp tác xã trong tổ chức sản xuất nông nghiệp theo tiêu chuẩn chứng nhận]. Guide funded by and submitted to Ministry of Agriculture and Rural Development of Vietnam.
46. Quang, H. V. (2021b). Study for proposing agricultural cooperative model in accordance with Law on cooperative in 2012 aiming to develop value chain linkages for each agricultural product groups in different regions. Study report submitted to Ministry of Agriculture and Rural Development of Vietnam.
47. Quang, H. V., Dinh, N. T. & Ba, N. V. (2020). Current status and solutions for promoting cooperatives to apply high technology in rice and fruit production in Mekong Delta. Study report submitted to Mekong Climate Resilience Program of GIZ.
48. Reardon, T., Timmer, C. P. & Minten, B. (2012). Supermarket revolution in Asia and emerging development strategies to include small farmers. *Proc Natl Acad Sci U S A,* 109(31), 12332-7. DOI:10.1073/pnas.1003160108.
49. Schreinemachers, P., Schad, I., Tipraqsa, P., Williams, P. M., Neef, A., Riwthong, S., Sangchan, W. & Grovermann, C. (2012). Can public GAP standards reduce agricultural pesticide use? The case of fruit and vegetable farming in northern Thailand. *Agriculture and Human Values,* 29(4), 519-529. DOI:10.1007/s10460-012-9378-6.
50. Sitorus, R., Harianto, H., Suharno, S. & Syaukat, Y. (2020). The Application of Good Agricultural Practices of White Pepper and Factors Affecting Farmer

Participation. *Agriekonomika,* 9(2), 129-139. DOI:10.21107/agriekonomika.v9i2.6824.

51. Stuart, A. M., Devkota, K. P., Sato, T., Pame, A. R. P., Balingbing, C., My Phung, N. T., Kieu, N. T., Hieu, P. T. M., Long, T. H., Beebout, S. & Singleton, G. R. (2018). On-farm assessment of different rice crop management practices in the Mekong Delta, Vietnam, using sustainability performance indicators. *Field Crops Research,* 229, 103-114. DOI:10.1016/j.fcr.2018.10.001.
52. Thai, T. T. & Pensupar, K. (2015). Factors Affecting Consumers' Decision to Purchase Vietgap Vegetables in Hanoi, Vietnam. *Full Paper Proceeding BESSH-2015,* 24(3), 54-64.
53. Thang, D. Q. (2028). Analyzing the impact of select factors on investment decisions for agricultural development under the GAP of households in Ninh Thuan, Vietnam. *International Journal of Economics, Commerce and Management,* VI(1), 335-365.
54. Trang, N. N. (2019). Determinants of Linking Gaps Tea Production: Case Study of Tea Production Households in Northern Midland and Mountainous Region, Vietnam. *Journal of Business Management and Economic Research,* 3(3), 34-45. DOI:10.29226/tr1001.2019.111.
55. Trang, N.N. (2020). Decision of tea production in good agricultural practices of farmer households in Northern mountainous region. Ph.D. thesis of National Economic University of Vietnam.
56. Wiggins, S., Kirsten, J. & Llambí, L. (2010). The Future of Small Farms. *World Development,* 38(10), 1341-1348. DOI:10.1016/j.worlddev.2009.06.013.
57. Xuan, N. N. & Ngoan, N. H. (2014). Economic Efficiency of Concentrated Pig Production toward Good Agricultural Practices of Farm Households in Suburban Hanoi. *Journal of Science and Development*, 12(6), 906-912.
58. Zhang, S., Sun, Z., Ma, W. & Valentinov, V. (2020). The effect of cooperative membership on agricultural technology adoption in Sichuan, China. *China Economic Review,* 62, 101334. DOI:10.1016/j.chieco.2019.101334.

Citation of this article

Hoang Vu Quang. (2024). The determinants of adoption of good agricultural practices by small farmer agricultural cooperatives in Vietnam's Mekong delta. Global Journal of Arts Humanity and Social Sciences, 4(1), 41–50. https://doi.org/10.5281/zenodo.10507181