JMSS Journal of Multidisciplinary in Social Sciences

Journal of Multidisciplinary in Social Sciences
Journal homepage : http://jmss.dusit.ac.th

Impacts of Logistics and Supply Chain Policy on Farmers' Well-Being

Patipol Homyamyen*

Faculty of Business Administration, Rajamangala University of Technology Suvarnabhumi, 72120 Thailand

Article info

Article history:
Received: 26 November 2019
Revised: 6 April 2020
Accepted: 27 April 2020

Keywords:
Logistics, Supply chain, Farmers, Rice, Well-being, Public policy

Abstract

Thailand's master plan for logistics and supply chain development for agriculture (2017-2021), initiated by the Ministry of Agriculture and Cooperatives, focuses on logistics and supply chain of agricultural sector including fruit and vegetable, rice, sugarcane, oil palm, and cassava. Suphanburi is well-known as an important farmland for rice production. Hence, this study examines the impacts of logistics and supply chain policy on the farmers' well-being in this area. The samples of this study were 250 farmers in Suphanburi, Thailand. The data was collected using questionnaire as a research tool. This study employed multiple regression analysis (MRA) for hypothesis testing. The results indicated that strengthening the capacity of farmers' institutions (SCFI), and improving logistics infrastructure (ILI) has positive impacts on farmers' well-being (FWB). However, using technology and innovation (UTI), and creating value of supply chains for farmers (CVSC) had no impact on the FWB. Discussion and recommendation are discussed in this paper.

Introduction

Thailand's master plan for logistics and supply chain development for agriculture (2017-2021), initiated by the Ministry of Agriculture and Cooperatives, focuses on logistics and supply chain of agricultural sector including fruit and vegetable, rice, sugarcane, oil palm, and cassava. The preparation of this master plan has set the issues and guidelines for comprehensive development linked to the situation and trend of logistics and supply chain development both domestically and internationally (Ministry of Agriculture and Cooperatives, 2018). It is set up in accordance with the direction and development guidelines of the country's agricultural development plan, government policies, and other related dimensions. For instances, the 20 Years of Agricultural and Co-operative Strategies (2017-2036), the 5-year agricultural and cooperative development plan during the National Economic and Social Development Plan Issue 12 (2017-2021), Thailand 4.0, Eastern Economic Corridor Development: EEC) policy, and Thailand Strategic Logistics Development Plan No. 3 (2017-2021). This master plan has three major objectives which are (1) to increase the efficiency of logistics management throughout the supply chain (2) to encourage farmers to be the main mechanism to connect with entrepreneurs throughout the supply chain and (3) to increase the ability to create value added agricultural economy for farmers, farmers' institutes, and entrepreneurs.

According to the Logistics Performance Index reported by the World Bank (2018), Thailand was ranked

* Corresponding Author
e-mail: Patipol_1803@hotmail.com

the 32nd among 163 countries of the world. The logistics performance of the country has improved since 2016 (ranked the 49th). In the overall picture, it was found that the context of Thailand's logistics has improved but the gap between high and poor performing countries has widen since some countries still have not improved their logistics efficiency. The key success to improve logistics efficiency is to build credibility in a predictable supply chain and logistics service quality because the shipper needs certainty in the cost, time or method of delivery, which some shippers agree to pay higher shipping costs in order to obtain good quality logistics services (Ministry of Agriculture and Cooperatives, 2018). In 2015, the Office of Agricultural Economics, Ministry of Agriculture and Cooperatives was funded to conduct research on logistics and supply chains of five major agricultural products, namely rice, tapioca, rubber, vegetables (asparagus), and fruit (durian) by developing a database system, known as the Agricultural Logistics Performance Index (ALPI) to assess logistics management efficiency of agricultural products in Thailand.

The evaluation results indicated that transportation cost is the highest logistics cost of the agricultural product supply chain approximately 1.14-5.88 percent of the sales followed by the cost of warehouse management which accounted for 1.08-6.40 percent, product holding cost 0.03%-1.27%, and logistics management costs of approximately 0.48%-1.28% of the sales. This study found that white rice growers had the highest transportation cost when compared to Jasmine rice, cassava, rubber, durian, and asparagus growers. It was estimated that the white rice growers have transportation cost of 16.62 percent of the total sales. When considering the time for shipping of 5 types of agricultural supply chains, farmers, farmers' institutions, and processing plants use 1-3 days to deliver the products. According to the overall product damage rate, the farmers have damage rates between 2 - 5 percent per sales. However, the Jasmine rice growers have the highest loss at about 5 percent per sales.

The rice farmers bear a great amount of logistics costs since they lack the knowledge, understanding, and management skills of effective logistics activities, from pre-production, harvesting, sorting quality, collecting, and distributing products to the end customers. They also lack integration or networking that is linked to production, marketing, and related agricultural logistics system, especially the production process control, and quality assurance of agricultural products to be consistent both in terms of quantity and quality. They also lack from agricultural products value chain development. In addition, the farmers still have limitations on the delivery of products to operators effectively, that is, delivering the product on time both in terms of agreed amount and quality (Ministry of Agriculture and Cooperatives, 2018). Consequently, farmers have a return that is not worth the investment. It inevitably affects their well-being. In Suphanburi, many households have lost their lands due to mortgage loan and become the tenant of the lands. Some households have faced financial problems since they received the loan from the Bank for Agriculture and Agricultural Cooperatives (BAAC). For example, a family has approximate debts of 500,000 baht because of the wrong investment of a family member in farming such as buying a tractor, and being tricked by a fertilizer sale representative (Laiprakobsup, 2017).

To cope with the mentioned problems, the government has planned to develop infrastructure and agricultural logistics facilities, to improve agricultural product transportation, to promote the use of technology and agricultural logistics innovation, to develop e-commerce, to develop traceability system, to encourage green logistics, to implement the agreement, and to improve legal and relevant logistics regulations. As a result, the Ministry of Agriculture and Cooperatives requires government agencies at all levels to develop a logistics plan for agricultural products, focusing on a spatial development area, especially the area that is the important source of production, collection, and distribution of agricultural products. The main reason of doing so is to reduce the logistics costs for farmers and entrepreneurs. Thailand's master plan for logistics and supply chain development for agriculture (2017-2021) has established three major strategies to cope with the problem which are to increase the competitive advantage on agricultural logistics throughout the supply chain, develop agricultural logistics infrastructure and facilities, and develop agricultural logistics supportive factors. To increase the competitive advantage, increasing capability in agricultural logistics management, creating and developing agricultural product value chain, and creating cooperation throughout the agricultural product supply chain should be promoted. Improvement of logistics infrastructure and facilities, research and development, and legal improvement are among the means to achieve the goal set by the master plan.

The authors, therefore, would like to examine the

impact of logistics and supply chain, as proposed by the government, on farmers' well-being. This study focuses mainly on the mentioned strategies and means which are associated with strengthening the capacity of farmers' institutions, improving logistics infrastructure, promoting use of technology and innovation, and creating value of supply chains for farmers. Results and discussion of the findings are beneficial for government agencies, farmers, and other relevant stakeholders.

Objectives

1. To examine the impact of logistics and supply chain, as proposed by the government, on farmers' well-being.

2. To provide suggestions and recommendations for policy makers.

Theoretical framework

1. Farmers' well-being

There is no single definition of well-being since it is associated with many aspects toward people's lives. More recent research has placed important on well-being as an ability to fulfill one's goals (OECD, 2011), happiness (Pollard & Lee, 2003; Promphakping, 2012), being in good health (OECD, 2011), and life satisfaction (OECD, 2011; Promphakping, 2012; Peel, Berry, & Schirmer, 2016; Promphakping (2012) stated that well-being in the view of psychologists refer to life satisfaction and global happiness. However, economists view well-being as happiness and wealth. According to Msuta & Urassa (2015), well-being is defined in different aspect. They defined this term as a "household's ability to meet its children's education costs, its asset ownership, and a households' food security status." Well-being can be categorized into five types; psychological well-being, physical well-being, mental well-being, economic well–being, and material well-being (Breslow, 1972; Helliwell & Putnam, 2004; Ryff, 1989). Hence, measuring well-being is quite complex depending on each context. Gasper (2004) proposed 6 dimensions of well-being which are pleasure or satisfaction, preference fulfillment, free choice, opulence, the attainment of certain values which can be specified independently of the individual concerned (good health, physical and mental), and possession of favorable capability, a favorable range of valued opportunities. In Thailand, The Institute for Population and Social Research, Mahidol University created a tool named HAPPINOMETER to measure well-being. This tool consists of nine indicators; happy body, happy relax, happy heart, happy soul, happy family, happy society, happy brain, happy money, and happy work-life (Kittisuksathit, 2017). This research developed a measurement to measure farmers' well-being based on these indicators.

2. Creating value of supply chains and farmers' well-being

Value chain is defined as "the full range of activities which are required to bring a product or service from conception, through the different phases of production (involving a combination of physical transformation and the input of various producer services), delivery to final consumers, and final disposal after use" (Kaplinsky & Morris, 2001). To promote the creating of supply chain for farmers, the government has promoted the production of rice to meet the standards and the needs of the market, the value-added for agricultural products, the establishment of a distribution center, the development of the rice market system, risk management, and the supply chain management for famers (Ministry of Agriculture and Cooperatives, 2018). FAO (2014) suggested that the development of the value chain will reduce the costs of food products to consumers or increase their benefits. Creating value of supply chain resulted in the change in local communities. People in the communities received benefits through lessening expenditure and increasing income. It also led to building network among farmers' households so they can be self-reliant (Namkham & Booncharoen, 2017). Hence, the authors proposed that creating value of supply chain would lead to the well-being of the farmers. Then, the first hypothesis is proposed as follow:

H_1: Creating value of supply chains has a positive influence on farmers' well-being

3. Strengthening the capacity of farmers' institutions and farmers' well-being

In Thailand, there is a Farmer Organization of Thailand. It has formed a group of more than 10 groups of farmers, each of which is powerful and expressive to represent the national farmers. This also includes representatives of dozens of farmer groups in each province and region. In the past decades, it was impossible to unite varies farmers' organization. To strengthen the capacity of farmers, and farmers' institutes, the government has tried to promote and support agriculture in accordance with the philosophy of sufficiency economy, to promote and develop knowledge of farmers to be professional farmers, promote

strengthening and linking farmers' networks among people in the community, promote sustainable agriculture, and focus on the farmers' occupation and make the farmers proud of the rice farming profession. Building and strengthening a network results in the community strength and development. Msuta & Urassa (2015) found that farmers' organizations contributed positively to their members' well-being. Whenever the society is good, people living in the community would be happy. Hence, the second hypothesis is proposed:

H_2: Strengthening the capacity of farmers' institutions has a positive influence on farmers' well-being

4. Technology and innovation and its impact on farmers' well-being

According to Thailand's master plan for logistics and supply chain development for agriculture (2017-2021), major logistics technology and innovation to be developed and improved include Electronic Data Interchange System (EDI) (2) barcode system) (3) radio frequency identification (RFID) (4) global positioning system (GPS), enterprise resource planning (ERP), (6) warehouse management system (WMS), and transportation management system (TMS). The government also promotes lean management to minimize waste of overproduction), waste of waiting, waste of transportation, waste of processing, waste of inventory, waste of motion, waste of defect, and waste of underutilized people (Ministry of Agriculture and Cooperatives, 2018). The World Development Report (World Bank, 2016) stated that the development of ICTs support allows more people and firms to participate in markets by creating more productive, and benefits. Improving technology and innovation leads to optimized supply chain management. It also enhances coordination of transportation, delivery of products, and improving capacity utilization (Dixie & Jayaraman, 2011). Karippacheril, Rios, & Srivastava (2011) found that technology improvement ensures food safety in global agriculture product chains. Some studies (Grossman & Tarazi, 2014; Jack & Suri, 2014) found technology can facilitate fast and secure payment. The authors believe that promotion and support of research, technology and innovation utilization in farming will enhance the farmers' well-being. Development of agricultural information technology and implication of the research findings, are also beneficial for the farmers. The third hypothesis, therefore, is proposed as follow:

H_3: Using technology and innovation has a positive influence on farmers' well-being

5. Logistics infrastructure and farmers' well-being

Logistics infrastructure could be divided into two types; hard infrastructure, and soft infrastructure. The soft infrastructure refers to all the services required to maintain the economic, health, and cultural and social standards of a population. Hard infrastructure involves the physical infrastructure of roads, bridges etc. (Charoonpipatkul, 2018). To improve the country logistics infrastructure, Thailand's master plan for logistics and supply chain development for agriculture (2017-2021) proposed two major strategies to improve logistics infrastructure. The first strategy is to develop and improve agricultural product checkpoint. It can be achieved by improving service efficiency of the checkpoint, linking relevant data through the National Single Window (NSW) and developing network connecting to ASEAN Single Window (ASW), minimizing the inspection and certification process of import-export of agricultural products, including providing part-time services to facilitate fast and extensive services. The latter strategy consists of seven minor means which are (1) building, improving and developing logistics infrastructure and agricultural logistics facilities of farmers' institutions, such as central market, cold room and modern technology systems (2) supporting the establishment of logistics service centers in the community including storage, distribution, and transportation of agricultural products (3) supporting shared use of logistics infrastructure and logistics Pooling between farmers, farmers' institutes, and entrepreneurs (4) developing agricultural product activities and facilities such as collection centers, distribution of products, warehouse and cargo (5) supporting the network of farmers, farmers' institutes, and entrepreneurs as well as promoting the use of E-Logistics by applying innovation and agricultural technology and (6) encouraging government agencies to develop the logistics database system for farmers, farmers' institutes, and entrepreneurs (Ministry of Agriculture and Cooperatives, 2018). Improvement and development of logistics infrastructure is beneficial for the economy of a country. It is a key factor for economic growth and enhances efficiently delivery of products between producers and consumers (Raimbekov, Syzdykbayeva, Baimbetova& Rakhmetulina, 2016). Generally, the economic growth was an important contributor to poverty reduction (OECD, 2010). Hence,

it could be implied that improving logistics infrastructure results in farmers' well-being. The fourth hypothesis, therefore, is proposed:

H_4: Improving logistics infrastructure has a positive influence on farmers' well-being

Then, the conceptual framework for this study is proposed as illustrated in Figure 1.

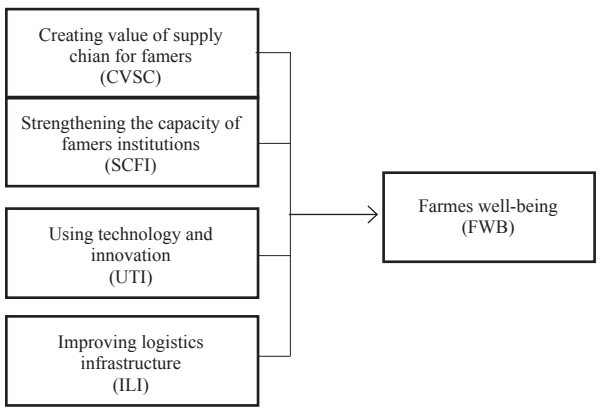

Figure 1 Conceptual framework

Research methodology

1. Sample

Pedhazur & Schmelkin (1991) recommended appropriate sample size for multiple regression analysis N ≥30k, where k is the number of predictors. Hence, the minimum sample size should be 120 (k = 4). In this study, the samples were 250 farmers in Suphanburi derived from simple random sampling. The average age of respondents was 51 years old. In terms of demographics, 50.80 percent of the respondents were female, 83.60 percent were married, the majority of them were primary school graduated accounting for 66.00 percent, and they have been working as farmers for 25 years as illustrated in Table 1.

Table 1 Demographic information of the samples

Demographic information	Frequency	Percentage
Gender		
Male	123	49.20
Female	127	50.80
Marital status		
Single	21	8.40
Married	209	83.60
Widowed	18	7.20
Divorced	2	0.80
Education background		
Primary school	165	66.00
Secondary school	46	18.40
High school	19	7.60
University/College	20	8.00

2. Measures

The questionnaire was sent to three experts to examine. The author employed item-objective congruence index (IOC) for evaluating content validity. According to the analysis, the IOC value of each item was higher than 0.50 indicating acceptable validity (Muneerat & Chinokul, 2014). Then, the pilot test was conducted by asking 30 participants to fill the questionnaire. The Cronbach's alpha of each construct was ranged from .800-.910 indicating a good and excellent reliability (George & Mallery, 2003).

3. Farmer's well-being (FWBQ)

Well-being of the farmers was measured using ten items of Farmers' Well-Being Questionnaire (FWBQ) developed by the authors. The alpha reliability of this measure was .800 indicating good reliability. Respondents were asked to rate their level of agreement with the response scale anchored by (1) strongly disagree and (5) strongly agree. Some items include "I am healthy," and "I have enough income and not in trouble," and "My family is happy and we do not fight."

4. Creating value of supply chains for farmers (CVSC)

Creating value of supply chains for farmers (CVSC) was measured using the five items of the Creating Value of Supply Chains for Farmer Questionnaire (CVSCQ) developed by the authors. This measurement revealed scores showing an alpha reliability of .857 indicating good reliability. Respondents were asked to rate their level of agreement with the response scale anchored by (1) strongly disagree and (5) strongly agree. Example items include "Government agencies have promoted the production of rice to meet the standards and the needs of the market," "Government agencies are promoting value-added for agricultural products, especially adding value to rice," and "Government agencies have promoted and established the rice market center and developed its system."

5. Strengthening the capacity of farmers' institutions (SCFI)

Strengthening the capacity of farmers' institutions (SCFI) was measured using the five items of the Strengthening the Capacity of Farmers' Institutions Questionnaire (SCFIQ) developed by the authors. This measurement revealed scores showing an alpha reliability of .886 indicating good reliability. Respondents were asked to rate their level of agreement with the response scale anchored by (1) strongly disagree and (5) strongly agree. Example items include "Government

agencies have promoted and supported agriculture in accordance with the philosophy of sufficiency economy," "Government agencies have promoted and developed the knowledge of farmers to be professional farmers," and "Government agencies help to promote and strengthen the farmers' networks to people in the community."

6. Using technology and innovation (UTI)

Using technology and innovation (UTI) was measured using the three items of the Using Technology and Innovation Questionnaire (UTIQ) developed by the authors. This measurement revealed scores showing an alpha reliability of .868 indicating good reliability. Respondents were asked to rate their level of agreement with the response scale anchored by (1) strongly disagree and (5) strongly agree. Example items include "Government agencies are promoting and supporting research, technology, and innovation in farming," "Government agencies have developed agricultural information technology and systematically linked the data," and "Government agencies promote the use of research, technology, and innovation to benefit farmers."

7. Improving logistics infrastructure (ILI)

Improving logistics infrastructure (ILI) was measured using the five items of the Improving Logistics Infrastructure Questionnaire (ILIQ) developed by the authors. This measurement revealed scores showing an alpha reliability of .910 indicating good reliability. Respondents were asked to rate their level of agreement with the response scale anchored by (1) strongly disagree and (5) strongly agree. Example items include "Government agencies have developed a logistics database system for farmers, farmers' institute, and entrepreneurs," "Government agencies have developed agricultural logistics facilities such as product collection and distribution centers for the benefit of farmers," and "Government agencies have supported the use of common agricultural infrastructure and logistics resources between farmers, farmers' institutes, and entrepreneurs to lighten cost burden, increase efficiency in logistics management, and promote the use of resources to create value."

8. Analysis

Stepwise multiple regression analysis was employed in this study since it is suitable for getting a regression model which has the fewest number of statistically significant independent variables. This technique is a modification of the forward selection so that after each step in which a variable was added, all candidate variables in the model are checked to see if their significance has been reduced below the specified tolerance level. If a non-significant variable is found, it is removed from the model. It also provides maximum predictive accuracy according to Hair, Black, Babin, & Anderson (2014). This technique requires four assumptions; there must be a linear relationship between the outcome variable and the independent variables, the residuals are normally distributed, the independent variables are not highly correlated with each other or no multicollinearity, and there should be no clear pattern in the distribution.

Results

1. Testing normal distribution

The multiple linear regression analysis requires that the errors between observed and predicted values should be normally distributed. The author employed skewness and kurtosis values to test the normal distribution of each item. According to Schmider, Ziegler, Danay, Beyer, & Bühner (2010), they recommended skewness and kurtosis values of less than |2.0| and |9.0| respectively. The analysis provided the skewness values ranging from .200-1.047 while the kurtosis ranging from .009-4.257. These values indicate normal distribution.

2. Testing linear relationship

The linearity assumption can best be tested with scatterplots. Figure 2 depicts the linear relationship between the independent and dependent variables.

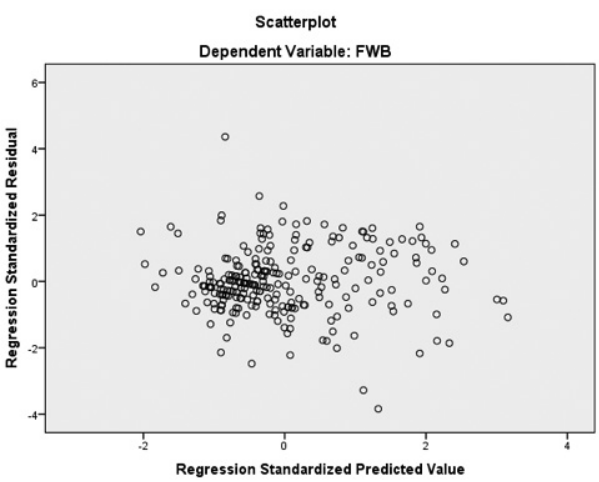

Figure 2 Testing linearity

3. Testing multicollinearity problem

The authors employed correlation matrix to test the multicollinearity problem. When computing a matrix of Pearson's bivariate correlations among all independent

variables, the magnitude of the correlation coefficients should be less than .80 indicating no high correlation among each independent variable. Table 2 shows that there is no correlation efficient that is higher than .80 indicating no multicollinearity problem.

Table 2 Correlation matrix among independent variable

		CVSC	SCFI	UTI	ILI
CVSC	Pearson Correlation	1	.555**	.515**	.573**
	Sig. (2-tailed)		.000	.000	.000
	N	250	250	250	250
SCFI	Pearson Correlation	.555**	1	.520**	.572**
	Sig. (2-tailed)	.000		.000	.000
	N	250	250	250	250
UTI	Pearson Correlation	.515**	.520**	1	.591**
	Sig. (2-tailed)	.000	.000		.000
	N	250	250	250	250
ILI	Pearson Correlation	.573**	.572**	.591**	1
	Sig. (2-tailed)	.000	.000	.000	
	N	250	250	250	250

** Correlation is significant at the 0.01 level (2-tailed).

4. Testing the homoscedasticity

The last assumption of multiple linear regression is homoscedasticity requiring there should be no clear pattern in the distribution. To test the homoscedasticity, a scatterplot of residuals versus predicted values was employed. The testing result indicates that the linear regression is homoscedasticity as depicted in Figure 3.

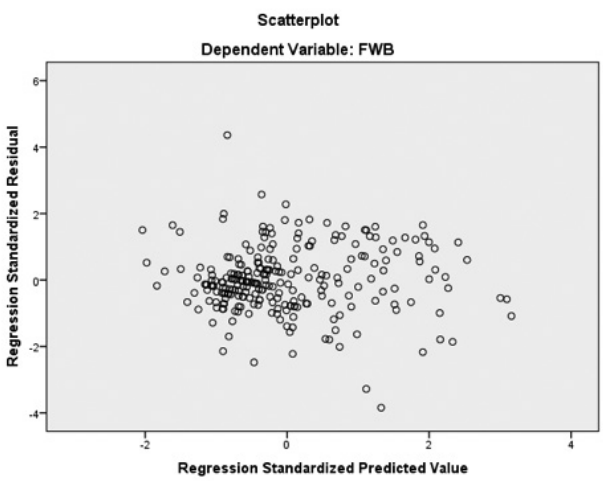

Figure 3 Scatterplot

5. Descriptive analysis results

The descriptive analysis results are presented in Table 3. The results indicate that farmer well-being (FWB) has the highest mean followed by using technology and innovation (UTI), creating value of supply chains for farmers (CVSC), strengthening the capacity of farmers' institutions (SCFI), and improving logistics infrastructure (ILI), respectively. According to Table 3, the farmers or respondents have a high level of well-being. However, their attitudes toward UTI, CVSC, SCFI, and ILI are quite moderate.

Table 3 Descriptive analysis results

Variable	Mean	Standard Deviation	Meaning
FWB	3.4756	.67289	High
CVSC	2.9456	.68554	Moderate
SCFI	2.9240	.75505	Moderate
UTI	3.0400	.83977	Moderate
ILI	2.8200	.81949	Moderate

According to the results, it could be implied that the farmers are happy with their lives. However, there is not much improvement in the logistics structure by the government as well as moderate use of technology and innovation, creating value of supply chain for farmers, and strengthening the capacity of farmers' institutions.

6. Stepwise multiple regression analysis results

For hypotheses testing, the authors employed stepwise multiple regression analysis to analyze the data. According to this analysis technique, each independent variable was added to the equation one by one according to its correlation with the dependent variable. Table 4 illustrates the Pearson's product moment coefficient between the independent variables and the dependent variable ranging from the highest of .331 (ILI) to the lowest of .265 (UTI). According to the analysis, improving logistics infrastructure (ILI) and strengthening the capacity of farmers' institutions (SCFI) were loaded into the equation, respectively. However, using technology and innovation (UTI), and creating value of supply chains for farmers (CVSC) were excluded from the equation.

Table 4 Correlations matrix

Variables		FWB	CVSC	SCFI	UTI	ILI
Pearson Correlation	FWB	1.000	.290	.326	.265	.331
	CVSC	.290	1.000	.555	.515	.573
	SCFI	.326	.555	1.000	.520	.572
	UTI	.265	.515	.520	1.000	.591
	ILI	.331	.573	.572	.591	1.000
Sig. (1-tailed)	FWB	.	.000	.000	.000	.000
	CVSC	.000	.	.000	.000	.000
	SCFI	.000	.000	.	.000	.000
	UTI	.000	.000	.000	.	.000
	ILI	.000	.000	.000	.000	.

To test the significance of the model, an ANOVA test was conducted as illustrated in Table 5 and Table 6. Based on the ANOVA test results, the model was found to be statistically significant with the significant value of .005. The R square is .137 and F is 19.653 indicating that the independent variables (ILI and SCFI) jointly explained 13.00 percent of the variance in the dependent variable (FWB) ($F=19.653$, $p < .05$).

Table 5 Model summary of multiple regression analysis

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.331[a]	.109	.106	.63635	.109	30.415	1	248	.000
2	.371[b]	.137	.130	.62752	.028	8.029	1	247	.005

a. Predictors: (Constant), ILI
b. Predictors: (Constant), ILI, SCFI

The F-ratio in the ANOVA (Table 6) tests whether the overall regression model is a good fit for the data. The table shows that the independent variables statistically significantly predict the dependent variable, $F(1, 248) = 30.415$, $p (.001) < .05$ (i.e., the regression model is a good fit of the data).

Table 6 ANOVA[a]

	Model	Sum of Squares	df	Mean Square	F	Sig.
1	Regression	12.316	1	12.316	30.415	.000[b]
	Residual	100.425	248	.405		
	Total	112.741	249			
2	Regression	15.478	2	7.739	19.653	.000[c]
	Residual	97.263	247	.394		
	Total	112.741	249			

a. Dependent Variable: FWB
b. Predictors: (Constant), ILI
c. Predictors: (Constant), ILI, SCFI

The final model indicates that strengthening the capacity of farmers' institutions (SCFI) and improving logistics infrastructure (ILI) were the most important factor affecting the farmers' well-being (FWB), respectively. However, using technology and innovation (UTI), and creating value of supply chains for farmers (CVSC) had no impact on the farmers' well-being (FWB) as illustrated in Table 7.

Table 7 Coefficients of multiple regression analysis

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.710	.144		18.758	.000
	ILI	.271	.049	.331	5.515	.000
	(Constant)	2.449	.170		14.423	.000
2	ILI	.175	.059	.214	2.966	.003
	SCFI	.182	.064	.204	2.834	.005

a. Dependent Variable: FWB

A one unit increase in improving logistics infrastructure (ILI) is associated with a 0.175 unit increase in the farmers' well-being (FWB) holding the capacity of farmers' institutions (SCFI) constant. In addition, each additional unit of the capacity of farmers' institutions (SCFI) is associated with a 0.182 unit increase in the farmers' well-being (FWB) holding the improving logistics infrastructure (ILI) constant.

Discussion

The findings indicate that using technology and innovation (UTI) does not affect the farmers' well-being which is inconsistent with the World Development Report (World Bank, 2016) who stated that the development of ICTs support allows more people and firms to participate in markets by creating more productivity , and benefits. Also, it does not support the finding of Dixie & Jayaraman (2011), Karippacheril, Rios& Srivastava (2011), Grossman & Tarazi (2014), and Jack & Suri (2014). This could be implied that implementing technology and innovation for agricultural sectors is still very low in Thailand. The farmers may not be familiar with using high technology and innovation to improve the way of growing rice. Hence, they feel that this factor is not important for achieving higher productivity .

Creating value of supply chains for farmers (CVSC) is also unassociated with farmers' well-being. It is inconsistent with the FAO (2014) who suggested that the development of the value chain will reduce the costs of food products to consumers or increase their benefits. It does not support Namkham & Booncharoen (2017) who claimed that farmers' households can be self-reliant if there is a presence of creating value of supply chains for farmers. This may imply that the Thai farmers have a limited understanding about logistics and supply chain. In addition, provision of logistics and supply chain is based on the benefits of the rich rather than the poor since the rich people have more power to influence the policy makers.

The finding of this study indicates that strengthening the capacity of farmers' institutions is the most influential factors affecting the farmers' well-being.

This result is consistent with the study of Msuta & Urassa (2015) who found that farmers' organizations contributed positively to their members' well-being. Moreover, improving logistics infrastructure was also an influential factor affecting the farmers' well-being. This is consistent with the study of Raimbekov, Syzdykbayeva, Baimbetova & Rakhmetulina (2016) who found that improving logistics infrastructure is a key factor for economic growth and enhances efficient delivery of products between producers and consumers. Then, the economic growth was an important contributor to poverty reduction (OECD, 2010) leading to well-being of the farmers. Therefore, government agencies both in national, regional, and provincial level should place importance on integrated farmers' network which consists of farmers, farmers' institutes, and firms so they can share information and logistics resources. Promotion and support of agriculture in accordance with the philosophy of sufficiency economy should be provided by the government agencies so the farmers will receive and develop their knowledge to become a professional farmer and make them proud of their occupation. Provision of logistics infrastructure such as logistics service center, storage, distribution, and transportation of agricultural products would be beneficial for the farmers and relevant stakeholders that will promote the well-being of farmers as well. Finally, policy makers should pay more attention on farmers' demands prior to making a decision on any famer-related policies. The author expects that this research model would be beneficial for both academics and related organizations to apply the results of this research. Researchers and scholars can apply this model in their future research. Also, there should be a study conducted in other regions or wider areas of the country so the samples can represent the whole country population. In addition, interview approach can be applied to collect in-depth information to support or validate the results derived from quantitative approach.

References

Breslow, L. (1972). A quantitative approach to the World Health Organization definition of health: Physical, mental and social well-being. *International Journal of Epidemiology, 1*(4), 347-355.

Charoonpipatkul, N. (2018). Exposing Thailand's logistics system. *Focused and quick, 134*(August), 1-8.

Dixie, G., & Jayaraman, N. (2011). Strengthening agricultural marketing with ICT. Retrieved April 1, 2020, from http://ai3.itb.ac.id/~basuki/presentasi/ICT%20&%20Agri/Section%203/final_Module9_Assessing%20Market%20and%20Value%20Chains_Strengthening%20Agricultural%20Marketing%20With%20ICT.pdf

FAO (2014). *Developing sustainable food value chains: Guiding principles.* Retrieved May 8, 2019, from http://www.fao.org/3/a-i3953e.pdf

Gasper, D. (2004). *Subjective and objective wellbeing in relation to economic inputs: Puzzles and responses. WeD Working Paper 09*. Bath, UK: Wellbeing in Developing Countries ESRC Research Group (WeD).

George, D., & Mallery, P. (2003). *SPSS for Windows step by step: A simple guide and reference.* 11.0 update (4th ed.). Boston: Allyn & Bacon.

Grossman, J., & Tarazi, M. (2014). *Serving smallholder farmers: Recent developments in digital finance.* Washington, DC: CGAP (Consultative Group to Assist the Poorest).

Hair, J.F., Black, W.C., Babin, B.J., & Anderson, R.E. (2014). *Multivariate data analysis* (7th ed.). Essex, UK: Pearson Education Limited.

Helliwell, J. F., & Putnam, R. D. (2004). The social context of well-being. *Philosophical Transactions of the Royal Society B: Biological Sciences, 359*(1449), 1435-1446.

Jack W, & Suri T. (2014). Risk sharing and transaction costs: Evidence from Kenya's mobile money revolution. *American Economic Review, 104*(1), 183-223.

Kaplinsky, R., & M. Morris. (2001). *A Handbook for value chain research*. Prepared for the International Development Research Centre, Ottawa

Karippacheril, T.G., Rios, L.D., & Srivastava, L. (2011). *Global markets, global challenges: Improving food safety and traceability while empowering smallholders through ICT.* Retrieved April 1, 2020, from https://elibrary.worldbank.org/doi/10.1596/978-1-4648-1002-2_Module11

Kittisuksathit, S. (2017). *HAPPINOMETER: Happiness self-measuring tool.* Nakhon Pathom: Institute for Population and Social Research, Mahidol University. Inequality in rice farmers' access to a government assistance program in rural Thailand

Laiprakobsup, T. (2017). Inequality in rice farmers' access to a government assistance program in rural Thailand. *Asian Politics & Policy, 9*(3), 442-461

Ministry of Agriculture and Cooperatives. (2018). *Thailand's master plan for logistics and supply chain development for agriculture (2017-2021)*. Bangkok: Ministry of Agriculture and Cooperatives.

Muneerat, P., & Chinokul, S. (2014). The development of English reading materials using inference strategies instruction to enhance English reading comprehension ability of upper secondary students: A case study of tenth grade students of Chonkanyanukoon School. *An Online Journal of Education, 9*(1), 521-533.

Msuta, P.B., & Urassa, J.K. (2015). The contribution of farmers' organizations to smallholder farmers' well-being: A case study of Kasulu district, Tanzania. *African Journal of Agricultural Research, 10*(23), 2343-2349.

Namkham, N., & Booncharoen, S. (2017). Supply chain management, Chao Phraya River Community Enterprise Group. *Industrial Technology Lampang Rajabhat University Journal, 10*(1), 40-49.

OECD. (2010). *Economic importance of agriculture for poverty reduction.* Retrieved May 8, 2019, from https://www.oecd.org/brazil/44804637.pdf

OECD. (2011). *How's life? Measuring well-being.* Retrieved May 7, 2019, from https://unstats.un. org/unsd/broaderprogress/pdf/How's%20life%20-%20Measuring%20well-being.pdf

Pedhazur, E. J., & Schmelkin, L. P. (1991). *Measurement, design, and analysis: An integrated approach*. Hillsdale, NJ: Lawrence Erlbaum Associates.

Peel, D., Berry, H.L., & Schirmer, J. (2016). Farm exit intention and wellbeing: A study of Australian farmers. *Journal of Rural Studies, 47*(2016), 41-51.

Pollard, E., & Lee, P. (2003). Child well-being: a systematic review of the literature. *Social Indicators Research, 61*(1), 9-78.

Promphakping, B. (2012). Well-being. *Journal of Humanities and Social Science, 29*(2), 23-50.

Raimbekov, Z., Syzdykbayeva, B., Baimbetova, A., & Rakhmetulina, Z. (2016). *Evaluating the impact of logistics infrastructure on the functioning and development of regional economy.* Retrieved May 8, 2019, from https://www.researchgate.net/publication/309093273_Evaluating _the_impact_of_logistics_infrastructure_on_the_functioning_and_development_of_regional_economy

Ryff, C. D. (1989). Happiness is everything, or is it? *Journal of Personality and Social Psychology, 57*(6), 1069-1081.

Schmider, E., Ziegler, M., Danay, E., Beyer, L., & Bühner, M. (2010). Is it really robust? Reinvestigating the robustness of ANOVA against violations of the normal distribution assumption. *Methodology: European Journal of Research Methods for the Behavioral and Social Sciences, 6*(4), 147-151.

World Bank. (2016). *World development report 2016: Digital dividends.* Washington, D.C.: World Bank.

World Bank. (2018). *International LPI 2018.* Retrieved May 6, 2019, from https://lpi. worldbank.org/international.