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PRODUCER SEGMENTATION AND THE ROLE OF LONG-TERM RELATIONSHIP IN MALAYSIA'S MILK SUPPLY CHAINS

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Abstract:

Research on buyer-seller relationships in the agricultural sector receives little attention. A growing body of evidence suggests that strong buyer-seller relationships facilitate more efficient supply chains. The long term relationship literature tends to treat suppliers as a homogenous group when attempting to identify motivations, strategies and incentives to enhance the quality of buyer-seller relationships. This article explores the role of long-term relationships between buyers and sellers in Malaysia's dairy industry, taking into consideration the heterogeneous nature of the producers. Interviews with 133 producers provide the data for this study. Cluster analysis suggests two well-defined groups differing in terms of demographic characteristics and relationship perceptions toward their buyers. Based on the results, the study proposes some policy implication and marketing strategies for both milk buyers and government.

Keyword: buyer-seller relationship, price satisfaction dimensions, cluster analysis, dairy industry, Malaysia

Introduction

Malaysia's dairy industry is changing rapidly as income growth, urbanization, shifting diets and more liberalized trade and investment polices enhance competition among milk processers. Milk demand is expected to increase by more than 30% in the half decade period leading up to 2014 (Beghin, 2006; Dong, 2006). In the face of this rapid growth, the local dairy industry is only keeping pace with its overall market share, around 5%. However, domestic dairy companies are seeking a better understanding of how they might compete to take better advantage of a profitable and expanding market (Boniface *et al.*, 2010).

Over the years, government programs included a range of reasonably successful initiatives to improve milk production. Examples include establishing Milk Collection Centres (MCCs), introducing more productive breeds and improving veterinary and extension services. The leading dairy processors have focused on improving logistics in product flows to lower costs, reduce waste and enhance efficiency in their chains. Increasingly, however, the dairy processors are exploring the role of producer

incentives that go beyond traditional production and product flow logistics. In particular, milk buyers seek information on how they can build stronger and mutually beneficial relationships with their suppliers to secure regular and uninterrupted milk supplies (Boniface *et al.*, 2010).

A growing agricultural literature suggests that efforts to build and maintain long-term buyer-seller relationships can provide benefits to both the producers and buyers. The roles of relationships are especially important in highly perishable commodities like milk. Previous studies suggest wide-ranging outcomes and benefits, including lower transaction costs, enhanced efficiencies, joint decision-making, better information sharing and joint investments (Batt, 2003; James, 2006; Lu *et al.*, 2008, Ng, 2010).

Research on the role of long-term buyer relationships in the agricultural sector is relatively recent. The studies aim to understand how developing and maintaining sustainable relationships can contribute to improved profits over time. For example, the research investigates the determinants of suppliers' trust (Batt, 2003; James, 2006), the effects of producers' loyalty (Boniface *et al.*, 2010), and how commitment between exchange partners influences economic outcomes (Spiller and Schulze, 2007). Other researchers examine networking between exchange partners (Lu *et al.*, 2008) and what determines suppliers' relationship quality (Gyau and Spiller, 2010; Ng, 2010; Reynolds *et al.*, 2009). A few studies explore how three relationship variables, trust, loyalty and commitment, influence the economic and non-economic business performance of the producers (Gyau and Spiller, 2008). The emerging consensus from these studies is that the stronger the buyer-seller relationship, the more efficient and sustainable the supply chain.

This study attempts to add to the long-term relationship literature in several ways. First, provides an agricultural section example in an emerging economy. Second, it expands on existing literature by gaining insights of the sellers' relationships perception and lastly, we explore the price satisfaction dimensions of the producers. Existing literature tends to treat suppliers as homogeneous. The purpose here is to investigate the nature of long-term relationships and better understand the economic implications by examining how different seller characteristics influence seller-buyer relationships. The paper contends that strategies and policies seeking to enhance quality buyer-seller relationships in the agricultural sector need to be tailored to the specific socio-demographic and economic attributes of the sellers.

The next section presents an overview of the Malaysian dairy industry development. Then, we outlined research methodology and cluster solutions and their implications in the next section. The final section presents a summary, describing the study's limitations as well as proposes direction for future research.

Malaysia's dairy industry and market relationships

Over the past two decades, Malaysian Government has continually structure and tailored the dairy industry development through extensive research and investment. The establishment of Milk Collection Centre (MCC) through the Department of Veterinary Services (DVS) was the initial steps to enhance milk supply chain in the country. Basically, MCC helps dairy producers who are predominantly small-scale farmers to market the milk directly to milk processors such as Dutch Lady, Susu Lembu Asli and Sabah International Dairies (Boniface *et al*., 2010). The arrangement was call "Memorandum of Understanding" which in contract farming terms known as resource providing contracts (Eaton *et al.*, 2001). In this contract, producers are obliged to provide labour and land while the contractor (DVS) provides veterinary services and consultation, breed and guidance to the producers. The MCC on the other hand, buys milk yield based on milk grades and quality at predetermined and subsidized prices (Wells, 1981).

After some years, the industry has been expanding with gradually increasing number of small scale producers with some few large-scale producers (Bhaskaran, 1999). The scenario however is still behindhand compare to the growing milk demands in the country. It is projected that the milk demands in Malaysia will be increasing from 46,000 metric tons in 2005 to 60,000 metric tons in 2014 (Dong, 2006) while the milk production within the last decade is increasing gradually (Boniface *et al.*, 2010). The unbalance milk supply chain has created a competitive dairy market with milk demands escalating over the supply. Immense amount of research and development are needed to address the changes especially on the supply chain management and marketing.

Researches in the Malaysia's dairy industry have varied their approaches in improving dairy business and management. Some studies focus on the farm management by looking at ways to reduce production cost through integrated farming (Wan Hassan, 1989) and computerised recording system (Pharo *et al.*, 1990), while other scholars investigated the impact of milk subsidies on dairy farmers development (Wells, 1981) and the viability of large scale farming (Bhaskaran, 1999). As most of the studies merely looking at the farm management and productivity but research on the buyer-seller perspective has been scarce (Boniface *et al.*, 2010).

Strong relationships between exchange partners based on sharing information and trust is important, especially for perishable important agricultural commodities such as milk and vegetables. In volatile food markets, close relationships with sellers can be crucial for buyers seeking supplies are scarce. Researchers identify a number of variables that influence the relationship, including trust in the partner and satisfaction with the relationship.

Batt (2003) argues that trust plays significant role in the buyer-seller relationships. The presence of trust in a relationship creates market barrier to other buyers. Trust initially promote mutual understanding between exchange partners and strengthen the relationships. Other research identifies that satisfaction and trust improves the relationship quality between exchanges partners (Boniface *et al*., 2009; Gyau and Spiller, 2010). Basically, quality relationships emerge when both parties develop mutual goal, joint actions and communicate frequently (Gyau and Spiller, 2010; Ng, 2010; Reynolds *et al.*, 2009). In the long run, these relationships variables strengthen the business relationships and promote long term relationships in which both parties having higher commitment and loyalty in their relationships (Morgan and Hunt, 1994; Boniface et al., 2010).

In the dairy industry, coordinated and integrated supply chains are needed because fresh milk is perishable. The need for economic motivation including better prices, lower transaction costs in the supply chain are given (Abdulai and Birachi, 2008; Siqueira and Aguar, 2008).However, promoting relationships outcomes such as trust, satisfaction, commitment and loyalty in the relationships encourage sustainable and integrated business relationships (Batt,2003; Espejel, Fandos, & Flavian, 2008 ; Gyau and Spiller, 2008). Producers are not alike in nature but varied in reality and while other scholars identified the economic and management profiles of the producers (Rosenberg & Turvey, 1991; Espinoza-Ortega *et al.*, 2007), we attempt to understand the producers' characteristics from the business relationships point of view.

Therefore, giving the background of long-term relationships and it significant in the industry we further propose that by treating the producers as heterogonous, we may further understand the operations of the dairy industry and improve its efficiency. In the next section we provide a description of the research methods.

Methodology

The research was done in a series of steps. First, we developed the questionnaires through extensive literature review, in-depth interviews and pilot study. Secondly, we interviewed 133 randomly selected then the data analyses. Next, we present the detail discussion of the methodology used in this study.

Measurements of the relational variables

The measurement scales for the variables were developed from the literature on inter-firm relationship performance. Each of the items used represent the relationships variables such as trust and satisfaction. We developed 7 items to represent each variable and was adapted from numerous literatures. However, after conducting factor analyses and reliability tests (Cronbach Alpha), the number of items used to represent the variables has been reduced (see table 2 and 3).

The trust variable was developed using an adaptation of the measures used by Batt (2003) and Gyau and Spiller (2007). The loyalty variable was developed based on the dimensions utilized by Rauyruen and Miller (2007) and Jacoby and Chestnut (1978) while relationship commitment and satisfaction variables adapted from Morgan and Hunt (1994), Anderson and Narus (1990) and Ganesan (1994) respectively. Price satisfaction dimension was adapted from Matzler et al., (2007).

In all cases, a five point likert-scale type questions ranging from: 1=strongly disagree, 2= disagree, 3= partly/disagree, 4=agree and 5 =strongly agree, were used to measure the various latent constructs of trust, satisfaction, relationship commitment, loyalty and price satisfaction dimensions.

Survey Design

In June and July, 2009, 133 producers out of a population of 550 in four selected states in Malaysia were randomly interviewed. The four selected states namely Selangor, Sabah, Melaka and Johor provide a representative overview of dairy farm operations throughout Malaysia as they represent the various forms of marketing channels and scales of operation.

The questionnaire was designed based on a two-step approach. First, a qualitative exploratory study consisting of a literature review, field visits, key-informant interviews and interviews with relevant

agencies (public and private institutions) to understand the dynamics of dairy producer-buyer relationships was undertaken.

In the second stage, the questionnaire was pre-tested with three supply chain and alliance specialists and 10 dairy producers. Respondents were asked to provide feedback on the length, content, format, comprehensibility and accuracy of the survey instrument. After each stage, the questionnaire was modified, incorporating the feedback.

The questionnaires were administered using face to face interviews which were conducted at the respondent's premises. In total, 133 successful interviews were conducted by 5 trained enumerators. To ensure consistency, producers were asked to evaluate the relationship with their main buyer, defined as the buyer who purchases the largest quantity of their fresh milk.

Description of the sample

The demographic variables shown in Table 1, indicate that the sample is well represented. The dairy producers in Malaysia are predominantly small-scale producers with some few large-scale producers (Bhaskaran, 1999). The department of Veterinary and services officer further explained that the dairy producers in Malaysia are mainly primary and secondary school certificate holders and have been in the business for more than 10 years.

Table 1: Respondents age, education, experience and firm size

Demography Variables		
Age (years)	Numbers of producer	Percentage (%)
19-30	13	9.8
31-40	36	27.1
41-50	47	35.3
51-60	28	21.1
61-70	9	6.8
Level of education		
Primary and secondary education	105	78.9
Diploma and certificate education	23	17.3
Tertiary education	5	3.8
Experience in the business (years)		
1-5	35	26.3
5-10	29	21.8
10-15	21	15.8
15-20	18	13.5
20-25	13	9.8
25-30	12	9.0

Farm size (number of cattle)		
Small-scale (1-30 cows)	57	42.9
Semi-commercial (31-50 cows)	25	18.8
Commercial (51 -100 cows)	31	23.3
Large-Scale (101 and above cows)	20	15.0

Table 1 shows that most of the respondents are around 41 to 50 years old, and attained primary and secondary education. It also indicates that 35 producers have 1-5 years of experience in the business while the rest have more than 10 years experience. Most of the respondents are predominantly small-scale producers. Most of them sell to MCC which is also the main buyer while only few percentages of the respondents consider private sector as they main buyer.

Statistical analysis

The data analysis comprised a number of steps. The Data Analysis and Statistical Software (STATA) version 10 was used for all statistical analysis. In the first step, the principal component analysis with varimax rotation was used to determine the dimensionality of the variables. All factors with Eigen values above 1 were extracted. In addition, all factors with factor loadings above 0.5 were retained. To test for the appropriateness of the factor analysis for the scale, the Kaiser-Meyer-Olkin Measure of Sampling adequacy (KMO-MSA) was conducted and all fell within the accepted region (KMO is greater than or equal to 0.5). A reliability test using the Cronbach Alpha was conducted to purify the measurement scale for each of the constructs used in the study. The alpha coefficients for most of the components were above the conventional cut off point of 0.60 (Boniface *et al.*, 2010). The results of the Principal Component Analysis (PCA) are shown in Table 2 (see appendix 1).

In the next stage, we conducted two-stage cluster analysis. The main objective of cluster analysis is to establish groups so that they are internally as homogenous as possible and externally (that is in comparison to each other) preferably heterogenous (Gyau *et al.*, 2009). In order to identify the appropriate number of groups, we performed a hierarchical cluster analysis and by examining the dendrogram and Calinski / Harabasz pseudo-F (Milligan & Cooper, 1985; Calinski & Harabasz, 1974), we identified the optimal number of clusters.

We then conducted a k-means non hierarchical analysis and identified two main producer segments in this data. The resulting clusters were compared through two- group mean-comparison test (t-test) to determine if there were differences between the clusters. Following, the level of trust, satisfaction, relationship commitment, and loyalty and price satisfaction dimensions variables were compared between the two clusters to further characterize the producers. We further discuss the relationship between the demographic variables and the producer segments.

Result and discussions

In order to validate the intended relationships variables, we performed a PCA using varimax rotation on relationship items that represent trust, satisfaction, relationship commitment and loyalty. Each of the intended variables shows unidimensional factor loadings ranging from 0.685 to 0.846 with the KMO for trust, satisfaction, relationship commitment and loyalty present acceptable scores at 0.709, 0.759, 0.814 and 0.785 respectively as shown in Table 2 (see appendix 1).

The results of the PCA for the price satisfaction dimension also indicate a unidimensional construct for each of the dimensions as shown in Table 3 (see appendix 2). The KMO scores were also within the acceptable range at 0.6434 for price reliability, 0.591 for relative price, 0.705 for price-quality ratio, 0.594 for price fairness and 0.670 for price transparency.

All of the constructs (Table 2 and Table 3: see appendix 1 and 2) had acceptable values for the main statistics and reliability coefficients (see cronbach's alphas in Table 4 and Table 5).

Next, a cluster analysis was performed based on the relationship variables and price satisfaction dimension. We obtained two groups of producers based on the relationships perception towards their buyers. The mean of the respondents in each cluster is shown in Table 4 while the means for the producer's perception towards the price satisfaction with the buyers are shown in Table 5. The results of the t test were significant among the various clusters indicating that the clusters are as homogenous within and heterogeneous between. We further explain the cluster descriptions as follow:

Cluster 1: There are 106 respondents in this cluster, which constitutes of 78% of the sample. They are the majority of the sample. The producers are likely to engage in long-term relationships as they are very loyal and committed to their buyers. They have a high trust in their buyers. Most of the producers in this group earned average profits around RM 4000 per month and most of them comprise of small-scale and semi commercial producers. In terms of price satisfaction, they react to price reliability, price fairness and price transparency. They are labelled as relationship oriented group (RG).

Cluster 2: The second cluster comprise of 20 % of the sample. Their average profit is approximately a RM 10000 per month. They are very market oriented producers and react with the real market price. Thus, they are committed with their buyers but easily exchange buyer when offer a reliable and transparent milk price. They are referred as market-driven group (MDG).

In the next section, we present the discussion of group members' characteristic for the relationships variable and price satisfaction dimension.

Evaluation of Clusters

In order to distinguish between clusters and to be able to establish appropriate marketing strategies, the two groups were evaluated based on four main relationship variables. Relationship variables such as trust, satisfaction, loyalty and relationships commitment are well known in promoting long-term relationships between exchange partners (Batt, 2003; Dwyer *et al.*, 1987; Gyau *et al.*, 2008; Lu *et al.*, 2008; Morgan and Hunt, 1994).

As shown in Table 4, the relationship group has higher trust and satisfaction for their buyers compared to the market-driven group. Considering the nature of the RG, they are vulnerable to market exploitation and discrimination. Therefore, securing trusted buyers can be seen as discerning ways to promote closer relationships. Buyers´ who keep promises and meet producers' expectation in the business may have the possibility to build long-term relationship with the RG.

Table 4: Producer's relationships perception of their buyers

Relationship variables	Relationship group (RG) =106 / 79.69%	Market-driven group (MDG) n=27 / 20.31%	t-stat
	μ	μ	
Trust (α = 0.737)			
My buyer promises are reliable	4.27	3.37	6.45[a]
I can trust my buyer	4.35	3.37	5.35[a]
I have trust in my buyer skill and expertise in the business	4.22	3.48	5.10[a]
My buyer cares for my welfare	4.15	2.85	8.30[a]
Satisfaction (α = 0.763)			
I feel satisfied doing business with my buyer	4.24	3.37	6.17[a]
My buyer often meets my expectations	4.17	3.30	6.40[a]
My buyer treat me fairly and equitably	4.18	3.30	5.90[a]
My buyer is quick to handle my complaints	3.85	2.85	6.20[a]
Relationship Commitment (α = 0.793)			

Our relationship is something that we are very committed to	4.25	3.74	4.09[a]
I feel committed to my buyer	4.22	3.48	6.27[a]
I want to maintain indefinitely our relationship	4.28	3.93	3.10[a]
I want to improve my relationship in long term	4.28	3.78	4.13[a]
I have maximum effort to maintain our relationship	4.25	3.85	3.59[a]
Loyalty (α = 0.649)			
If I have other alternative buyer, I will remain with this buyer	3.97	2.89	6.44[a]
I will continue to do more business with my current buyer in the next few years	4.73	3.56	7.49[a]
I am loyal to my buyer	4.75	3.81	6.82[a]
I will ask other dairy producer to seek assistance from my buyer	4.35	2.81	9.24[a]

[a] Statistically significant at 1%

On the contrary, the MDG has more milk yield to offer and more production costs to bear. They initially look for constant milk buyers such as milk processors and at the same time reduce transaction costs by vertically integrating with the buyers. MDG will trust in buyers that can provide technical expertise and skill in the dairy business. Milk buyers' profound expertise and skills indicate a proven record in the business and having relationships with these buyers promote technology and knowledge transfer (Eaton *et al.*, 2001; Espinoza-Ortega *et al.*, 2007).

The presence of trust and satisfaction in buyer-seller relationships may promote relationship quality between exchange partners. Relationship quality (RQ) can be defined as the producers' perception of how well their relationships fulfil the expectations, predictions, goals and desires of the customer, and can be consider as an appropriate indicator for success of a relationship (Boniface *et al.*, 2009; Gyau & Spiller, 2010; Ndubisi, 2007; Wong & Sohal, 2002). Therefore, it is essential for milk buyers to secure and capture producers' trust and satisfaction in order to improve their relationships.

The other two variables namely relationship commitment and loyalty can be used as a measure of long-term and sustainable business relationship since both relationship variables are not built overnight (Anderson and Narus, 1990; Morgan and Hunt, 1994; Rauyruen and Miller, 2007). As shown in Table 4, the RG is highly committed and loyal to the buyers. Given the fact that this group is predominantly small-scale producers, they produce lower quantities milk compared to the MDG. Therefore, by having the same buyer, they can reduce the transaction costs such as search and transportation costs.

The MDG however, scores slightly higher on the relationship commitment with the exchange partners. It is understandable that being large-scale producers, they may have the advantage of producing more milk and access to greater market. High volume of milk means higher level of sales when they are able to identify suitable buyers. In that case they are more likely to be committed to the relationships and secure constant sales. However, in the long run, they may change buyers if the current buyer does not meet their expectation and there is an alternative buyer.

Price satisfaction comparison between clusters

Price satisfaction refers to the psychological result of a difference between price expectations and price perceptions (Gyau and Spiller, 2010; Matzler *et al*., 2007). Hence, by securing price satisfaction, producers may stay in the relationship and be loyal with the buyers (Matzler, et al., 2007). There are many dimensions of price satisfaction which were considered for this study. These include price reliability, relative price, price quality ratio, price transparency and price fairness as shown in table 5.

Table 5: Producer's price satisfaction scores

Price satisfaction dimensions		Relationship group (RG) n=106 / 79.69%	Market-driven group (MDG) n=27 / 20.31%	t-Stat
		μ	μ	
Price Reliability (α = 0.641)				
Description	**Statement**			
Price does not change unexpectedly and suppliers are informed timely (Matzler *et al.*, 2007).	Milk price changes are communicated properly	4.14	3.70	4.21[a]
	Milk price changes are communicated timely	4.11	3.56	5.13[a]
	My buyer keeps all promise regarding milk price	4.08	3.63	3.43[a]
Relative Price (α = 0.587)				
Price of the offer compared to that of competitors' offers (Matzler *et al.*, 2007).	Terms and condition of my buyer are better tailored to my needs than those of other buyers	3.62	3.04	3.72[a]
	I am convinced that my buyer is the best choice	4.12	2.93	7.63[a]
	I do not believe other buyer will have the same or even better milk price offer	3.45	3.15	1.49
Price Quality Ratio (α = 0.801)				
The price receives from their buyer reflecting the	I get a good price-quality ratio	3.94	2.89	6.87[a]

quality of the product (Zeithaml, 1988).	I have the impression that I know what I am paying for	3.75	2.85	4.71[a]
	I agree with the milk price and grading system	3.89	2.93	4.57[a]
Price Fairness (α = 0.656)				
Consumers gain satisfaction from a price of a product if they believe that the offered price is favourable and fair (Campbell, 1999; Diller, 2000).	My buyer does not take advantage of me	4.19	2.96	9.28[a]
	My buyer always consistence with the same pricing formulas	4.06	3.48	5.94[a]
	The buyer offer me fair and reasonable milk price	3.89	3.00	4.65[a]
Price Transparency (α = 0.721)				
Clear, comprehensive, current and effortless overview about a company quoted prices (Matzler *et al.*, 2007).	My buyer milk price is clear, comprehensible and understandable	4.08	3.67	4.49[a]
	Milk price information is understandable and comprehensive	4.10	3.67	4.25[a]
	Milk price information is complete, correct and frank	4.21	3.63	5.13[a]

[a] Statistically significant at 1%.

Price reliability includes the notion of price confidence, consistency and favourability (Diller, 1997). Matzler *et al*. (2007, p.221) explain that "Customers will perceive high price reliability if there are no hidden costs, if prices do not change unexpectedly. If prices change, customers should be informed properly and in a timely manner to build trust and maintain a long-term relationship." In this research, all of the respondents in the RG agreed that prices are communicated timely and properly with regards to price changes while the MDG somehow "agree and disagree" that the buyer offer a reliable milk price.

Relative price on the other hand, is related to comparing comprehensively prices offer by other buyers and current buyer (Diller, 1997). By knowing that the current buyer offers better and reasonable price in comparison to other buyers, they will feel satisfied and might stay with the buyer. In this study, the RG believe that their main buyer offer them relatively satisfied price while the MDG feel otherwise.

Concerning price-quality ratio, the MDG does not agree that they receive prices which are a reflection of the quality, thus have low price quality ratio. They expect higher price offered for their milk quality. The expectation of higher milk price is also mutually shared with the RG. Basically, price-quality ratio is related to how well the price offer by the buyer is based on the quality value by the producers (Gyau and Spiller, 2010).

In terms of price fairness, the RG believe that their main buyer offers them fair and reasonable price while the MDG does give a clear stand on the price fairness as they rated average 3.00 for the means which is basically partly agree or disagree.

Lastly, the RG has a higher rating than the MDG on price transparency which is connected with the price formula offered by the buyers (Schroeder *et al.*, 1998). This indicates that the RG is confident that milk price information is complete, correct and frank. Therefore, the RG is satisfied with the price transparency dimension while the MDG remain moderate and require a better price formula from the buyers.

Demographic characteristic of producer segments

In order to get a clear characteristic of each of the groups, we then analysed the demographic characteristics of the producers. The outcome of the cluster analysis between the relationship and market-driven groups are distinguished by the relationship variables and price satisfaction dimensions. They do not significantly differ in terms of age, level of education, main source of income, main milk buyers, between states or average milk production (see Table 6). Both groups, however, differ in terms of firm sizes, average monthly profit and number of years in the dairy business.

Table 6: Demographic variables and producer's segmentation

	Cluster 1 n=106 / 79.69% μ	Cluster 2 N=27 / 20.31% μ	t-stat
Difference between states	1.55	1.67	-1.12
Average Age (years)	44	46	-0.96
Level of Education :			
Primary and secondary school	84	21	
Diploma and certificate	19	4	-0.54
Tertiary Education	3	2	
Producer's main source of income (businesses)			
dairy as main income	93	22	
other business as main income	7	4	-0.390
working with private/government as main income	6	1	

Number of years in the dairy business	12 years	18 years	-2.92[a]
Farm Size (number of cattle)			
Small-scale (1-30 cows)	45	12	
Semi-commercial (31-50 cows)	22	3	-2.17[b]
Commercial (51 -100 cows)	25	7	
Large-Scale (101 and above cows)	14	5	
Average milk production (kilos)	10 kilos	9 kilos	0.87
Producer's main buyer			
Public sector (MCC)	82	22	1.13
Private sector	24	5	
Average farm profit (Ringgit Malaysia)	RM 3940	RM 10007	-2.10[b]

[a ,b] Statistically significant at 1% and 5% , respectively.

Based on the demographic characteristics in Table 6, we observed that the RG represents each of the producers' firm size categories (from small-scale producers to large-scale producers) but predominantly comes from small-scale and semi-commercial producers. They basically have been in the business for an average of 12 years. Most of the producers earned average farm profit around RM3900 monthly for the whole group. On the contrary, the MDG seems to be much more stable with average farm profit around RM 10000 per month. The producers have an average of 18 years experience in the business. Five of the producers in this group have more than 100 cows and 10 producers have between 31 to 100 cows, while the rest of the producers have less than 30 cows.

To sum up, we present the characterization of the dairy producer segments based on their perceived relationships toward their buyers and price satisfaction dimensions for which we observed statically significant differences between groups (see table 7).

Table 7: Characterization of producer segments

Variable	Cluster 1 n=106 / 79.69%	Cluster 2 n=27 / 20.31%
Producers' trust in their buyers	High	Moderate
Producers' satisfaction toward the buyers	High	Moderate
Producers' relationship commitment toward the buyers	High	Moderate
Producers' loyalty with they buyers	High	Moderate

Price reliability	High	Moderate
Relative price	Moderate	Moderate
Price-quality ratio	Moderate	Low
Price fairness	High	Moderate
Price transparency	High	Moderate
Number of years in the dairy business	Relatively less	Many
Firm Size	Small-Medium	large
Average farm profit	Moderate	High

Conclusion and implications

In many ways, other research on producers segmentation have detailed out the economic characteristics and management profiles of the producers (Rosenberg & Turvey, 1991; Espinoza-Ortega *et al.*, 2007). In this paper, we present the producer segmentation based on long-term relationship variables and price satisfaction of the producers. Considering the importance of building long-term relationship in the dairy industry, it is essential to consider the producer's characteristics in the relational variables.

Based on the results presented in this study, we found two main groups within the sample. First, the relationship group which consider long-term relationships as important ingredient in their businesses. They have high trust in their buyers and are committed and loyal to them. Reflected by their average farm profit which is around RM 4000 monthly, they focus on sustainable business relationships. In terms of milk price, they are quite satisfied with the current milk prices offered by the buyers especially in terms of price reliability, price fairness and price transparency. Most of this group member comes from small-scale and semi-commercial producers.

The market-driven group is made up of farmers who are likely to maintain their relationships with the buyers but are able to switch buyers at any time as they are not loyal to their current buyers. This group is also interested in reliable and transparent milk prices. By looking at the demographic characteristics, the market-driven group have stable average monthly profits and most likely have been in the dairy business for more than 18 years. This evidence might indicate that they have good knowledge in the dairy industry and have more experience.

The findings have some implications for both policy and management in the milk industry in Malaysia. The main managerial implication is that buyers who want to promote sustainable and

uninterrupted milk supply must use different strategies for the different groups. For instance buyers can improve their relationships with the relationship oriented group by engendering relationship management practices that can sustain the trust and commitment levels. This may include joint activities and problem solving, better communication and flexibility (Boniface *et al*., 2009, Gyau and Spiller 2007, Lu *et al.*, 2008). Such activities are more likely to be successful for the relationship group than the market-driven group.

For policy, we suggest that the government through the MCC must ensure clear and transparent price formula which takes into consideration the quality of the milk. This is against the background that none of the groups on the average had a high score on the fact that the pricing system takes into consideration the quality of their products. The above therefore suggest that the government who is the largest buyer must institute on site testing of the milk in order to determine the quality. Furthermore, the price that is associated with each quality level also needs to be visible in order to enhance farmers` confidence in the pricing system.

The outcomes of this research should be seen within the context of some limitations which could stimulate further research on the relationship performance between the dairy producers and their buyers. The first limitation is that although buyer-seller relationship is a dynamic phenomenon which evolve over time, this study considered the relationship variables at a particular point in time. The cross-sectional nature of the data implies that we are unable to capture changes in the variables used over time. Capturing time series data would provide a better insight into time varying dimensions of the relationship variables. Secondly, the relationship performance was measured from the perspective of the producers only. Future research should therefore consider measuring the relationship performance dimensions from the perspective of the buyers in order to triangulate the results and to determine if there are any perception gaps in the measurements.

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Appendix 1:

Table 2: Principal component analysis: trust, satisfaction, relationships commitment and loyalty

Variables and indicators	Factor loading	KMO*
Trust		**0.709**
My buyer promises are reliable	0.801	
I can trust my buyer	0.774	
I have trust in my buyer skill and expertise in the business	0.725	
My buyer cares for my welfare	0.687	
Satisfaction		**0.759**
I feel satisfied doing business with my buyer	0.787	
My buyer often meets my expectations	0.781	
My buyer treat me fairly and equitably	0.734	
My buyer is quick to handle my complaints	0.708	
Relationship Commitment		**0.814**
Our relationship is something that we are very committed to	0.774	
I feel committed to my buyer	0.760	
I want to maintain indefinitely our relationship	0.750	
I want to improve my relationship in long term	0.730	
I have maximum effort to maintain our relationship	0.685	
Loyalty		**0.785**
If I have other alternative buyer, I will remain with this buyer	0.846	
I will continue to do more business with my current buyer in the next few years	0.814	
I am loyal to my buyer	0.802	
I will ask other dairy producer to seek assistance from my buyer	0.723	

*KMO: Kaiser-Meyer-Olkin Measure of Sampling Adequacy

Appendix 2:

Table 3: Principal component analysis: price satisfaction dimension

Variables and indicators	Factor loading	KMO*
Price Reliability		0.634
Milk price changes are communicated properly	0.807	
Milk price changes are communicated timely	0.779	
My buyer keeps all promise regarding milk price	0.702	
Relative Price		0.591
Terms and condition of my buyer are better tailored to my needs than those of other buyers	0.819	
I am convinced that my buyer is the best choice	0.706	
I do not believe other buyer will have the same or even better milk price offer	0.692	
Price Quality Ratio		0.705
I get a good price-quality ratio	0.868	
I have the impression that I know what I am paying for	0.838	
I agree with the milk price and grading system	0.830	
Price Fairness		0.594
My buyer does not take advantage of me	0.854	
My buyer always consistence with the same pricing formulas	0.781	
The buyer offer me fair and reasonable milk price	0.670	
Price Transparency		0.670
My buyer milk price is clear, comprehensible and understandable	0.828	
Milk price information is understandable and comprehensive	0.813	
Milk price information is complete, correct and frank	0.760	

*KMO: Kaiser-Meyer-Olkin Measure of Sampling Adequacy