Type and Understanding of Supply Chain Collaboration in Thailand's dairy farmers

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Abstract—Thai's milk producers mostly 90 percentage are backyard farmers. This study has objectives to explain supply chain collaboration understanding of Thailand's dairy farmers and identify type of supply chain collaboration in dairy farms operation. The result of the study shows that Thai farmers have medium to low level of understanding regarding to supply chain collaboration. Moreover, Thailand's dairy industry has supply chain collaboration type as a coordinated collaboration to synchronized collaboration.

Keywords- supply chain collaboration; understanding; type; Thailand's dairy farmers

I. INTRODUCTION

Milk and dairy products are source of protein that cheaper when compare with other protein sources. Milk and dairy products are highly containing of nutrient foods, it is supplying energy, proteins, amino acids, minerals, and other micronutrients. Thai dairy industry, in 1960. Thai dairy farmers mainly are back yard farmer. Thai's milk producers mostly 90 percentage are backyard farmers, each farm have the lactating cow on average about 15 to 20 cows per farms. Once they get milk each day, they will transfer milk to co-operatives that they are member daily.

Supply chain collaboration and supply chain management have been successfully implemented to many industries. Aristides et al. showed that supply chain collaboration concept was highly critical for the agri-food industry; however, they were showing some constraints to implement supply chain collaboration, due to the nature of products in the industry, and the specific structure of the segment [1]. Barratt reported that, although supply chain collaboration is known to be very difficult to implement, it still has a high potential to deliver significant improvement to business, organization or industry performances. Barratt also showed the scope of both vertical and horizontal supply chain collaboration [2]. However, for the dairy industry, it is obvious showing lack of information and understanding about supply chain collaboration.

II. RESERCH QUESTIONS AND OJECTIVES

A. Reserch questions

There are 4 types of supply chain collaboration in, researchers would like to understand, what is the existing type of supply chain collaboration in Thai dairy farmers. Moreover, understanding for supply chain collaboration of Thai dairy farmers is in which level.

B. Reserch ojectives

This study aims to achieve a matrix on supply chain collaboration in Thailand's dairy industry. Moreover, this matrix will be used to explain more about type and characteristic of supply chain collaboration in Thailand dairy industry. Finally, government will be able to understand the industry and know the issue in the supply chain.

III. LITERATURE REVIEW

A. Supply chain collaboration

Definitions of Supply chain collaboration are many, Horvath said "Supply chain collaboration is the driving force of effective supply chain management, among all parties in the value chain, whatever their size, function, or relative position"[3] or some said " Two or more autonomous firms working together to plan and execute supply chain activities"[4] or 'Collaboration occurs when a group of autonomous stakeholders of a problem domain engage in an interactive process, using shared rules, norms

and structures, to act or decide on issues related to that domain'[5]. Cohen and Roussel said "Companies within the supply chain work together toward mutual objectives through the sharing of ideas, information, knowledge, risks and rewards" [6]

Regarding to type of supply chain collaboration Cohen and Roussel [6] showed 4 type of collaboration as per following: Transactional collaboration, cooperative collaboration, coordinated collaboration, and synchronized collaboration as shows in figure 1.

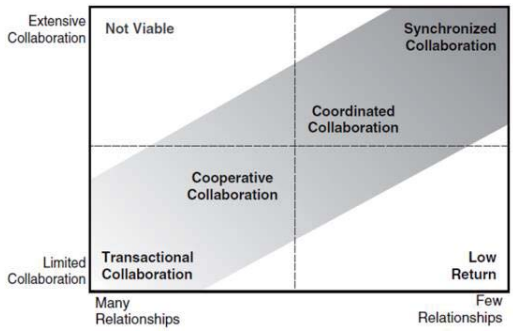

Figure 1. Type of Supply Chain Collaboration [6]

Moreover, Reference [7] showed another view of supply chain collaboration regarding to interaction between planning collaboration and Inventory collaboration, as showed in figure 2., this interaction can be used to identify 4 types of supply chain collaboration as following Traditional supply chain, Information exchange, Vender managed replenishment, and Synchronized supply

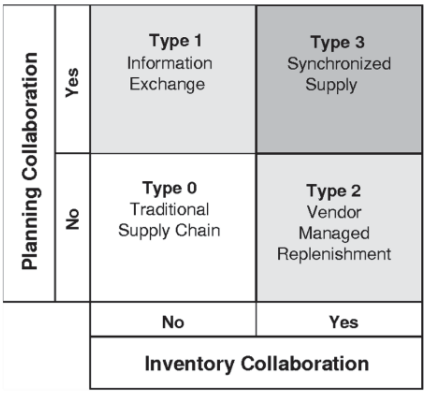

Figure 2. Type of Supply Chain Collaboration based on interaction of planning and inventory collaboration [7]

IV. METHODOLOGY

Dairy co-operatives, the Dairy Farming Promotion Organization of Thailand (D.P.O.) and dairy farmers are key stake holders of the industry

A. *Population and Sample*

Thailand's dairy farmers are 16,248 farms with 670 milk collecting centers; however, for the milk collecting centers that certified GMP by department of livestock development, Thailand are 187 centers. The dairy farms that under these GMP certified milk collecting centers were target sample.

B. *Data Collection*

A paper-based survey was conducted, using the Likert-scale from 1-5 (least to most important), researchers sent out the questionnaire 5,610 copies to farmers nation-wide. It was sending to co-operatives and milk collecting centers 187 centers. Thus 30 copies of questionnaires per milk collecting center. After 2 weeks of sending out the survey, researchers sent email to follow up. Then email following was done in another 2 weeks later after the first follow up email. Finally, the questionnaires were return 1,137 copies, 20.26% response rate; however, there were some missing data in some copies. Thus, the surveys 1,054 copies, 18.79% response rate, used in the analysis of data.

V. ANALYSIS AND RESULTS

A. *Data Analysis*

1) *Descriptive analysis*

Normal statistics was conducted to understand dairy farmers characteristics.

2) *Scatter plot analysis*

Scatter plot is using to explain the relationship between 2 variables. In this study, researchers were using the plot for 2 models. First, it used for comparing with Cohen and Roussel [6], then another one comparing with [7]

B. *Results*

1) *Thailand's dairy Famer Charecteristics*

This study explores Thai dairy farmers in 3 major dimensions such as educations, years of experiences in dairy business, and number of cows per farm (it also means size of farms) For the results of 3 dimensions are below

a) *Education*

In term of education, as a result of analysis, it showed that majority of farmers are graduated primary school 27.9%, then, the second rank of education of farmer is senior high school, they graduated 19.4%, and the third rank is bachelor degree. While, the undergraduate schools are contributing 81.2%, and the education of farmers that graduated from university is 18.5% as showed in Table I. Moreover, primary school, and both junior and senior high school are contributing 64.6%.

TABLE I DESCRITIVE ANALYSIS FOR EDUCATION OF DAIRY FARMERS IN THAILAND

Educations of Thailand dairy farmers*					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		1.0	0.1	0.1	0.1
	> Bachelor	8.0	0.8	0.8	0.9
	Bachelor	187.0	17.7	17.7	18.6
	High Vocational Certificate	117.0	11.1	11.1	29.7
	Senior High School	204.0	19.4	19.4	49.1
	Vocational Certificate	58.0	5.5	5.5	54.6
	Junior High School	183.0	17.4	17.4	71.9
	Primary School	294.0	27.9	27.9	99.8
	Other	2.0	0.2	0.2	100.0
	Total	1054.0	100.0	100.0	

*Result from SPSS

b) Experiences

Dairy farmers can or cannot manage cattle farms, not only knowledges from educations, but also experiences, Thus, experiences are important to run the farms. As a result of analysis, showed in Table II, Thai dairy farmers 38.8% have more than 10 years experiences in the business, 23.6% have 5-10 years experiences, and 20.7% have 3-5 year of experiences. Only 16.3% of dairy farmers have experiences less than 3 years.

c) Farm sizes

Number of cows on hands, it can be used to explain size of farm. For small farms, they have cows 1-20 cows, then farmers have more than 21-50 cows, they are medium size. Result shows that mostly farms are medium farms with 21-50 cows on hands, it is contributing 46.9% while small and large farms are contributing 27.1% and 22.5% respectively. However, small and medium farms together contribute 74% of sample as demonstrates in table III

TABLE II EXPERIENCES OF DAIRY FARMERS IN THAILAND

Experiences of Thailand dairy farmers (years)*				
		Frequency	Valid Percent	Cumulative Percent
Valid		1	.1	.1
	>10	409	38.8	38.9
	5-10	249	23.6	62.5
	3-5	218	20.7	83.2
	1-3	156	14.8	98.0
	<1	16	1.5	99.5
	Other	5	.5	100.0
	Total	1054	100.0	

*Result from SPSS

TABLE II SIZE OF DAIRY FARMS IN THAILAND

Farm Size (Number of Cows) *				
		Frequency	Valid Percent	Cumulative Percent
Valid		1	.1	.1
	>201	3	.3	0.4
	101-200	24	2.3	2.7
	51-100	210	19.9	22.6
	21-50	494	46.9	69.4
	1-20	286	27.1	96.6
	Other	36	3.4	100.0
	Total	1054	100.0	

2) Supply chain collaboration understanding

The result of survey is showing that Thailand's dairy farmers have an understanding regarding to Supply chain collaboration 2.618 out of 5.00 scores. An interpretation of this score, it means, Thailand's dairy farmers have understanding in the medium level (2.61-3.40 scores indicated as medium). However, this score is nearly low level.

3) Supply chain collaboration model

The analysis was conducted to 2 models comparing to different ways, by different questions.

a) Model 1

This model, the researchers aim to compare supply chain collaboration in Thailand dairy farmers with model from Cohen and Roussel [6]. As presents in Figure 3, the result can explain that, supply chain collaboration in Thailand dairy farmer is in the *coordinated collaboration type*. There are low in term of number of relationship (in the analysis the researchers indicated that low relationship to high score) while there are in the medium level of collaboration among parties.

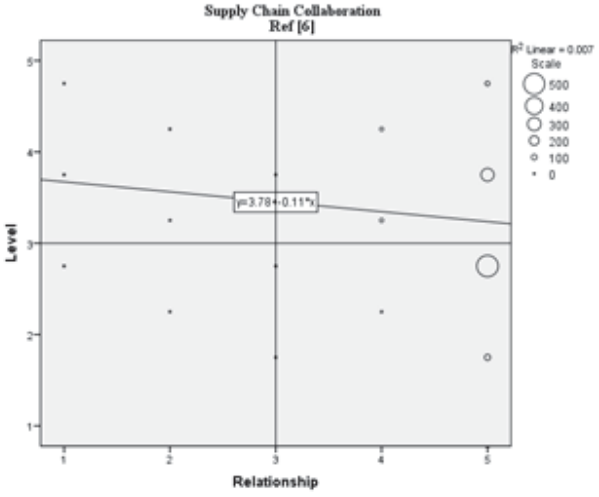

Figure 3. Type of Supply Chain Collaboration by number of relationships versus level of collaboration

b) Model 2

This model, the researchers have objective to compare supply chain collaboration in Thailand's dairy farmers with model from Holweg, Disney and [7]. The result of the scatter plot analysis between planning versus inventory collaboration shows in Figure 4. An interpretation of this scatter plot, it can explain that supply chain collaboration in this scope, Thailand's dairy farmers have majority that sharing plan and inventory among the chain. As show in Figure 4, it shows a biggest circle in the middle of the chart, while second bigger, it is in the *synchronized supply type*.

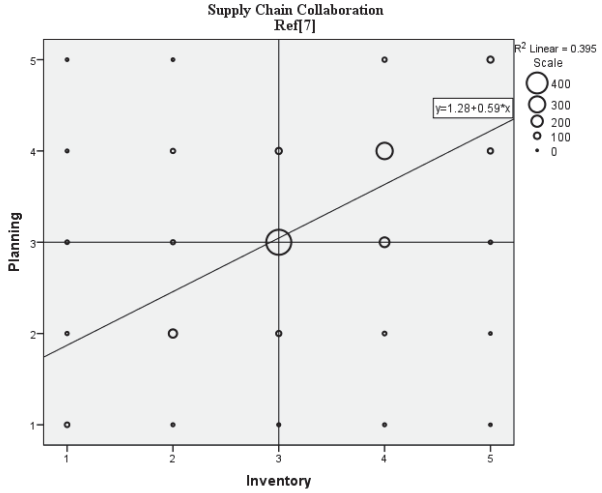

Figure 4. Type of Supply Chain Collaboration by planning versus inventory collaboration

VI. Discussion and Conclusion

Thailand's dairy farmers are mostly in the low level of educations; however, they have much experiences in the dairy industry. One concern of this, they might use experiences more than technical knowledges or they might not really find more information to manage they farms such as knowledges about farm management and diseases. It also concerns about understanding and knowledges of food-borne diseases. Moreover, most or the farmers are small to mid sizes of the farms. It can impact to the cost of production in term of economy of scales, unlike to Australian dairy farmers [8], they demonstrated the cost of production is a key pillar of success in dairy business.

From understanding of supply chain collaboration, the medium level of understanding, in this study, is medium-low. When compare with Australian dairy industry as a bench, Thailand is quite low. This needs some action plan to increase awareness and understanding of supply chain collaboration. It will support the industry to have competitive advantages. Moreover, highly understanding and implementation of support chain collaboration will improve the businesses.

Regarding to types of supply chain collaboration for the Thailand dairy farmers, for the model 1, it shows the *coordinated collaboration* while model 2, it presents as the low level of *synchronized supply type*. Form two models, it is in the same trends that implementation of supply chain collaborations is in *the coordination collaboration to synchronized collaboration*.

However, in these 2 models, it captures only some point of supply chain collaboration variables. Some researchers have showed that information sharing is also one of important variable to take into account of the collaboration of supply chain [9]. Study in Egypt, in cotton supply chain, was using more variables than these 4 variables to explain level of supply chain collaboration. Reference [10], the researchers studied about long-term supply chain collaboration, and it showed that Collaborative planning, Collaborative execution, Collaborative decision making impacted to Success of collaboration. Moreover, Success of collaboration impacts to collaboration in future [11].

This study conducted during Covid-19 situation in Thailand, it might have limitation to explain more to the farmers about the survey, as showed in the result, Thai dairy farmers are limited of education. If the researchers have a good chance to have a group meeting with dairy farmers, like face to face meeting with them. It might helpful to understand them more. Further study, more variables that link to the supply chin collaboration could be added to the question list.

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