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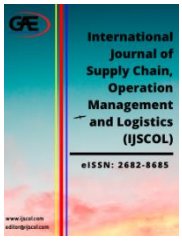

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FACTORS INFLUENCING SMALL FARMERS TO PARTICIPATE IN SUGARCANE LOADING STATIONS IN THAILAND

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Abstract:

Sugarcane loading stations were established in the sugarcane business in Thailand for more than ten years to decrease the transportation cost of the small farmers. However, the participation rate was rather low. The main objective of this study was to investigate the factors influencing sugarcane small farmers to join contract farming with sugarcane loading stations. Descriptive analysis was used to describe farmers' demographic profiles and farms' characteristics. Factor analysis was used to determine factors influencing farmers' motivation to join with loading stations. Social participation was revealed as the factor the most influenced farmers' motivation to join with loading stations, followed by economic constraints and individual goals, which these two factors have also significantly influenced the farmers' motivation to join with loading stations. Conversely, the sign of education (positive) and age (negative) were estimated in the logistic regression analysis, which increases age level will reduce the small farmers' motivation to participate in the sugarcane loading stations, and the higher education level will increase the small farmers' motivation to participate in the sugarcane loading stations.

Keywords:

Sugarcane, Loading Station, Contact Farming, Farmer Participation

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Introduction

Sugarcane is an economic crop that is important for industries and farmers in Thailand. It is considered the main raw material that is important to the sugar production industry in Thailand. Sugarcane farmers can earn an income of USD 937.5 million per year and Thailand is the second largest sugar exporter in the world after Brazil. The industry is relatively distinctive as the crop can be planted in any region in Thailand and there is a market readily available. In 2017, more than 45% of total sugarcane farmers in Thailand (192,328 families) are small farmers who own planted areas less than 5.0 hectares. Another 25% (106,849 families) are the small farmers who hold planted areas of more than 5.0 hectares but not over 10.0 hectares. The remaining 30% (128,218 families) are "the head of a quota" or large-scale farmers who are holding planted areas of more than 10.0 hectares and have their own trucks and high investment.

The traditional supply chain of the sugarcane industry in Thailand showed that farmers will transport their harvested sugarcane and sold to the middleman first and then only to the mills, due to their limited capacity of a truckload. In that traditional system, the middleman played a significant role in collecting the sugarcane produce from the farmers and re-sell it to the mills. As a result, this system has caused a lack of bargaining power to the farmers in pricing and the mills have to pay for a higher price to the middleman. To overcome the issues in the traditional supply chain, the government has implemented a loading station (LS) strategy to reduce the cost of transportation from farms to mills and a total of 167 stations was launched in 2003. In this new supply chain, the loading station is owned by the sugar mills. To reduce the small farmers' cost of transportation, the loading station is set up in the area nearby to the sugarcane planted area. According to Chetthamrongchai *et al*. (2001), the loading station was estimated to save the transportation cost from 27.8% to 40.9% compared to the traditional supply chain system.

Although the loading stations are established to save the farmers' costs, a few farmers are not selling their products to the loading stations. According to the Thailand Department of Agricultural Economics (2017), the current sugarcane farmers having a contract with the loading station are only 67% (200,448 farmers) and the remaining 33% (98,729 farmers) are still trading their production with the middleman. Thus, the objective of this study was to investigate the factors influencing sugarcane small farmers to join contract farming with sugarcane loading stations.

Literature Review

Innovation Adoption Concept

Rogers and Shoemaker (1971) suggested adopting innovation as making decisions to fully implement innovation in a better and more useful way. The acceptance of innovation is a process that begins when a person or a community experiences it. The decision's process of accepting or rejecting the innovation is depending on two key factors namely person community and innovation. In terms of the composition of innovation, Foster (1973) described it arises from the individual and the community that has learned by themselves and how much the innovation benefits the community. Economic necessity has greatly influenced the acceptance of innovation because normally innovation requires money to be operated mostly in the agricultural sector. Besides that, supporting elements to the adoption of the innovation including cultural factors, beliefs, and values must be compatible with innovation. In general,

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a person becomes accustomed to a life plan or old practices and feels that the existing condition is already good and doesn't want to change unless for the better.

Agricultural Innovation and Technology Concept

Burton (1992) suggested that agricultural technology as an applied science that brings the knowledge gained from scientific research to create agricultural machinery, processing, and development of new animal species to be used to improve the production on the farm and improve the processing, transportation, and distribution of agricultural products. In considering the appropriate technology to be used in the community, the activities should use local resources and workers, able to create inexpensive tools and suitable in local conditions where the community can cooperate and be accepted socially and culturally. Rogers (1983) referred the innovation as an idea, method, or practice that the individual perceives as a new thing or a new idea. It may not necessarily be new knowledge that some people may know and yet fail to produce the desired attitude towards knowledge. By the same token, agricultural innovation means ideas, knowledge, attitudes, intentions, decisions, and the ability to accept new things including new practices by the farmers. Some scholars of agricultural extension considered agricultural innovations, as well as agricultural technology, can be used to promote the innovation to the farmers and subsequently becomes a technology when it is used. Introducing agricultural innovation and technology to the community means incorporating new concepts, knowledge, methods, and tools. It should suit the economic, social, and biological conditions of farmers and consistent with the previous practices of the community. It should also suitable for the local environment which can be operated and controlled by local people.

Concept of Community Culture Economy and Community Participation for Sustainable Development

Thailand's economy consists of two economic systems namely community economy and capitalist economy. In the community economy, the majority of Thai people make a living in a rural area of the country. The important characteristic of the community economy are families and communities are treated as a production unit. The goal of the production unit is the survival of families and communities to be able to support themselves and reproduce families and communities. Therefore, the production has the characteristics for household consumption and only produce enough for supporting the family's expenses rather than aiming for maximum profit.

The family members of farmers are the main labor in the production process. The production of smallholders is different from the production of a capitalist economic system because, in the latter system, the production process of large holders needs large investment, employs hired labor, and larger area for production (Nardsupa, 2007). On the other hand, social or community participation is a social gathering both of individual and group (United Nation, 1981; Reeder, (1974). Participation is the people's right to decide on the policy-related not only in allocating and utilizing of raw materials but also to participate in the planning of maintaining the utility of production, service, and public facilitation. Therefore, participation means people will get involved in a decision-making at different levels to determine the needs of their communities followed by analyzing, planning, operating, and gaining the benefits from community development including monitoring and evaluation of development which enhances the foundation of sustainable development (Hongwiwat, 1994).

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Material and Methods

The research was conducted in the North East of Thailand which has large sugarcane planted areas and a large number of sugarcane small farmers (Office of Agricultural Economics, 2017). A sample of 500 sugarcane small farmers were selected using stratified sampling from a population of sugarcane small farmers. The interviews using a structured questionnaire were carried out with the target respondents. The research instrument being the questionnaire should be reviewed for content validity by a panel of experts (Linder *et al.*, 2001). In terms of the reliability of the instrument, the Cronbach's alpha coefficient was tested for each variable. A reliability level of 0.80 or higher is considered acceptable (van den Ban, 1988). Descriptive analysis was used in this study to describe the sugarcane farmers' characteristics and farming while factor analysis was used to identify the factors related to the motivation of small farmers to involve in contract farming with sugarcane loading stations. The logistic regression analysis was used to examine the significant relationship between estimated factors with the sugarcane small farmers' motivation to join with sugarcane loading stations.

Results and Discussions

Demographic Profiles of Small Farmers

The descriptive analysis was conducted to determine the demographic profiles of small farmers and farm characteristics, and the results are presented in Table 1. The majority of the respondents were older small farmers (51-60 years old). Younger sugarcane small farmers (below 50 years old) can be categorized as influential farmers as they tend to easily adopt innovation and systems including engaging with loading stations or contract farming than the older farmers did. Most of the respondents had primary school education (64.8%). The lower the education level the higher tendency to refuse to adopt innovation. In terms of size of sugarcane farm owned by the farmers, the majority of the farms had sized of 2.1-4.0 hectares (39.0%) followed by more than 6.0 hectares (26.8%), 4.1-6.0 hectares (18.8%), and less than 2.0 hectares (15.4%) respectively. More than half of the farmers had experience in the sugarcane industry around 21-30 years (55.2%). For the income, slightly more than half of the farmers earned approximately USD1,801-2,300 per season.

Table 1: **Small Farmers' Demographic Profiles and Farm Characteristics (n=500)**

Profile		**Frequency (n)**	**Percentage (%)**
Age (year)	20-30	1	0.2
	31-40	25	5.0
	41-50	159	31.8
	51-60	225	45.0
	> 60	90	18.0
Educational level	Primary school	324	64.8
	Secondary school	88	17.6
	High school/Certificated	53	10.6
	Diploma	18	3.6
	Bachelor degree	15	3.0
	Master degree	1	0.2
	PhD degree	1	0.2
Farm size of sugarcane (hectares)	0-2	77	15.4
	2.1-4.0	195	39.0
	4.1-6.0	94	18.8
	>6.0	134	26.8

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Experience in sugarcane production	0-10	29	5.8
	11-20	126	25.2
	21-30	276	55.2
	31-40	62	12.4
	41-50	7	1.4
	>50	0	5.8
Farm income (USD)	0-1,800	121	24.2
	1,801-2,300	255	51.0
	2,301-3,000	70	14.0
	>3,000	54	10.8

Factor Analysis

Factor analysis was used in this study to identify the factors related to the motivation of small farmers to involve in contract farming with sugarcane loading stations. In the factor analysis, the first step is to ensure the adequacy of sampling data. Therefore, the Kaiser-Meyer-Olkin (KMO) test is adopted to measure the sampling adequacy and to compare the magnitude of the observed correlation coefficients to the magnitude of partial correlation coefficients. As can be seen in Table 2, KMO was 0.945 and the Chi-square for Bartlett's test of sphericity was 6406.128. Since the value of KMO was greater than 0.8 and the Bartlett's test was significant at a 1% significance level, thus the sample was ideal and strongly adequate for factor analysis.

Table 2: KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.945
Bartlett's Test of Sphericity	Approx. Chi-Square	6406.128
	df	66
	Sig.	0.000

Table 3 shows the three factors identified from the factor analysis and the items and factor loading for each factor. The three factors including social participation (F1), economic constraints (F2), and individual goals (F3), and these factors accounted for approximately 84.12% of the total variance. The total variance indicated 84.12% of the variance in the farmers' motivation to engage in loading stations was explained by the three factors while the remaining 16.88% was explained by the unknown factors. Based on the factor loading of these three factors, the range was between 0.63 and 0.86, which is considered strong in explaining the factors.

Table 3: Summary of Factor Analysis Results

Items	**Factor loading**		
	F1	**F2**	**F3**
Social participation			
i. If I involve in any business opportunities provided by the loading station, I will join as a contract farmer with the sugarcane loading station.	0.831		
ii. If the loading station can provide a channel to share the updated information continuously with farmers, then it will be able to increase my motivation to be a contract farmer.	0.830		
iii. If the loading station lets the farmers taking part in the operating plan will be better.	0.795		

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iv. Having a joint meeting with the sugarcane loading station will increase my intention to join as a contract farmer.	0.752		
v. If farmers can negotiate the product price with the loading station, it will motivate me to continue or join as a contract farmer with the sugarcane loading station.	0.748		
vi. Organizing a workshop for contract farmers to develop their knowledge is important.	0.695		
Economic constraints			
i. I am willing to join as a contract farmer because the loading station offers a lower-rate loan.		0.852	
ii. I will join as a contract farmer with a sugarcane loading station because it is difficult to apply for a loan with a commercial bank.		0.846	
iii. I am willing to join as a contract farmer due to the guaranteed price offered by the loading station.		0.817	
iv. I will join as a contract farmer because of the higher cost of production.		0.740	
Individual goals			
i. I believe that joining as a contract farmer with a sugarcane loading station will be able to help me expand my business.			0.855
ii. I believe that the sugarcane loading station will be able to increase my profit.			0.633
Eigenvalue	**4.112**	**3.625**	**2.358**
Variance (%)	**34.264**	**30.208**	**19.652**
Accumulate variance (%)	**34.264**	**64.672**	**84.124**

Note: F1 = Social participation; F2 = Economic constraints; F3 = Individual goals

The first factor (F1) can be identified as *social participation* between the sugarcane contract farmers and the loading station. This factor explained about 34.264% of the variance. It consisted of six items with the highest factor loading was 0.831 with the following statement, "If I involve in any business opportunities which provided by the loading station, I will join as a contract farmer with the sugarcane loading station". The second item was "If the loading station can provide a channel to share the updated information continuously with farmers, then it will be able to increase my motivation to be a contract farmer" (0.830); followed by the items "If the loading station let the farmers taking part in the operating plan will be better" (0.795); "Having a joint meeting with the sugarcane loading will increase my intention to join as a contract farmer" (0.752); "If farmers can negotiate the product price with loading station, it will motivate me to continue or join as a contract farmer with sugarcane loading station" (0.748); and "Organizing a workshop for contract farmers to develop their knowledge is important" (0.695). Hence, all items represent the motivation of sugarcane small farmers to participate in the loading station activities.

The second identified factor (F2) was *economic constraints*. The total variance of this factor was 30.208%. There were four items with the largest contributor was "I am willing to join as a contract farmer because loading station offers a lower rate loan (0.852). These were followed by "I will join as a contract farmer with sugar loading station because it is difficult to apply for a loan with commercial bank" (0.846); "I am willing to join as a contract farmer due to the guaranteed price offered by loading station" (0.817); and "I will join as a contract farmer

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because of the higher cost of production" (0.740). It can be concluded that economic constraints were the factors consisting of the respondents' expectation to gain the profit from the loading station and motivate them to stay and expand their sugarcane business.

The final factor (F3) was the individual goals based on respondents' expected advantage from joining the sugarcane loading station which contributed approximately 19.652%. There were two items categorized under this factor, which were "I believe that joining as a contract farmer with sugarcane loading station will be able to help me expanding my business" (0.855), and "I believe that the sugarcane loading station will be able to increase my profit" (0.633).

Reliability Analysis

Table 5: Reliability Analysis

Factors	Cronbach's Alpha	Number of Items
Social participation (F1)	0.954	6
Economic constraints (F2)	0.933	4
Individual goals (F3)	0.873	2
Total	0.958	12

Reliability analysis was carried out to determine the internal reliability of the factors extracted from factor analysis. Cronbach's alpha was used to measure the reliability of items under each factor and overall reliability factors. The Cronbach's alpha for the 12 items was 0.958 as shown in Table 5, indicating that the data is reliable to be used in logistic regression analysis.

Estimated Logit Model A Sugarcane Small Farmers Motivation to Join with Sugarcane Loading Station

Table 6: Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	524.638	6	.000
	Block	524.638	6	.000
	Model	524.638	6	.000

As indicated in Table 6, omnibus tests of model coefficients were used to test the hypothesis as stated below: -

H_0: The motivation of small farmers to join with loading station is not related to the independent variables.
H_1: The motivation of small farmers to join with loading station is related to the independent variables.

Model Chi-square = 524.638, Sig = 0.000 mean reject H_0 or the motivation of small farmers to join with loading station is related to the independent variables at least 1 independent variable.

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Model Summary

Table 7: Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	151.485[a]	.650	.877

a. Estimation terminated at iteration number 7 because parameter estimates changed by less than .001.

The value of -2 Log likelihood near to zero means the equation or model created is good quality or blends well with the data (Table 7).

The value of Cox & Snell R square = 0.650 there is no value near to zero mean the harmonization of the model in terms of comparing the quality of the model created with the worst model in the empty model without any independent variables.

The value of Nagelkerke R square = 0.877 means the variables can explain the fluctuation of small farmers' motivation to join with loading station for 87.7%.

Interpretation of the Model

Table 8: The Variables in the Equation

Dependent: Motivation	Coefficient (B)	S.E.	Wald	df	Sig.	Exp(B)
Social participation	2.950***	0.331	79.458	1	0.000	19.112
Economic constraints	2.241***	0.285	61.835	1	0.000	9.398
Individual goal	1.689***	0.249	46.211	1	0.000	5.417
Age	-0.033	0.039	0.698	1	0.404	0.968
Education level	0.121	0.257	0.219	1	0.639	1.128
Farm size	0.035***	0.013	6.763	1	0.009	1.035
Constant	1.199	2.302	0.271	1	0.602	3.318

The results of logistic regression analysis in Table 8 showed that the small farmers' motivation to participate in the sugarcane loading station was an important factor that influenced the small farmers' decision making to sign a contract with the loading station. The small farmers' social participation coefficient showed a positive value of 2.950 and statistically significant at a 1% significance level. The exponential coefficient for small farmers' motivation value was 19.112 indicating that the small farmers' motivation to participate with the loading station will increase by 19.112 times more if the small farmers can involve in the decision-making process in the loading station.

On the other hand, economic constraints of small farmers are important in determining the small farmers' motivation to sign a contract with the loading station. The coefficient illustrated a positive economic constraints value of 2.241 and significant at a 1% significance level. Besides, the exponential coefficient for small farmers' motivation value was 9.398 which indicated that the small farmers' motivation to incorporate with the loading stations will increase by 9.398 times more if the small farmers can get higher profit or advantage from the loading stations.

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In the same way, the individual goal of small farmers was also a positive factor to determine the motivation of small farmers to engage with the loading stations. The coefficient showed a positive individual goal value of 1.689 and significant at 0.05% significance level. The exponential coefficient for small farmers' motivation value was 5.417 indicating that the small farmers' motivation to join the loading stations will increase by 5.417 times more if the loading stations respond to the small farmers' requests. The fourth important factor that influenced the small farmers to engage with the loading stations was the farm size. The respondent's farm size plays an important role in determining the motivation of small farmers to join the loading stations. The coefficient for farm size was 0.035 and it was statistically significant at a 1% significance level. This suggests that small farmers with larger farm size will be more willing to join with the loading stations. Moreover, the results also showed that farmers with larger farm size will have 1.035 times more intention to join the contract with loading stations than the small farmers with smaller farm size. On the contrary, the results didn't have enough evidence to support that age and education were significant causal impact on the dependent variable. Since, the p-value for age and education both were greater than 0.05, indicating that these two variables were not an important factor to affect changes in the dependent variable. However, the sign of education (positive) and age (negative) were correctly estimated in the logistic model, which increased age level will reduce the small farmers' motivation to participate in the sugarcane loading station, and the higher education level will increase the small farmers' motivation to participate in the sugarcane loading station.

Conclusion

The factor analysis showed that social participation, economic constraints, and individual goal are related to the farmers' motivation to join with the loading station as a contract farmer. The ability to involve in negotiating the selling price with the loading station will increase the participation rate among the farmers. The majority of the farmers also believed that the loading stations can assist them to increase their production and profits. On the other hand, age and household size have also influenced the motivation. Older farmers did not have the intention to join the loading station as a contract farmer. This is mainly due to their unwillingness to take the risk and the fact that they are contented with the existing system. Besides, farmers with large household size are more willing to join as a contract farmer with the loading stations. In conclusion, the small farmers with the business contract will be more efficient than non-contract farmers. Thus, loading stations have to encourage the farmers in discussing their problems and engage them in the price negotiation. Information transparency is important to attract more small farmers to engage with the loading station as a contract farmer. Promoting the benefits of joining the loading stations including lower interest rates offered to the contract farmers and the ability to assist the farmers to be more efficient may motivate the farmers to engage as contract farmers.

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