Determining The Elements in Supply Chain Model of The Malaysian Agricultural Co-operatives

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ABSTRACT

In Malaysia, cooperatives are viewed as a developing sector, yet agricultural cooperatives are still lagging behind in terms of a number of factors mainly in supply chain system. Thus, this study attempts to examine the elements contributing to the supply chain model in Malaysian agricultural cooperatives. The primary data is collected via survey using questionnaire from agricultural-based cooperatives, farmers' cooperatives and fishermen's cooperatives. Factor analysis and structural equations modeling were used to analyze the data. Findings show quality, technology and marketing, logistic, governance and quality of workforce, suppliers and optimum level of production, quality work life and efficient technology and experienced and trained worker are significant in determining the supply chain of Malaysian agricultural cooperatives.

Keywords: Agricultural cooperatives, supply chain model

INTRODUCTION

Cooperatives are one of the tertiary economic institutions other than government and private sector. The cooperatives sector has developed from many aspects, including the number of cooperatives, membership, asset and capital. From 1990-2007, the number of cooperatives has increased 70.7% from 3,028 to 5,170 (showing annual growth rate of 3% per annum). Its members increased in a progressive rate from 3.3 million to 6.3 million members (that is a fifth of Malaysian population in 2008). Capital and asset also show enormous increased. Capital has improved 5 times from RM1.6 billion to RM7.8 billion and asset has jumped 7 times from RM6.1 billion

to RM47.4 billion in the period. The cooperatives activities include banking, credit/ finance, consumer, industrialization, services and others (SKM, 2008).

However, compared to the other sectors, the developments of agricultural cooperatives are relatively slow, that is the number of agriculture based cooperatives has reduced more than doubled, from 1,111 in the year 1978 to 553 in the year 2008. Fishermen's cooperatives show similar result; the number of cooperatives has reduced from 51 in the year 1973 to only 35 in the year 2008 (SKM, 2008).

The main problem of the poor performance of agricultural cooperatives is attributed to institutional change, such as change of management board and reconstitution of the law of cooperative. However, the institutional change is a factor that is independent, which is outside of control of cooperatives. The other important factors that determine growth are macroeconomic and micro management, including management of supply chain system in the agricultural cooperatives. An effective management of the supply chain system will determine the performance of agricultural cooperatives (Fatimah et al., 2009). Management of supply chain system and the elements that determine the supply chain is a factor that a cooperative can control. The need to conduct this study is to reform the supply chain of cooperatives and thus able to improve the lives of fishermen and small entrepreneurs.

Supply chain system is defined as "planning, coordination and control to all business process in the supply chain system to provide the highest value to the consumer at the lowest cost and at the same time to give the highest return to the stakeholder" (Van der Vorst, 2000, pp. 10). In this context, supply chain is a series of physical activity and the decision maker is incorporated in the flow of goods, information, rights on goods is covered on all levels and the participant of the organization.

In the context of this definition, supply chain is a series of physical activities and decision making is united with good flows, information, rights on goods throughout all levels and the participant of the organization. The supply chain combines various mediator and entities for example factories and its suppliers, logistics, warehouse, wholesaler, processor and consumer. Thus the supply chain can be defined from the perspective of "network" that connects various participant (or agent or entity) in the industry. Supply chain can also be defined as "a network between business entity that is responsible of procurement activity, production and distribution of output of various related output" (Billington, 1994).

Every entity in the chain has different objective and limitations, but they need and depend on each other to make sure the supply chain reached its objective, such as

on time delivery, quality and minimizing cost. Thus the performance of every entity in the supply chain depends on the performance of other entity and their willingness and ability to coordinate the activities in the supply chain (Swamintahan et al., 1998).

In reality, for an entity to maximize profit in business it has to take a strategy that will bring benefit to their own entity without disrupting the supply chain system performance. Based on the supply chain system definition in the literature, studies have identified seven main elements that have been main indicators that determine the system. These elements are individual, supplier, governance, marketing, quality system, technology and logistics.

The management of the performance in the supply chain is important at both level of individual and organizational. The management of the performance of supply chain system can be defined as a cycle covering problem identification, understanding main problem, taking decision to overcome the problem, validating the data and process (Kuei et al., 2002). Among the important management aspects are delivery cost, efficiency, fast response, high quality services and quality of goods. The management of performance has to be done by all parties in various levels in an organization.

However, there has been no specific study in determining the supply chain model for agriculture cooperatives. The significance and contribution of this study is to focus on micro management aspect and upgrade the role of cooperatives in development of agricultural industries.

OBJECTIVES OF THE STUDY

The main objective of this study is to analyze the supply chain model of agricultural cooperatives especially agriculture-based cooperatives, farming cooperatives and fisherman cooperatives. The specific research objective is:

1. To analyze the factors that contributed to the cooperatives supply chain; and
2. To determine elements in supply chain that contributes significantly to agricultural cooperatives in Malaysia.

METHODOLOGY

To measure the performance of management in supply chain system, determining factor or Key Performance Indicator (KPI) is used. KPI is an important indicator to measure the achievement of main business in a company. It helps an organization to measure the progress of the organization in achieving its objective. KPI can be

calculated and it mirrors a main success factor in an organization. There are various aspects and methods in measuring KPI in the literature (Beamon, 1999).

Based on a few selected studies, five KPI has been chosen as a measure to the performance of every element in the supply chain. The combination of KPI for every element is shown in Figure 1. These KPI are:

KPI1 ——→Cycle Time Scale
KPI2 ——→Cost
KPI3 ——→Quality / Standard compliancy
KPI4 ——→Knowledge/ Skill/ Efficiency
KPI5 ——→Customers' Feedback

(Van der Vorst (2000), Billington (1994) and Fatimah et al., 2009)

Cycle time scale refers to time needed to complete a business process. This factor is also a determinant of competitiveness of a company where a cooperative has to make sure product or services is ready in less time than offered by competitor so that customer's satisfaction is guaranteed (Van der Vorst (2000), Billington (1994) and Fatimah et al., 2009).

Cost covers operational cost such as cost that is associated with production, processing and marketing. This factor will eventually became a determinant for acquired profit level after it is deducted from acquired revenue (Van der Vorst (2000), Billington (1994) and Fatimah et al., 2009).

Quality refers to reliability towards quality of goods provided. In this context, compliance to standard or specification and honest relationship between supplier and buyer is important to ensure the quality of the good and consistent service and reliability. Emphasis on this factor is important for the long term relationship between cooperatives, supplier, distributor and customer (Van der Vorst (2000), Billington (1994) and Fatimah et al., 2009).

Knowledge, Skill and Efficiency refer to the skill of an individual that is competitiveness and ability of a worker in dealing with others. It is also referred to as tact in consulting, communicating, and making decision and dealing with customers or suppliers (Van der Vorst (2000), Billington (1994) and Fatimah et al., 2009).

Customers' Feedback refers to perception of the customer to the value of the goods and services provided by cooperatives. Customers' perception is important because

it determines the strength of customer satisfaction and relationship with the company that will probably increase customers' loyalty in the future. Customer satisfaction also refers to the ability of the organization to give quality services to its customer through its supply chain system (Van der Vorst (2000), Billington (1994) and Fatimah et al., 2009).

This study will evaluate the connection of the elements in supply chain model and its importance in influencing performance of agricultural cooperatives taking into account the role of KPI as mediator. The model framework is shown as below in Figure 1.

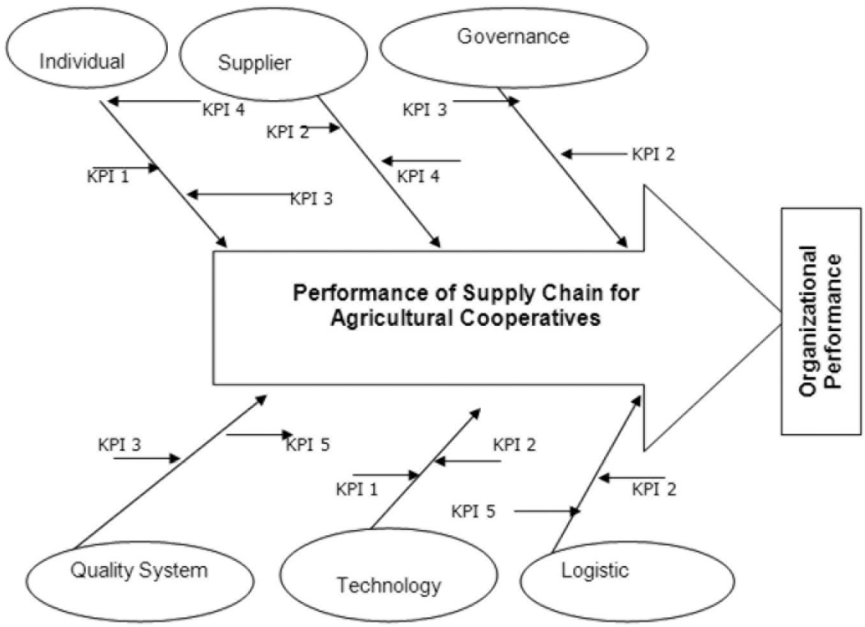

Figure 1: A model framework of supply chain system for agricultural cooperatives

Selected cooperatives and respondent's profile has been examined by percentile analysis and frequency table. To evaluate the element of the supply chain model, reliability mean analysis has been used by related variable and identified KPI.

The model framework is assessed as a basic model to construct the latent variable or contributing factors of supply chain performance management of agricultural cooperatives. The data was collected using survey, where cluster sampling technique was used as it is more cost-effective to select respondents in groups or clusters by their geographical areas.

RESULT AND DISCUSSION

The respondents were selected by cluster sampling by region from agriculture cooperatives throughout the states in Peninsular Malaysia, Sabah and Sarawak. The names of agriculture cooperatives are obtained from Malaysia Commissioner of Cooperatives. The respondents are representative from upper level management of the agricultural cooperative, such as a member of the board of director or manager of the respective cooperative.

The study has interviewed 252 respondents from 192 cooperatives via survey who were asked to determine the importance of elements in supply chain based on 5-item likert scale. The distribution of respondents according to cooperatives are 152 respondents from agriculture based cooperatives, 12 respondents from fishermen's cooperatives and 88 respondents from farmer's cooperatives. The distribution of cooperatives that were interviewed is 118 agriculture based cooperatives, 7 fishermen's cooperatives and 67 farmer's cooperatives.

A brief background of respondent's socio economic profile can be described as follows. Majority of respondents (88.1%) are male and the rest is female, while more than half of the respondents (65.2%) are in upper level management. Majority of the respondents (74.3%) is more than 50 years old. Meanwhile, on education level only 11.3% graduates from university and less than half (39.3%) has secondary level education, although on cooperatives experience level, almost all respondents (91.9%) has more than 10 years of experience in agricultural cooperatives.

To test the reliability of the data, reliability analysis is done by SPSS 12.0 and the Cronbach Alpha above 0.7 is used as indicator (Pallant, 2001). The result shows all items variable is highly reliable (0.95) with 40 items. Factors that contribute are people, supplier, governance, marketing, quality systems, technology, and logistic.

The data is analyzed using factor analysis in SPSS 12.0. Kaiser Meyer Olkin is 0.505 which are the minimum value for a good factor analysis and Bartlett test is significance at 5% level of significance. The variables are analysed using Principal Component Analysis of Factor Analysis then grouped according to rotated component using varimax. The number of factors extracted is six with eigen values above 1.0 with total variance explained 67.5%. This output is then used as a model for Structural Equations Modelling. The results are shown in Figure 2.

The results are examined for offending estimates, and there are no offending estimates found in the standardized estimates of coefficients. In assessing the goodness of fit

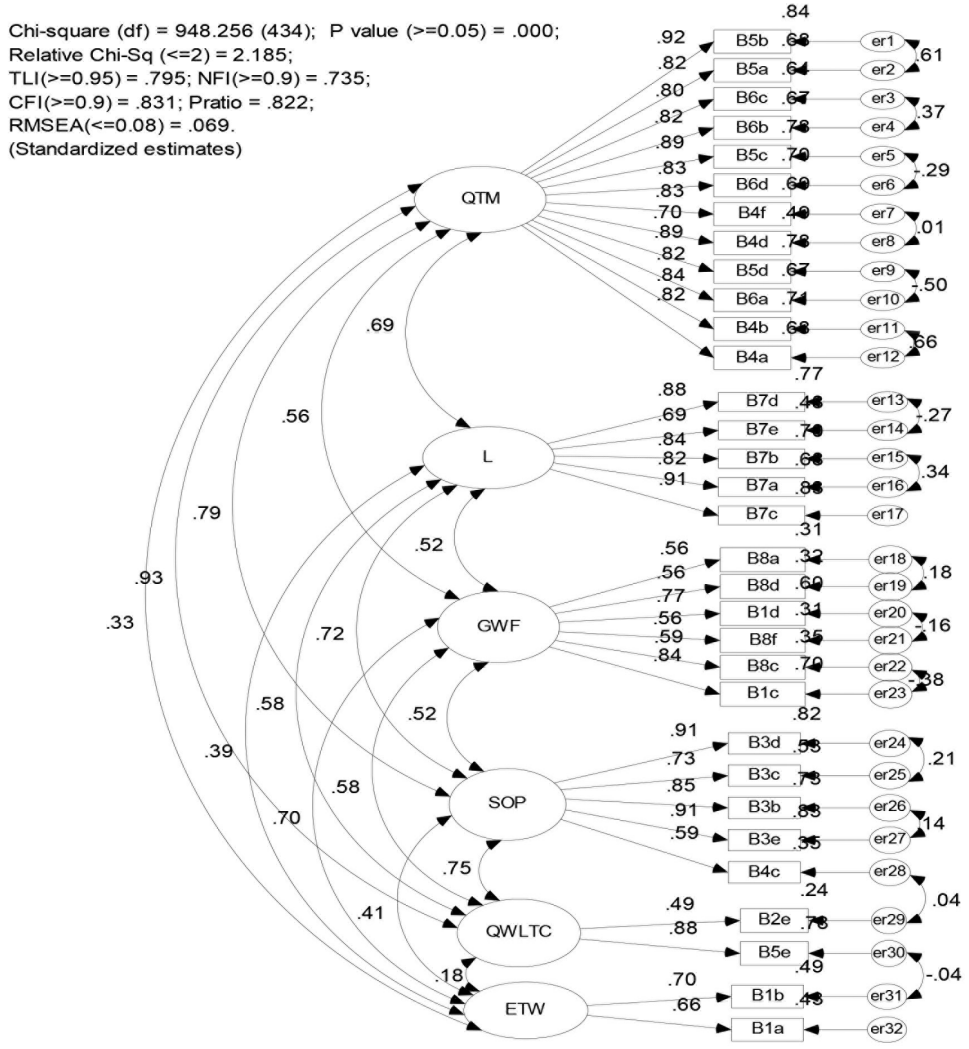

Figure 2: A first order Confirmatory Factor Analysis for Supply Chain Performance Management of Agricultural Cooperatives

indices, chi-square statistic is 0.00, which indicates the actual and predicted input matrices are not statistically different. However, as sample size exceeds 200, chi-square becomes too sensitive and tends to indicate significant differences. Thus, other measures of goodness of fit are used (Hair et al., 1998).

According to Hair et al. (1998), the goodness-of-fit measures are when GFI, AGFI, IFI, CFI, TLI and NFI were > 0.90 and RMSEA was < 0.08. Although the data revealed that the fit statistics for model does not meet conventional standards, but the model fulfilled the root mean square of error of approximation (RMSEA= 0.069) below

0.08. This result is further strengthen by all parameters estimates are significance at 1% level of significance with loading greater than 0.5 (Table 1). According to Hair et al. (1998), significance of estimated coefficients is the most obvious examination of structural equation model. Thus, the model is deemed acceptable to represent the supply chain of agricultural cooperatives in Malaysia. The KPI elements are contributory to performance of agricultural cooperatives.

Table 1: CFA result of loadings, estimates, standard error, critical ratio, significant p-value and item description for the supply chain model items variable

Construct	Item	Statement	Loadings	Est.	S.E	C.R	P
Quality of supplies, technology and marketing (QTM)	B5b	Technology efficiency	.94	1.00	*	*	*
	B5a	New technology	.86	1.02	.062	16.32	.000
	B6c	Promotion activity	.79	.90	.077	11.81	.000
	B6b	Pricing strategies	.82	.92	.071	12.94	.000
	B5c	Tech. acceptance level	.88	.96	.057	16.85	.000
	B6d	Cut cost via technology	.83	.95	.074	12.92	.000
	B4f	On time production	.85	.89	.065	13.72	.000
	B4d	Safety procedure	.70	.85	.092	9.28	.000
	B5d	Goods delivery service	.87	.90	.055	16.33	.000
	B6a	Production by demand	.80	.85	.069	12.41	.000
	B4b	Product fulfill standard	.86	.88	.063	13.95	.000
	B4a	Supplies fulfill standard	.84	.91	.067	13.59	.000
Logistic (L)	B7d	Monitor supplies going	.86	1.00	*	*	*
	B7e	out	.68	.83	.109	7.65	.000
	B7b	Computerized logistic	.86	.94	.083	11.28	.000
	B7a	sys.	.86	.87	.078	11.14	.000
	B7c	Cost supplies going out	.90	.99	.081	12.18	.000
		Cost supplies going in					
		Monitor supplies going in					
Governance and quality of workforce (GWF)	B8a	Vision/mission	.62	1.00	*	*	*
	B8d	Dedicated workers	.62	.97	.148	6.55	.000
	B1d	Mgt. commitment to HR	.72	1.41	.196	7.21	.000
	B8f	Annual meeting abide	.59	.90	.138	6.53	.000
	B8c	law	.59	.92	.145	6.33	
	B1c	Info. sharing among workers	.76	1.62	.216	7.45	
		Workers fulfilled standard					
Suppliers and Optimum level of production (SOP)	B3d	Corporation between	.91	1.00	*	*	*
	B3c	suppliers	.76	.86	.09	9.97a	.000
	B3b	Bargaining power	.85	.97	.08	12.56	.000
	B3e	Suppliers deliver on	.91	1.00	.07	15.03	
	B4c	time	.58	.73	.11	6.53	
		Relationship with suppliers					
		Product accepted by customers					

Table 1: Cont'd

Construct	Item	Statement	Loadings	Est.	S.E	C.R	P
Quality work life and efficient technology (QWLTC)	B2e B5e	Workers safety and health Technology compatibleness	.49 .89	1.00 1.87	* .31	* 5.95	* .000
Experienced and trained workers (ETW)	B1b B1a	Workers trained > 1year Workers experienced>2 years	.67 .69	1.00 .75	* .14	* 5.50	* .000

* The value do not count because unstandardized regression weight of the item is fixed to default 1 as a required constraint for model

Based on Figure 2 and Table 1, the result shows that the items in variables individual, supplier, governance, quality system, technology and logistic are reconstructed into five new variables. The variables are:

1. Quality, technology and marketing (QTM)
2. Logistic (L)
3. Governance and quality of workforce (GWF)
4. Suppliers and optimum level of production (SOP)
5. Quality work life and efficient technology (QWLTC)
6. Experienced and trained workers (ETW)

All these variables are viewed important to determine the supply chain of agricultural cooperatives of Malaysia by the representative of management board of selected agricultural cooperatives in Malaysia. The variables and their elements are described in the paragraphs below:

Quality, technology and marketing (QTM) are viewed as one of the main contributing factors in determining supply chain management. In this variable, it places importance on cycle time scale (time needed to completing business process), cost (cost associated with production, processing and marketing), quality (reliability towards quality of goods provided) and customers' feedback (perception of the customer to the value of the good and services provided). According to Ahmad (2006), a number of agricultural cooperatives in Malaysia lack competitiveness in the market due to economies of scale and is currently plagued by inefficiency, uneconomical scale of operation, low technology and inefficient marketing systems. An important and effective marketing organization for fresh agriculture produce and agricultural food products is important

and this will require a long term coordinated consumer-based and quality assurance approach.

Logistic (L) is viewed as one of the important factors in determining supply chain management. It is the main transportation for carrying the goods from the supplier to cooperatives, as majority of agriculture cooperatives purpose is to serve farmers in rural areas. Logistic system is also important to minimize cost, and to ensure the quality of goods is not damaged during the process of transferring the goods from one place to another.

Another main factor is supplier and optimum level of production (SOP). Suppliers of agricultural cooperatives include farmers in rural areas. In this perspective, knowledge, skill and efficiency (skill of an individual in dealing with others) is important as it will lead to consulting, communicating, and making decision and dealing with suppliers. Through good communication, optimum level of production can be determined as suppliers will supply optimum quantity of goods that is demanded by cooperatives. This is also to minimize cost that is associated with production such as storage cost and cost of damaged goods. Statistically this factor has been placed of great importance by cooperatives as there has been an increase in the business coverage per sector of the agricultural cooperatives for the entire food sector in 2000-2005. Crop production, paddy production, livestock and aquaculture are the main business transacted (Ahmad, 2006).

Quality work life and technology compatibleness (QWLTC) are also viewed as a latent construct of supply chain of agricultural cooperatives in Malaysia. In providing a better quality work life, cooperatives might attract youths with better academic credentials to work. The migration of youths from the rural areas to the cities has considerably reduced the number of farm workers and increased the acreage of unutilized land. Technology compatibleness in helping cooperatives to compete against the market is also needed. Majority of the subsistence farmers are older and very traditional in their work approach. The small holder sector continues to experience problems of low productivity and uneconomic size of holdings while labor/workers shortages led to substantial idle agricultural land and abandoned holdings (Ahmad, 2006).

Experienced and trained workers (ETW) are also one of the determinants in supply chain management of agricultural cooperatives. The cooperatives management prefers to have experienced workers which have at least 2 years of experience and 1 year of training, as this will enhanced the effectiveness of supply chain in cycle time scale, providing reliable quality towards quality of goods provided, and to enhance

knowledge, skill and efficiency as ability of a worker in dealing with others. It is also referred to as skill in consulting, communicating, and making decision and dealing with customers or suppliers.

CONCLUSION

This objective of this study is to investigate the elements in supply chain of agricultural cooperatives in Malaysia. The findings showed that although all seven variables (individual, supplier, governance, marketing, quality systems, technology, and logistics) are found significant, there is separate grouping for the variables item. The result indicated a reconstruction of six variables, namely quality, technology and marketing, logistic, governance and quality of workforce, suppliers and optimum level of production, quality work life and efficient technology and experienced and trained workers, which are significant in determining the supply chain of Malaysian agricultural cooperatives.

The representative of management board of selected agricultural cooperatives in Malaysia places great importance in quality, technology and marketing. This variable concentrates on cycle time scale, cost, quality and customers' feedback. Another determining variable is logistics. An efficient transportation system is important for carrying the goods from the supplier to cooperatives, as majority of agriculture cooperatives purpose is to serve farmers in rural areas. Another determining variable is supplier and optimum level of production, as suppliers will supply optimum quantity of goods that is demanded by cooperatives. Quality work life and technology compatibleness are also viewed as important as cooperatives might attract youths with better academic credentials to work. The last important element that is viewed as important for supply chain of cooperative is experienced and trained workers. The cooperatives management prefers to have experienced workers which have at least 2 years of experience and 1 year of training.

The limitations of this study include non-normality of the data and many missing values in the observations.

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