Supply Chain Performance Evaluation for Regional Longan Growers under Thailand–China FTA

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Abstract. After Thailand and China agreed the ASEAN framework under Free Trade Agreement (FTA) since 2003, the FTA program has been applicable on agricultural produce since then. Objectives of the research are to investigate the supply chain performance of regional longan growers under Thailand–China FTA. Based on current literature review, we develop a framework for measuring effective factors of collaborative supply chain and supply chain performance. From empirical study of fifty five hundred longan growers in Thailand (Northern and Eastern areas) are selected. Questionnaires was developed by Q-sort technique , and the values of Cohen's Kappa coefficients are 61% and 72% in the first and second round respectively, indicate that this high percentage results are validated for all dimensions and can be used in a large-scale survey. Moreover, the reliability test by Cronbach's Alpha of overall factors is 0.82 showing that the internal consistency of the items for all dimension is high. As a significant result; this paper shows longan growers in eastern area have stronger good performance than those in northern area in four factors namely, supply chain performance, collaborative supply chain, supply chain process, and business strategy. Nevertheless, the results from regression analysis confirm the relationship of the factors in four models. Lastly, the results of the study show the competency of Thai longan growers is not strong and this can stimulate more interests both at international business level and agriculture business level.

Keywords: Longan, Supply Chain Performance, Collaborative Supply Chain and Export

1. Introduction

Thailand has exported longan to international market during 2005 – 2009, the volume was 120,000 - 220,000 tons per year; and the value was 2,100 – 3,500 billion Baht; the average of growth rate was 20 % per year, and China is the main international market (80% of export longan).[8] Therefore; the longan export of Thailand should be improved to support the demand of international market that is increasing every year. Although, Thailand and China have increased the cooperation in international trade by FTA program that focuses on all vegetable and fruit products on October 1, 2003. The report of Ministry of Commerce of Thailand in 2005 showed many non tariff barrier such as the high rate taxation by local government(vat 13%), reliability of auditing of AQSIQ, transportation mode, and currency exchanging etc[17],[18]. Therefore, the collaboration between business partners of two countries should be improved by using supply chain management techniques. This paper, then, tries to find the supply chain performance of longan export of Thailand under FTA situation between Thailand and China. The results of study be shown benefits in supply chain management of two countries and decrease the barriers of international trade.

2. Performance Evaluation

Stock & Lambert [7] described the meaning of SCM as the integration of key business processes from end users through suppliers that provide products, services, and information that add value for customers and other stakeholders. Gunasekaran, A.et al[2] propose the framework to promote a better understanding of the importance of SCM performance measurement and metrics. They also explain the attribute of supply

chain in new era because supply chain management (SCM) has been a major component of competitive strategy to enhance organizational productivity and profitability. Simatupang, T.M. and Sridharan [12],[14] describe that supply chain collaboration facilitated the cooperation of participating members along the supply chain to improve performance. In addition; they also present the framework for collaborative enablers that depict the linkage between collaborations enablers, supply chain processes and supply chain performance. As a result, the collaborative enablers drive the shared supply chain processes that lead to better supply chain performance. Berhard J. Angerhofer al et [1] present a model and a performance measurement system for collaborative supply chains; and also, explain the benefits of collaborative supply chain(CSC) that is used to gain competitive advantage ,by improving overall performance through taking a holistic perspective of the supply chain. The model of CSC has six constituents: stakeholders, processes, business strategy, enabling technology, and level of collaboration, process. Pongchai[10] finds that Information technology(IT) , information sharing and trust are positive related to effective collaboration. A number of researcher has studied the relationship between trust and collaborative supply chain (Mehrjerdi [8]; Niklas Myhr et al., [10] ; Thechatakerng, S. and Rialp, J.[13];Kumar et al.[5]). Trust is the degree to which partners perceive each other as credible and benevolent and is expected to have a positive effect on the degree of collaboration in supply chain relationships. Ying-Pin Yeh [15] focuses on the decision of suppliers and customers and the services that depend on the communications channel via electronic technology such as the Internet, EDI, Telephone, Fax et al. Therefore, communication is one factor that should affect collaborative supply chain. J. Saengadsapaviriya and C. Jungthirapanich [3] present the framework that shows the relationship between FTA regulation factor and collaborative supply chain. FTA regulations factors and agricultural business factors are developed from FTA situation reported of Ministry of Commerce and Ministry of Agricultural and Cooperative [16] ,[17], [18]. In addition, J. Saengadsapaviriya [4] also present the results of measurements from that framework which is referred to above. The statistical analysis shows that Thai longan growers have level of operations of collaborative supply chain management and supply chain performance at moderate level.The experiment also show the factor analysis results. There are 66 items in the seven factors . Factor loading each item ,that is greater than or equal to 0.30, is the criteria for selection. The results show that there were 13 components that had Eigen value greater than or equal to 1. The Fullfillment / Responsiveness /Delivery is first order component and Eigen value = 17.850, Trust is second order component and Eigen value = 5.909. Decision synchronization is third order component and Eigen value = 3.40. And Information sharing is thirteen order component and Eigen value =1.05. The cumulative variance explained by the seven factors was 67.048 which is technically acceptable.

3. Research Methodology

3.1 Research Design: Both quantitative and qualitative research methodology are employed.

3.2 Study Areas: Based on database of Ministry of Agricultural and Cooperative of Thailand, the populations of study is longan grower. The study areas is longan plantation area for exported which be located in Northern area (Chiangmai , Lamphoon), and Eastern area(Chantaburee).

3.3 Tools: Interviews form or questionnaires were developed through literature review and Q-sort techniques for validation test were applied, then questionnaire pre-test for reliability was also been used.

4. Regional Areas Model

Based on conceptual framework was developed by J. Saengadsapaviriya [4], a model of performance comparison is created to compare the performance of the two regional areas: Northern and Eastern areas through the process of supply chain performance measurement as shown in Fig. 1.
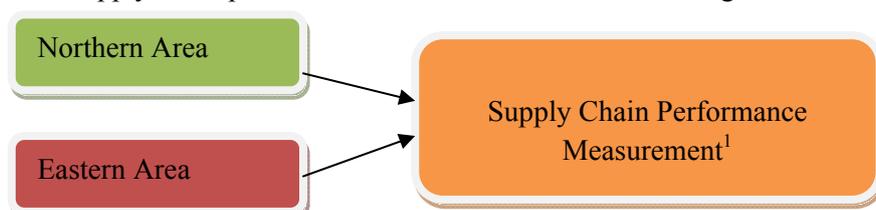

Fig 1. Model of performance comparison (Note that Supply Chain Performance Measurement is shown in Fig 2)

5. Results the evaluation

Based on statistical analysis (t-test) , there are a significant difference between longan growers in northern area and eastern area in operations level of mean in four factors,namely, supply chain performance, supply chain process, collaborative supply chain ,and business strategy at level significance 0.05. The mean values indicates that longan growers in eastern area are greater than longan growers in northern area. Meanwhile, there are no difference between longan growers in northern area and eastern area in operation level of mean in three factors, namely, trust, communication, and level of collaboration as shown in table I. In summary, it indicates that eastern longan growers have better performance and stronger level of operations than northern longan growers in business performance in four factors (1 to 4). Meanwhile, there are no difference in three factors (5 to 7), and the performances in both areas are poor.

Table I. Independent t-test output

	Northern area $n_1 = 500$		Level of operations	Eastern area $n_2 = 55$		Level of operations	t-test	sig
	Mean	SD		Mean	SD			
1. Supply chain performance	3.1077	0.7685	Moderate	3.4566	0.7709	High	3.195	0.010*
2. Collaborative supply chain	2.7641	0.7825	Moderate	3.1323	0.7056	Moderate	3.343	0.000*
3. Supply chain process	3.1859	0.7315	Moderate	3.6976	0.7166	High	4.962	0.000*
4. Business strategy	3.1254	0.8472	Moderate	3.5068	0.6699	High	3.228	0.001*
5. Trust	2.4600	0.9257	Low	2.6788	0.7914	Moderate	1.683	0.092
6. Communication	2.5012	0.9440	Low	2.4327	0.9331	Low	0.511	0.609
7. Level of collaboration	2.4852	0.8755	Low	2.4364	0.7130	Low	0.399	0.690

Note * = significance difference at 0.05

5.2 From regression analysis outputs (Table II to IV) and multiple regression analysis output (Table V), we can conduct in order to confirm the results by dividing our computation into four models as listed in the following equations. Note that Model I, II and III derive from the regression analysis outputs while the only last Model V is from multiple regression table V.

$$Model \quad I \qquad Y_i = 1.268 + 0.579 A_i \qquad 1.1 \quad All \ areas$$

$$Y_i = 1.369 + 0.564 A_i \qquad 1.2 \quad Eastern \ area$$

$$Y_i = 1.275 + 0.575 A_i \qquad 1.3 \quad Northern \ area$$

$$Model \ II \qquad Y_i = 1.268 + 0.579 B_i \qquad 2.1 \quad All \ areas$$
$$Y_i = 1.369 + 0.564 B_i \qquad 2.2 \quad Eastern \ area$$
$$Y_i = 1.511 + 0.578 B_i \qquad 2.3 \quad Northern \ area$$
$$Model \ III \qquad A_i = 1.695 + 0.555 B_i \qquad 3.1 \quad All \ areas$$
equation of Eastern area 3.2 can not fit at level of significance 0.05

$$A_i = 1.634 + 0.561 B_i \qquad 3.3 \quad Northern \ area$$

$$Model \ IV \quad B_i = 0.829 + 0.370x_1 + 0.201x_2 + 0.123 x_3 \qquad All \ areas$$
$$B_i = 0.880 + 0.432x_1 + 0.302x_2 \qquad Eastern \ area$$
$$B_i = 0.853 + 0.356x_1 + 0.209x_2 + 0.113x_3 \qquad Northern \ area$$

where Y_i = Supply Chain Performance, A_i = Supply Chain Process, B_i = Collaborative supply chain management, x_1 = Business strategy, x_2 = Level of collaboration, x_3 = Trust , x_4 = Communication

Based on statistical report in Table II, the results are shown that supply chain process has correlated with supply chain performance in northern area, eastern area, and all area 54.8%,49.2%,55.5 % respectively (R=0.548, 0.492, 0.554) , and they explain variance in supply chain performance in northern area, eastern area, and all area 30%, 24.2% ,30.6 % respectively (R2=0.300, 0.242, 0.306). In addition; supply chain

process was significant predictors of supply chain performance in equation 1.1(b_i = 0.579, t = 15.632 , sig =0.000), equation 1.2(b_i = 0.564, t = 14.602 , sig =0.000), and equation 1.3(b_i = 0.575, t = 14.602 , sig =0.000).

Table II. Regression analysis output Model I

	Northern area	Eastern area	All areas
R^2	0.300	0.242	0.306
R	0.548	0.492	0.554
Y-intercept	1.275	1.369	1.268
bi	0.575	0.564	0.579
	t = 14.602 , sig =0.000	t = 14.602 , sig =0.000	t = 15.632,sig=0.000

Note : Y_i = Supply Chain Performance , A_i = Supply Chain Process

Based on statistical report in Table III, the results are shown that supply chain process has correlated with supply chain performance in northern area, eastern area, and all area 58.8%,49.2%,55.4 % respectively (R=0.588, 0.274, 0.568) , and they explain variance in supply chain performance in northern area, eastern area, and all area 34.6%, 7.5% ,32.3 % respectively ($R2$=0.346, 0.075, 0.323). In addition; supply chain process was significant predictors of supply chain performance in equation 1.1(b_i = 0.579, t = 16.231, sig =0.000) , equation 1.2(b_i = 0.30, t = 2.076 , sig =0.043), and equation 1.3(b_i = 0.563, t = 15.632 , sig =0.000).

Table III. Regression analysis output Model II

	Northern area	Eastern area	Total
R^2	0.346	0.075	0.323
R	0.588	0.274	0.568
Y-intercept	1.511	2.518	1.566
bi	0.578	0.30	0.563
	t = 16.231602 , sig =0.000	t = 14.602 , sig =0.000	t = 15.632,sig=0.000

Note : Y_i = Supply Chain Performance , B_i = Collaborative supply chain management

Based on statistical report in Table IV, the results are shown that supply chain process has correlated with supply chain performance in northern area, eastern area, and all area 60.18%,25.8%,58.1 % respectively (R=0.601, 0.258, 0.581) , and they explain variance in supply chain performance in northern area, eastern area, and all area 36.1%, 6.6% ,33.8 % respectively ($R2$=0.361, 0.066, 0.338). In addition; collaborative supply chain is significant predictors of supply chain performance in equation 1.1(b_i = 0.561, t = 16.761 , sig =0.000), equation 1.2(b_i = 0.236, t = 1.942 , sig =0.057), and equation 1.3(b_i = 0.555, t = 16.787, sig =0.000).

Table IV. Regression analysis output Model III

	Northern area	Eastern area	Total
R^2	0.361	0.066	0.338
R	0.601	0.258	0.581
Y-intercept	1.634	2.898	1.695
bi	0.561	0.236	0.555
	t = 16.761 , sig =0.000	t = 1.942 , sig =0.057*	t = 16.787,sig=0.000

Note : A_i = Supply Chain Process , B_i = Collaborative supply chain management
*= non-significance

Based on statistical report in Table V, the results are shown that supply chain process has correlated with supply chain performance in northern area, eastern area, and all area 59.4%,59.1%,60.0 % respectively (R=0.594, 0.591, 0.600) , and they explain variance in supply chain performance in northern area, eastern area, and all area 35.2%, 34.9% ,36.0 % respectively ($R2$=0.352, 0.349, 0.360). In addition; collaborative supply chain is significant predictors of supply chain process in equation 1.1(b_i = 0.579, t = 15.632 , sig =0.000) equation 1.2(b_i = 0.564, t = 14.602 , sig =0.000), and equation 1.3(b_i = 0.575, t = 14.602 , sig =0.000).

Table V. Regression analysis output Model IV

	Northern area	Eastern area	Total
R^2	0.352	0.349	0.360
R	0.594	0.591	0.600
Y-intercept	0.853	2.880	0.829
b_l(BS)	0.356	0.432	0..370
	t = 9.761 , sig =0.000	t = 3.442 , sig =0.001	t = 10.614,sig=0.000

	0.209	0.302	0.201
b_2 (Level)	t = 5.430 , sig =0.000	t = 2.564 , sig =0.013	t = 15.632,sig=0.000
b_3(Trust)	0.113 t = 5.430 , sig =0.000	nonsig *	0.123 t = 3.611,sig=0.000
b_4(Com)	nonsig *	nonsig *	nonsig *

Note : C_i = Collaborative supply chain management , x_1 ＝ Business strategy(BS), x_2 = Level of collaboration(Level), x_3 = Trust, x_4 = Communication (Com), nonsig = non-significance

6. Conclusions

This paper shows that longan grower in eastern area shows the level of performance in four factors (supply chain performance , collaborative supply chain ,supply chain processes, and business strategy) stronger than northern area at level of significance 0.05 . In addition, the regression analysis results in Model I to IV, they are shown supply chain process and collaborative supply chain have significance related to supply chain performance all area in Model I, Model II, And collaborative supply chain has significance related to supply chain process all area in Model III. Lastly, Model IV is shown three factors such as business strategy, level of collaboration ,and trust that be fitted in multiple regression equation in northern area, and all area. Meanwhile, there are only two factors namely, business strategy, and level of collaboration be fitted in multiple regression equation in eastern area. It indicates that affecting factors of collaborative supply chain are varied by area of plantation or geographic factor.

Therefore, to make the study more beneficial for all parties concerned, the future researcher should study in the first and second tiers customers in group from stakeholder in supply chain such as consolidators and exporters, that are business frontier, and have to fellow FTA regulation. Therefore;   we can plus FTA regulation factors to framework ,and measuring the results. In addition, the Chinese importers should also be observed by qualitative research. We expect that the results demonstrated the weak and strength points from Thailand and China to promote the international trade under the FTA situation.

7. Acknowledgment

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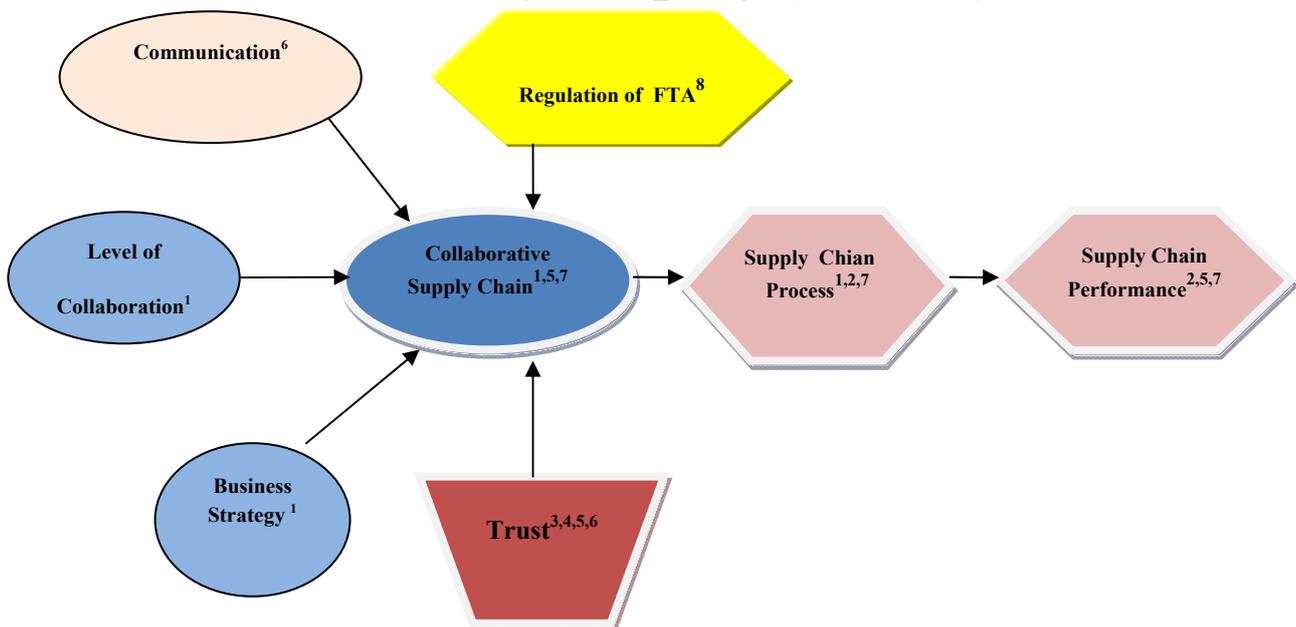
Figure 2.   Conceptual framework of Collaborative Supply Chain Performance
Source: Adopted from A. GB.J. Angerhofer, M.C. Angelides [1] (2005); Gunasekaran, A [2] .,et al(2004); Pongchai [3] (2002); Niklas Mynr . et al [4] (2005) ; Mehrjerdi [5] (2009) Ying-Pin Yeh [6] (2005); Simatupang and Sridharam [7] (2004);J. Saengadsapaviriya [8] (2007,2011)