

# Assessing Consumer Perceptions on Quality of Different Milk Products Using the Caswell's Classification on Intrinsic Food Quality Attributes

W. J. S. FERNANDO<sup>1</sup> and U. K. JAYASINGHE-MUDALIGE<sup>1</sup>

<sup>1</sup> Department of Agribusiness Management, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka, Makandura, Gonawila. (NWP)

## ABSTRACT

Increased demand for food quality creates a great influence on market segmentation and industry development. So in order to be quality competitive, food processing firms have to understand consumer's perception of various food qualities attributes on their products. As well as milk is one of the major food item in each and every nation with higher nutritive value and higher quality consideration. Hence, this study evaluates consumer perception on four different milk products: 1. domestically produced milk powder, 2. imported milk powder, 3. fresh milk in tetra pack, 4. value added liquid milk in tetra pack, in respective to intrinsic food quality attributes suggested by Caswell. Semantic Differential analysis (SD) is a technique for attitude measurement. So in order to ascertain consumer's perception on each milk product based on food quality attributes Semantic Differential analysis was used. The primary data were collected through a questionnaire survey using randomly selected sample of 210 consumers in Puttalam District from June to July 2006. According to Semantic Differential charts, imported milk powder has higher consumer perception while all four different milk products have negative image regarding food safety attributes.

**KEYWORDS:** Consumer perception, Caswell's classification on intrinsic food quality attributes, Milk, Semantic Differential analysis (SD).

## INTRODUCTION

Demand for quality is increasing among consumer around the World. Food quality has three dimensions. They are, food is safety to eat, the food meets the expectation of the consumer (e.g. organoleptic, nutritional characteristics and resulting benefits) and the food has other characteristics that are not directly related to the food such as organic farming, fair trade and culture etc.

Quality attributes of food products can be analyze effectively along three dimensions. They are, intrinsic or extrinsic, information environment, and vertically or horizontally differentiated. Intrinsic or extrinsic is quality and quality perception influenced by attributes that are intrinsic to products (e.g. nutritional content) or by quality indicator and causes that are extrinsic to the products (e.g. brand name). Information environment is information on product quality of a search nature (the buyer can judge quality by evaluating the product prior to purchase, e.g., color), experience nature (the buyer must used the product in order to evaluate the quality, e.g., taste), or credence nature (the buyer cannot judge product quality even after purchase and use, e.g., pesticide residues). Vertically or horizontally differentiated is quality vertically (buyers all share the same quality ranking) or horizontally (buyers have different quality rankings) differentiates (Caswell, 2000).

Consumers food choices are influenced by variety of factors including taste, convenience, price and accessibility, available alternatives, health status and cultural traditional. Consumers have always cared about multiple attributes of food products but trend are oscillating in terms of consumers caring more about a broader range of attributes. In this study

main attention is given to intrinsic food quality attributes (Table 1).

**Table 6 - Caswell's classification on food quality attributes:**

Quality Attributes	Component
01. Food safety	Food born pathogens Heavy metals Drug residues Food additives Spoilage & botulism Irradiation & fumigation
02. Nutritional	Calories Fat & cholesterol Sodium & minerals Carbohydrates & fiber Protein Vitamins
03. Sensory	Taste Color Freshness Aroma
04. Value	Compositional integrity Size Style Convenience Package materials Shelf life

Source: Caswell (2000)

Milk is an almost completes food; consists of protein (mainly casein), fat, salts, and milk sugar or lactose as well vitamins A, C, D, certain B and lesser amount of other nutrients. Milk is a major source of calcium and good source of phosphorous. Low fat

and skim milk fortified with vitamins A and D have the same nutritional value as whole milk but with fewer calories and less cholesterol. Whole milk has 3.5 percent milk fat, low fat milk one to two percent and skim 0.5 percent. Heavy cream has a minimum of 36 percent milk fat, half and half not less than 10.5 percent nor more than 18 percent.

There are two main milk products in Sri Lanka. They are milk powder and liquid milk. Milk powder is mainly in two forms based on milk fat as full cream and nonfat. Full cream milk contains more than 1.5 percent milk fat and nonfat milk contains less than 1.5 percent milk fat. Powder milk is more popular among consumers mainly due to it guarantees quality, convenience in handling and has the possibility of storing under room temperature for several weeks. Liquid milk also is in two forms as fresh milk and value added liquid milk. Pasteurized milk with a shelf life between four to seven days is what people refer to as fresh milk. In flavored milk, milk is stabilized with different flavors like chocolate, coffee, vanilla, etc. and milk flavored with fruit juices are the milk with unstabilized flavor. This flavored milk has been introduced to market to increase milk consumption and encourage young people to drink milk.

In 1981 under the policy of liberalization and privatization the government took a decision to close the National Milk Board and signed an agreement with Nestle to develop the dairy industry. Today entire milk food sector is in the hands of just two or three large companies such as Nestle, Anchor, and Maliban, which market mainly imported milk powder from the West (Table 2). Only seventeen percent of total milk consumption (Table 3) is produced within the country, rest is imported from the West. Milk powder is imported from the New Zealand, Australia and Denmark. MILCO is the only one firm which produced milk powder domestically. Anchor is the leader of milk powder market which has fifty percent of market share. Nespray takes the second position. Highland which is produced domestically has around seven to ten percent market share and it is in the fifth or sixth place in the milk powder market. MILCO and Nestle are the main milk collectors. Lanka Dairies,

Nestle, MILCO, Newdale Dairies, Rich Life are some firms deal with liquid milk market in Sri Lanka and MILCO is the leader.

**Table 3 - 2003/04 all Island monthly per capita milk consumption and expenditure by items:**

Item (Milk)	Unit	Quantity (Unit)	Value (Rs.)
Unprocessed (fresh)	M liter	47.18	1.30
Pasteurized (fresh)	M liter	4.27	0.29
Sterilized (fresh)	M liter	2.49	0.13
Powder (infant)	Grams	30.00	11.13
Powder (full-cream)	Grams	250.66	81.48
Powder (nonfat)	Grams	28.38	10.12
Condensed milk	M liter	1.98	0.26
Evaporated milk	M liter	1.23	0.13

Source: Hector Kobbekaduwa Agrarian Research and Training Institute.

In the diet of every nation, milk is considered as a nature's perfect food. An adequate consumption of milk can correct dietary deficiency and symptoms of vomiting and diarrhea, etc. of most people. Milk plays an important role in Sri Lankan diet as in the other nations. Milk is one of the major fat sources in Sri Lankan diet which is second only to oil and fat food; as well milk is a considerable source of calories and protein (Food Balance Sheet, 2005). Since milk is one of the major food items in Sri Lanka, in this study four different milk products as (1) domestically produced milk powder, (2) imported milk powder, (3) fresh milk in tetra pack, (4) value added liquid milk in tetra pack have been selected to ascertain consumer perception on those milk products in respect to intrinsic food quality attributes. Which product has higher consumer image? What could be the possible reasons for that and ways to increase consumers image on other milk products and what are attributes which are not satisfied by the milk products are the aspects which are going to be addressed in this study using Semantic Differential analysis.

**Table 2 – Import of milk and milk products (1997 to 2002):**

Year	Milk and Cream		Milk Powder Fat <1.5		Milk Powder Fat >1.5	
	Quantity ('000 Kg)	Value ('000,000 Rs.)	Quantity ('000,000 Kg)	Value ('000,000 Rs.)	Quantity ('000,000 Kg)	Value ('000,000 Rs.)
1997	169	6	4	473	37	4,837
1998	237	9	5	528	49	6,505
1999	48	5	6	601	48	6,518
2000	185	11	8	1,100	49	7,287
2001	136	16	0	0	52	9,669
2002	279	25	17	3,139	45	7,258

Source: Ministry of Agriculture and Livestock (2003)

**METHODOLOGY**

In this section the paper presents the methods used to examine the economic problem of the study. First describe theoretical framework, then data collection and analysis.

**Theoretical Framework**

The Semantic Differential (SD) measures people’s reactions to stimulus words and concepts in terms of rating on bipolar scales defined with contrasting adjectives at each end. Bipolar adjective scales are simple economical means for obtaining data on people’s reactions. Rating on bipolar adjective scales tends to be correlated, and three basic dimensions of response account for most of the co-variation in rating. The three dimensions which have been labeled Evaluation, Potency, and Activity (EPA), some adjective scale are almost pure measures of the EPA; for example, good-bad for Evaluation, powerful-powerless for Potency, and fast-slow for Activity (Heise, 1967).

The SD has been used as a measure of attitude in a wide variety of projects. Osgood, et al., (1957) report exploratory studies in which the SD was used to assess attitude change as a result of mass media programs and as a result of messages structured in different ways. The SD has been used by other investigators to study attitude formation (e.g., Barclay and Thumin, 1963), attitudes towards organizations (e.g., Rodefeld, 1967), attitudes towards jobs and occupations (e.g., Triandis, 1959; Beardslee and O’Dowd, 1961; Gusfield and Schwartz, 1963), and attitudes toward minorities (e.g., Prothro and Keehn, 1957; Williams, 1964; 1966). The results in these, and many other studies, support the validity of the SD as a technique for attitude measurement.

**Data Collection and Analysis**

To analyze consumer’s perception on four different

milk products, a pre tested questionnaire survey was conducted based on SD method of a seven point scale in which extremely good are marked as seven and extremely bad are as one. The questionnaire consists of main four intrinsic food quality attributes and their components which have been illustrated in Table 1. The questionnaire survey was conducted with randomly selected consumers reflecting various socio economic characteristics in Puttalam district, from June to July 2006. The survey covers the areas of Nattandiya, Marawilla and Wennappuwa. The valid respondents were 210.

Data analyzing describes the way to analyze primary data which have been collected through consumer survey. The Semantic differential charts were plotted using software “XLStat” for the averaged values of each component of intrinsic food quality attributes. The two axis of semantic differential chart were quality attributes and scale value.

**RESULTS AND DISCUSSION**

**Consumer Perception Level on Four Different Milk Products**

In semantic differential chart for intrinsic food quality attributes, imported milk powder had the highest consumer perception for each and every intrinsic food quality attribute. Domestically produced milk powder took second place. Except sensory attribute and value attribute fresh milk in tetra pack took third place and next was value added liquid milk in tetra pack. Consumers had higher perception in sensory attribute on value added liquid milk in tetra pack than fresh milk in tetra pack. Both fresh milk in tetra pack and value added liquid milk in tetra pack had same level of consumer perception for value attribute (Figure 1).

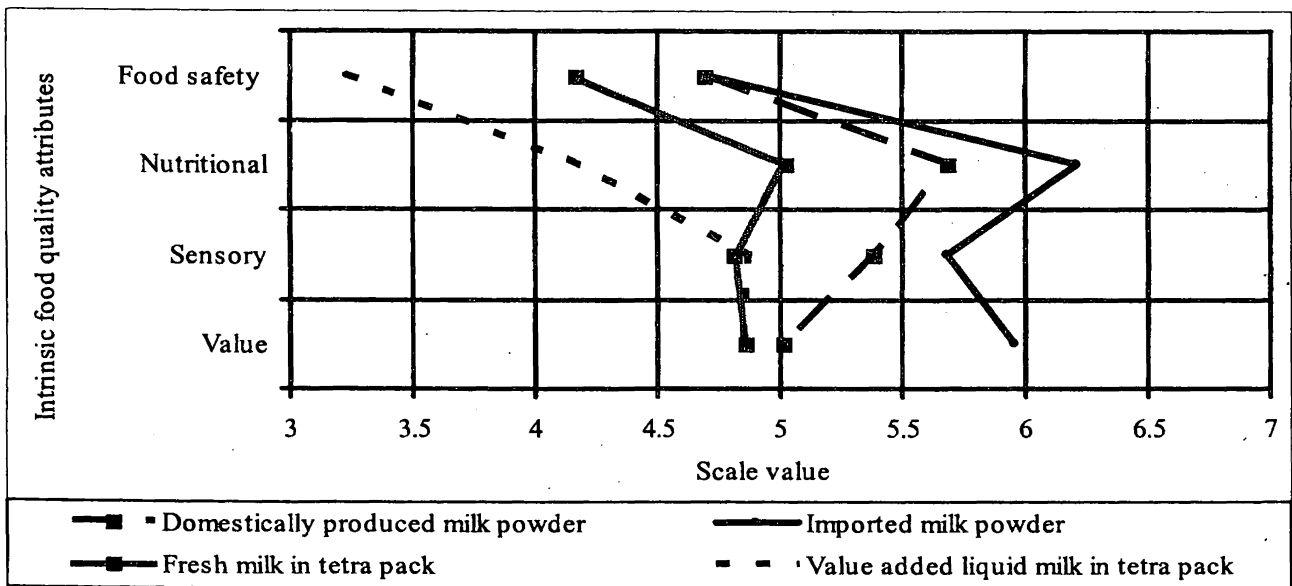


Figure 1 – Semantic Differential chart for intrinsic food quality attributes:

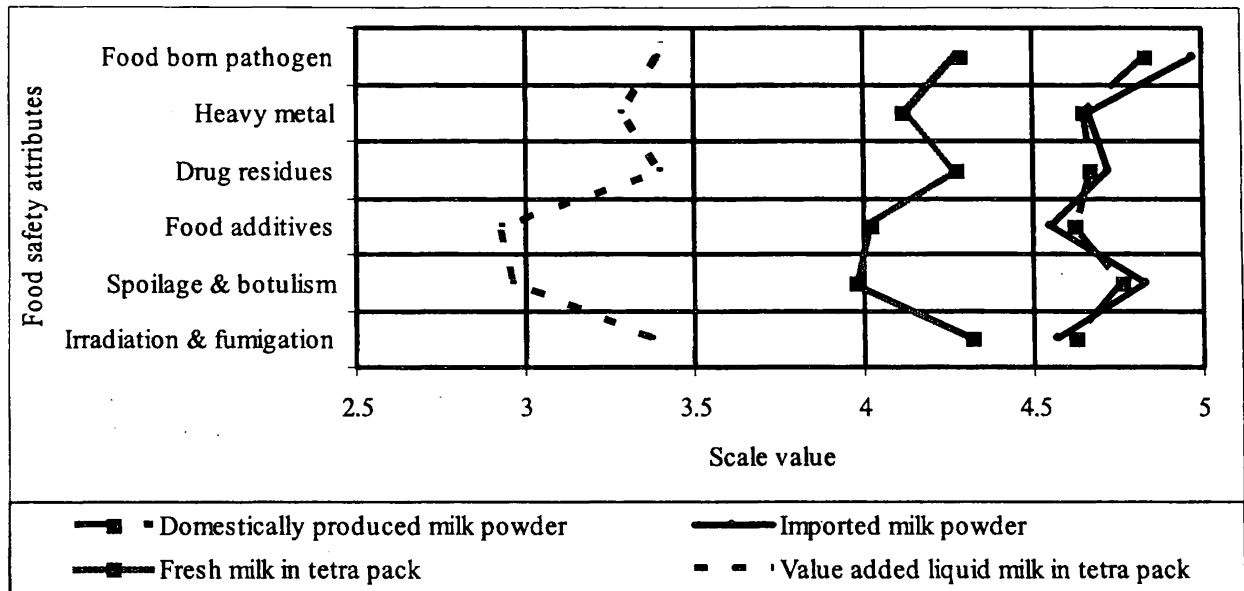


Figure 2 - Semantic Differential chart for food safety attributes:

In the semantic differential chart for food safety attributes, consumer had highest perception on imported milk powder except food additives, irradiation and fumigation. Domestically produced milk powder took second place and third place goes to fresh milk in tetra pack. Value added liquid milk in tetra pack had lowest consumer perception in food safety attributes. Only in food additives, irradiation and fumigation, domestically produced milk powder had highest consumer perception than imported milk powder. Consumer perception in some food safety attributes in value added liquid milk in tetra pack such as food additives, spoilage and botulism had

scale value less than three (slightly bad) (Figure 2).

The semantic differential chart for nutritional attributes shows that imported milk powder had highest consumer perception in all nutritional attributes which had gone beyond scale value six (quite good). Except all the nutritional attributes of value added liquid milk in tetra pack and calories of fresh milk in tetra pack, others had consumer perception beyond scale value five (slightly good). Only the fat and cholesterol content of value added liquid milk in tetra pack had lowest consumer perception, scale value less than four (neutral) (Figure 3).

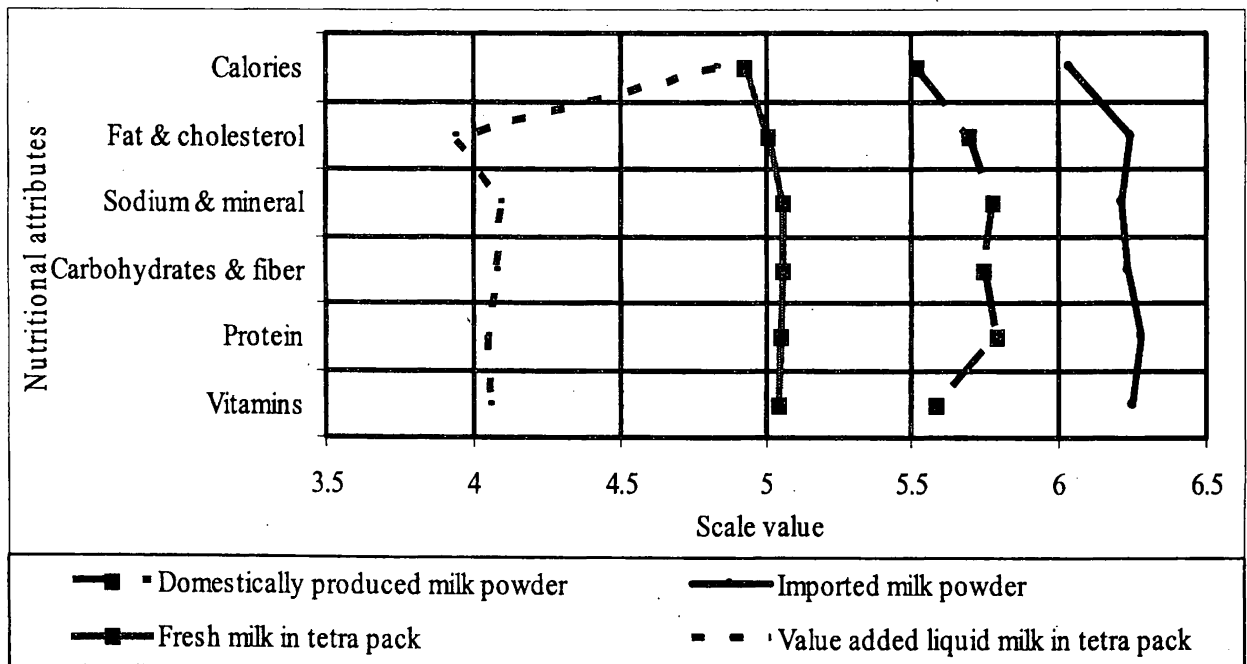


Figure 3 - Semantic Differential chart for nutritional attributes:

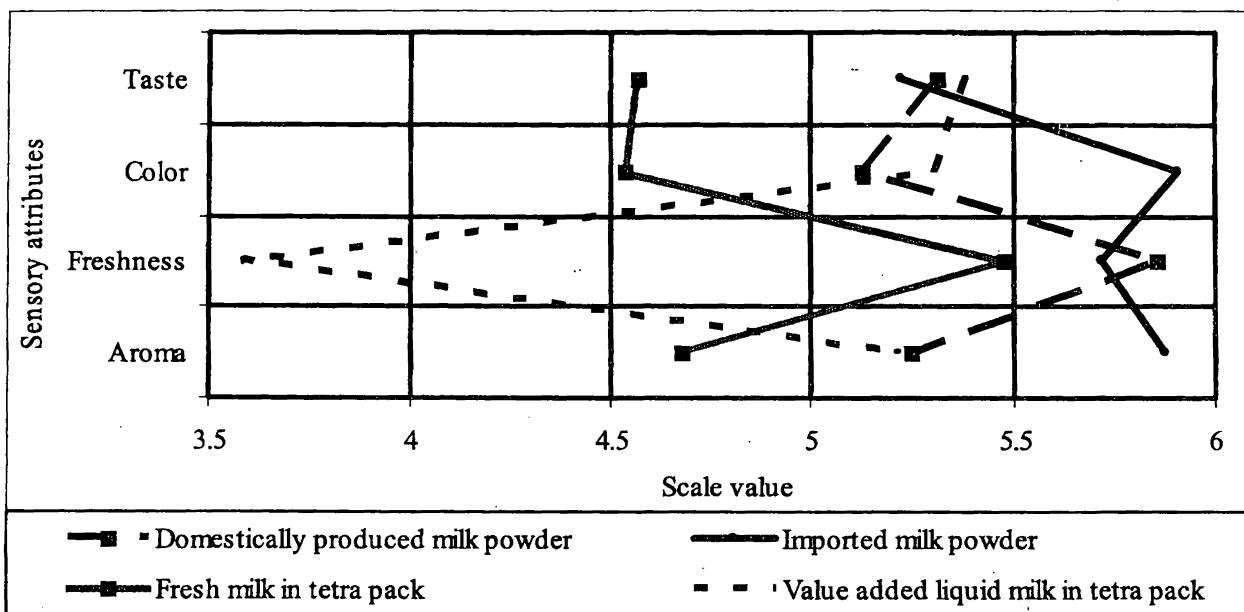


Figure 4 – Semantic Differential chart for sensory attributes:

The semantic differential chart for sensory attributes suggested that, there were great variation in consumer perception regarding all sensory attributes compared to other intrinsic food quality attributes. In taste consumer had highest perception for value added liquid milk in tetra pack and for color, aroma imported milk powder had highest consumer perception. Domestically produced milk powder had highest consumer perception for freshness. Fresh milk in tetra pack had lowest consumer perception for all sensory attributes except freshness. For freshness value added liquid milk in tetra pack had lowest consumer perception (Figure 4).

In semantic differential chart for value attributes, imported milk powder had highest consumer perception in all value attributes except convenience. Regarding convenience both fresh milk in tetra pack and value added liquid milk in tetra pack had highest consumer perception. For compositional integrity, style and shelf life fresh milk in tetra pack had lowest consumer perception. And for size and package material, value added liquid milk in tetra pack had lowest consumer perception. Domestically produced milk powder had lowest consumer perception for convenience (Figure 5).

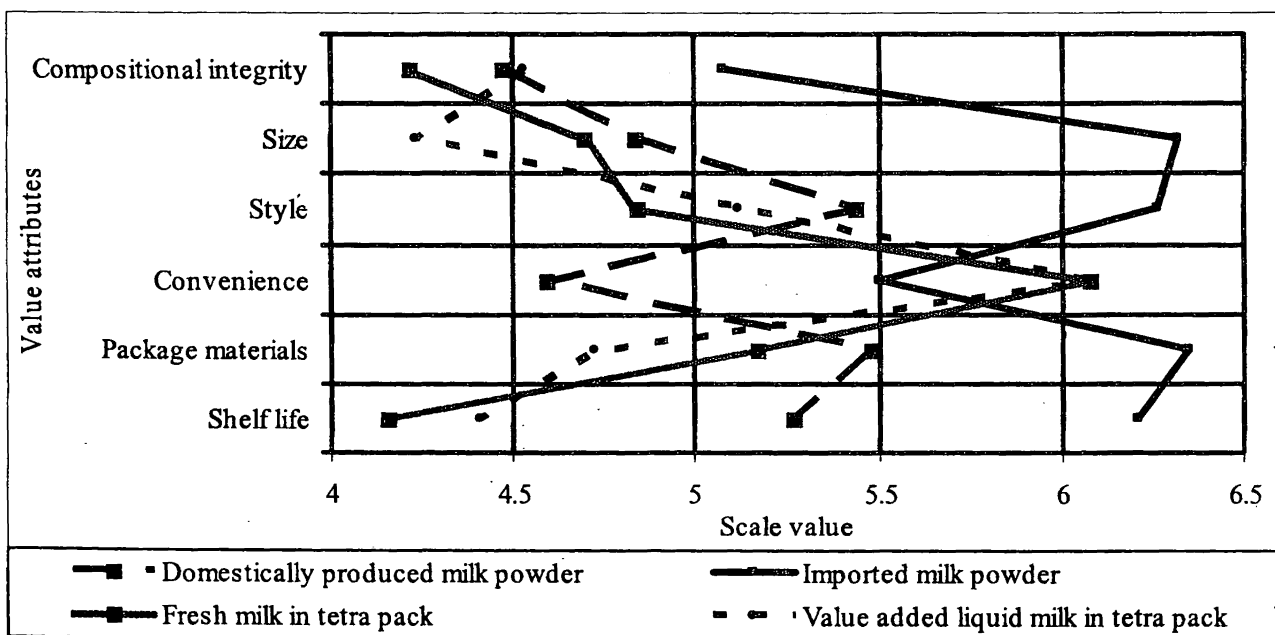


Figure 5 – Semantic Differential chart for value attributes:

**Table 4 - Consumer image of four different milk products:**

Intrinsic Food Quality Attributes	Domestically Produced Milk Powder	Imported Milk Powder	Fresh Milk in Tetra Pack	Value Added Liquid Milk in Tetra Pack
Food safety	-	-	-	-
Nutrition.	+	+	+	-
Sensory	+	+	-	-
Value	+	+	-	-

Note: Scale value greater than or equal to five (slightly good) had been marked as plus (+) and other was as negatives (-).

**Image Comparison of Four Different Milk Products**

All four different milk products had negative image for food safety attribute. In nutritional attribute only value added liquid milk in tetra pack had negative image, other three products had positive image. In both sensory and value attributes domestically produced milk powder and imported milk powder had positive image and other two milk products, fresh milk in tetra pack and value added liquid milk in tetra pack had negative image (Table 4).

**CONCLUSION**

In this modern world customer demand for quality on the agriculture and food system has increased, as well as some customers are more aware and more sensitive to the potential risks and benefits of different patterns of food consumption. And they are looking for means to identify safer and more nutritious products. These are the aspects which must be considered in market segmentation and industry development.

Semantic differential analysis has been applied to four different milk products in Sri Lanka to understand consumer perception of intrinsic food quality attributes of milk. The results show that imported milk powder has higher consumer perception for the most of food quality attributes. That is mainly due to imported milk powder has higher consumer loyalty compared to other three milk products. Because domestically produced milk powder, fresh milk in tetra pack and value added liquid milk in tetra pack had been introduced to milk market where the imported milk powder already exists.

Though food quality attributes can be categorized as search, experience and credence nature based on information environment, most of attributes are credence and experience nature, which could not be observed before purchase. Since food safety attributes are also in credence and experience nature, all four different milk products have negative image regarding food safety attributes due to inadequate information.

This study shows the consumer perception level on each milk product and quality attributes that should be further developed in each milk product. These out comes help to milk processing firms to develop policies and new product design, as well as modify their strategies which are more suited for the consumers' quality aspects.

Consumers and government demand for food quality, including food safety which must be managed by the food processing firms. This study considers only the customer demand and it was a short coming of the study. A further study can be carried out with considering both customer and government demand for food quality.

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