Assessing Consumer Attitudes and Perceptions Towards Food Quality: The Case of Consumption of Tetra-Packed Fresh Milk in Sri Lanka

Sumudu Kariyawasam[1], Udith Jayasinghe-Mudalige[2], and Jeevika Weerahewa[3]

[1] Undergraduate Student, Department of Agribusiness Management, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka, Makandura, Gonawila (NWP), Sri Lanka.
Tel: +94 (077) 628 1268, Fax: 94 (031) 229 9248, E-mail: sumudusdk@yahoo.com

[2] Senior Lecturer, Department of Agribusiness Management, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka, Makandura, Gonawila (NWP), Sri Lanka.
Tel: 94 (077) 362 8911, Fax: 94 (031) 229 9248, E-mail: udith@hotmail.com

[3] Assistant Professor, Department of Food, Agriculture, and Resource Economics, University of Guelph, Guelph, Ontario, N1G 2W1, Canada.
Tel: (519)-824-4120 Ext 53236, Fax: (519)-767-1510, e-mail: jeevika@uoguelph.ca

[2] *Corresponding author*
[3] *Presenting Author*

A Selected Paper Presentation At The
Canadian Agricultural Economics Society Annual Meeting,
Montreal, Quebec, Canada, May 26 – 28, 2006.

Assessing Consumer Perceptions Towards Attributes of Food Quality: The Case of Consumption of Tetra-Packed Fresh Milk in Sri Lanka

Sumudu Kariyawasam, Udith Jayasinghe-Mudalige, and Jeevika Weerahewa

ABSTRACT

The objectives of this study are (i) to assess consumer perceptions on fresh milk that are stored in tetra-packs, and (ii) to determine the relationship between the perceptions and the socio-economic characteristics of the consumers. Using Caswell's four subsets of food quality (i.e. food safety, nutrition, value, and packaging) two indices, namely *Mean Attribute Score* (MAS) and a *Food Quality Responsive Index* (FQRI) were developed, which describe how important each of these four subsets and various attributes included in each subset for a consumer to be "loyal" with fresh milk in a tetra-pack instead of spending that part of money on close substitutes. A sample of 664 consumers were randomly selected and interviewed using a structured questionnaire at 10 different marketplaces in the Gampaha district in Sri Lanka from April to May in 2005. A subset of 100 consumers who consumes the product more frequently was considered for further analysis. Ordered Logistic Regression technique was used to estimate the coefficients of the model, to which five levels for the dependent variable was derived using the range of values of the FQRI. The results based on the MAS indicate that consumers tend to purchase tetra-pack considering the attributes included in value and package subsets mainly, including purity, appearance, size, convenience, and informational labeling etc. However, consumers did not believe that it enhances those attributes included in "food safety" and "nutritional" subsets. The statistical outcome shows that age, gender, level of education and income have a significant impact on this behavior. It suggests that the "market" can promote the consumption of fresh milk provided that a product complies with the safety and nutritional standards set by the "government".

KEY WORDS: Consumer attitudes and perceptions, Food packaging, Food safety and quality, Milk processing sector, Tetra-pack

Assessing Consumer Attitudes and Perceptions Towards Food Quality: The Case of Consumption of Tetra-Packed Fresh Milk in Sri Lanka

Sumudu Kariyawasam, Udith Jayasinghe-Mudalige, and Jeevika Weerahewa

INTRODUCTION

Assuring the quality of food products has become an increasing focus for governments, firms, and international trade and standards bodies. Quality assurance is gaining in prominence because "attributes of quality" are being more highly valued by those institutions. This higher valuation, according to Caswell (1998), is prompting more voluntary quality assurance by food companies and more regulation by government. In fact, national level regulation aiming quality takes on many dimensions or regimes because product quality itself in multidimensional. As a result, there is no definitive list of all attributes of quality, because the importance of such characteristics varies across circumstances and among customers.

Quality management literature, in more general perspective, explores a number of attributes for product quality. According to Garvin (1987), product quality has eight dimensions, i.e. performance, features, reliability, conformance, durability, serviceability, aesthetics and perceptions. Brown *et al.* (1994) specifies a number of indicators to measure quality including, product service quality, operational quality, financial quality, public responsibility, employee and customer satisfaction, where each indicator can be measured by means of a subset of another variables, for example, employee satisfaction is a function of turnover, request for transfer, complaints, and absenteeism.

In attempts to explore the attributes of food quality, different dimensions have been identified, including: (1) information environment, (2) vertical or horizontal differentiation, and (3) whether they are intrinsic or extrinsic. With respect to information environment, following Nelson (1970, 1974) and Darby and Karni (1973), one can distinguish three

categories of product quality attributes that explain how consumers learn about the quality of the commodities they purchase. Of which, the first category is referred as "*search*" attributes where the consumers can determine product quality at the point of purchase by looking at the product, examining, or researching it (e.g., color). For the products that belong to the second category – called as "*experience*" attributes – consumers cannot determine product quality until they buy and use it (e.g., taste). In connection with the products that belong to the third category – "*credence*" attributes – consumers cannot judge the quality of a product even after consumption of it (e.g., pesticide residues).

The second dimension, namely the "vertical and horizontal differentiation" takes into account of how buyers share certain attributes of quality, in which "vertical" refers to the cases where buyers all share the same quality ranking, whilst "horizontal" refers to the cases where buyers have different quality rankings (see Caswell, 1998 for details). The third dimension – "intrinsic or extrinsic" is defined as quality and quality perception influenced by attributes that are intrinsic to the product (e.g., nutritional content) or by quality indicators and cues that are extrinsic to the product (e.g., brand name).

Food safety has been considered the most important subset of food quality amongst the others (Hooker and Caswell, 1998). However, consumer analyzing the quality of different products may be based on different criteria. For instance, a consumer who purchases a Genetically Modified (GM) food product may care, first and foremost, about the use of biotechnology and in turn accept or reject the purchase of that product on the basis of intrinsic process attributes. Another consumer who is worry about the presence of GM food may also care about other quality attributes associated with that such as environmental impact, nutritional quality, and convenience of use. Consequently, they will make tradeoffs, particularly if safety is assured, between the GM status of the food and other desirable attributes (Caswell, 1998).

A number of conceptual frameworks and theoretical models have been developed to explain consumer behaviour on food quality attributes (see for example, Caswell, 1992; Caswell and Mojduszka, 1996; Caswell and Padberg, 1992; Frazao and Allshouse, 1996; French and Neighbors, 1991). However, there is a paucity of literature with respect to empirical investigation that explored, to the best knowledge of authors, relative importance of a given attribute or bundle of attributes (i.e. subset) to a consumer to purchase a food product, and there is no comprehensive analysis carried out in the context of consumers in Sri Lanka that based on a sound theoretical framework such as Caswell's classification (exclusions apply – see, Pathiraja and Ariyawardena, 2003). This study aims to close that gap, which examines this issue using the special case of introduction of a novel packaging material to the local fresh milk market recently, i.e. fresh milk in a *Tetra-Packed* container.

Fresh Milk Industry in Sri Lanka and Tetra-Packs

Although fresh milk is considered to be the most heavily consumed beverage in the world, level of consumption of which in Sri Lanka is considerably low with the per capita consumption of about 4.14 Kg per year. Only about 1 percent of the population in the island consumes fresh milk regularly as compared to 63 percent of others consumer varieties of full-cream milk powder. Table 1 shows the changes in production and consumption of fresh milk over the years.

Table 1 - Fresh milk production and consumption of Sri Lanka (1999-2003):

Year	Production ('00000 Liters)	Consumption (Kg/Year/Head)
1999	126.42	3.59
2000	127.64	3.58
2001	129.02	3.54
2002	129.09	3.68
2003	132.22	4.14

Source: Census and Statistics (2004)

Arising from that, the national and local governments together with the stakeholders of milk processing sector in the country have taken various initiatives to promote the consumption of fresh milk through the development of various value-added products, although promotion of which amongst the consumers is associated with a number of difficulties. Amongst others, the most critical is to maintain the fresh quality of milk along the marketing channel over time because of its very high susceptibility to microbial organisms, and other external forces such as sunrays and dust. Under these circumstances, packaging plays a major role since it can avoid occurring many of these to a reasonable extent. Amongst the different types of packaging materials available in the food processing industry, including rather conventional types of metal cans, glass bottles, paper, paperboards, fiberboards and plastics, and modern types such as laminates and restorable pouches, glass bottles and plastic have been used predominately to market value-added fresh milk.

Fresh milk contained in about a 300 ml tetra-pack, which is coming under the category of laminates, is a novel product to the Sri Lanka fresh milk market introduced recently. It is promoted as a product that can save the quality of fresh milk (and other liquids) for a considerably long time period. Tetra pack is an aseptic packaging system which has been sterilized prior to fill with sterilized food, resulting a product which is shelf stable for six months. It has been made out of three basic materials combined together, resulting a very efficient, safe and lightweight package. Each of this material has a unique function. It is made out of paper (75%) to provide strength and stiffness, polythene (20%) to make the packages liquid tight and provide a barrier to micro-organisms, aluminum foil (5%) to keep out air, light, off-flavors and all the things that can cause food to deteriorate. Fresh milk packages that come under these laminating packages (excluding plastic bottles or glass containers) are treated with Ultra High Temperature (UHT) treatment.

The specific objective of this study is, therefore, to examine extent to which "consumers who diverted from the consumption of fresh milk stored in a rather conventional packaging material (e.g. glass bottle and plastic) to purchase tetra-packed fresh milk on regular basis" are perceived about its attributes of quality based on the Caswell's classification, and whether and how that behaviour is correlated with their socio-economic characteristics (i.e. age, gender, income, marital status, and level of education).

METHODS

Quantification of Food Quality Attributes

The fact that an assortment of food quality attributes are given in the Caswell's classification as well as the subjective nature of these attributes as perceived by consumers, and in turn, the requirement that the individual attributes identified in the classification should not have any overlapping characteristics (i.e. mutually exclusive and exhaustive) were explicitly taken into account in developing an appropriate empirical framework to examine this economic problem.

It was hypothesized that a consumer's decision to purchase a tetra-packed fresh milk regularly (over and above spending of that part of money on close substitutes such as glass bottles and plastic cans) is a result of an "extra utility" that she obtained on the perception that tetra-pack is higher in quality with respect to those attributes included in the four subsets (in compared to that in a glass bottle or a plastic can). In turn, the higher value she placed on a given "attribute" in the classification, for example low in calorie per 100 ml in a 350 ml tetra-pack can have a greater impact on consumer's decision to purchase it over the other substitutes [A number of different intrinsic attributes, as identified by Caswell (1998), are described in Table 2]. Likewise, the consumer's choice of tetra-pack may be triggered by her perception that it is better in many or all these quality attributes given in Table 2 over the

other substitutes. For example, if the consumer perceived that tetra-pack is better in all six attributes included under the subset of food safety (1.1. to 1.6 in Table 2), it is an indication that fresh milk in a tetra-pack is perceived "safer" than that in another container, and so on.

Table 2 - Intrinsic food quality attributes:

Subset	Attribute
1. Food Safety	1.1 Foodborne Pathogen
	1.2 Heavy Metal
	1.3 Pesticides Residues
	1.4 Food Additives
	1.5 Naturally Occurring Toxins
	1.6 Veterinary Residues
2. Nutritional	2.1 Calories
	2.2 Fat & Cholesterol
	2.3 Minerals
	2.4 Carbohydrates
	2.5 Protein
	2.6 Vitamins
3. Value	3.1 Purity
	3.2 Compositional Integrity
	3.3 Appearance
	3.4 Taste
	3.5 Convenience
	3.6 Size and Style
4. Package	4.1 Package Material
	4.2 Other Information (e.g. Handling)
	4.3 Labeling (e.g. Nutritional)

Source: Caswell (1998)

However, quantifying of such behavior is associated with a number of difficulties, including "unobservability" (Hair *et al*., 1995) and "subjectivity" (Buchanan, 1969) of perceptions amongst the individuals. To resolve the difficulties, researchers have resorted to alternative ways of developing appropriate techniques to avoid losing too much information. Powers and Xie (1999), for example, report that "*Scoring Methods*" can effectively be used to evaluate such criteria, and "*Integer Scoring*"[1], which assigns integers a rank order is the simplest and perhaps most popular of these methods.

In so doing, the scores given by respondents in a sample to a set of statements explaining these quality attributes can be used to evaluate the "relative importance" of each to them. For the purpose of this analysis, a "*Mean Attribute Score*" (MAS) has been developed, which was calculated by aggregating the scores given by all respondents (N_i, where i = 1,2…n) to all attributes (X_S, where s = 1,2…m) and dividing it by number of respondents in the sample (N_i). The value of MAS will in turn depend on the size of the scale used to get scores, for example for a five-point Likert scale it will be ranged from 1 (min) to 5 (max).

With that, another index can be developed, namely "*Food Quality Responsive Index*" (FQRI), which is an *Additive Index* based on the same techniques to describe how important each of these four subsets "as a whole" for an individual consumer to be loyal with a given food product, and in this particular case – "tetra-pack fresh milk". The formulation of the FQRI was based on the equation shown below:

$$FQRI_{\ i} = \sum_{s=1}^{m} a_{is}.X_s \,/\, aX$$

[1] In integer scoring, for example, the researcher can assign a Likert-like scale of *strongly disagree = 1, disagree = 2, neutral = 3, agree = 4, and strongly agree = 5* to measure the extent to which a respondent agrees on a given criteria. In doing so, the terms of the scale, and the range of the integers, may be set according to the nature of the question/issue. The crucial assumption underlying integer scoring is that the distances between adjacent categories are all equal, thus, researchers who may use integer scoring should be conscious of, and sensitive to, this.

In this equation, the term a_{is} denotes the integer score given to an attribute (X_s) by the respondent *i* (*i* = 1, 2, 3…n) on the Likert-scale and *s* represents the number of attributes (*s* = 1, 2, 3…*m*) used to calculate the index. The scores given by respondents to *s* where *m* = 21 for this analysis (see Table 1) were used to estimate the FQRI.

The term *a*X represents the "Maximum Potential Score" that can be obtained by a respondent[2], which in turn be used to normalize the value of the index. With normalization of the index, the values should, theoretically, be range from 0 (minimum) to 1 (maximum) continuously with a certain Mean and Standard Deviation. Given the largely unknown behaviour of consumers with respect to each subset, all attributes shown in Table 1 were given equal weights in estimating the index. Thus, the simple average of Likert-scale values normalized by the maximum potential score (aX) was taken to develop the index.

Specification of the Empirical Model

With FQRI of a consumer was taken as the dependent variable, the following empirical model was constructed to find out whether there is any significant relationship between the consumer perception on food quality attributes and their socio-economic characteristics:

$$FQRI_i = \alpha 1 + \alpha 2 * AGE_i + \alpha 3 * GEN_i + \alpha 4 * INC_i + \alpha 5 * MRS_i + \alpha 6 * EDU_i + \varepsilon_i$$

Where, the explanatory variables are respondents: (1) AGE – age (less than 35 years = 1 and more than 35 years = 0); (2) GEN – gender (male = 1; female = 0); (3) INC – ratio of disposable income to total income (more than 0.75 = 1; less than 0.75 = 0); (4) MRS – marital status (married = 1; unmarried = 0), and (5) EDU – level of education (beyond the Ordinary Level = 1; up to the Ordinary Level = 0).

[2] For example, given a set of 21 attributes with a five-point Likert-scale it would be 5x21 = 105.

Data Collection and Analysis

A questionnaire-based survey[3] was conducted with a sample of 664 consumers selected randomly to reflect the various socio-economic characteristics indicated in the empirical model at 10 different marketplaces, including national chain stores, grocery stores, and milk bars located in the Gampaha district in Sri Lanka over the period of April to May in 2005. To develop the MAS and FQRI, set of statements explaining the meaning of quality attributes[4] (see Table 1) were forwarded to consumers through this questionnaire so that an average consumer can understand meaning and difference between each attribute properly. The respondents were asked to indicate their perceptions about each attribute on a five-point Likert scale [5](Oppenheim, 1992).

At the end of coding of data, there were 100 consumers who diverted from other substitutes to purchase tetra-pack fresh milk on a regular basis (i.e. "tetra-pack loyalists") were considered for analysis[6], which satisfied 15 percent of the original sample with the Mean consumption of 3.43 tetra-packs per week. The Ordered Logistic Regression techniques were used to estimate the coefficients of the empirical model (Borooah, 2002 and Pampel, 2000). The FQRI derived for consumers in the sample (n=100) were used to derive five-ordered dependent variables for the analysis. The estimates of "logged odds" (logits) of

[3] The questionnaire was pre tested prior the real survey with a small sample of potential consumers (n=20) and minor modifications were done to the preliminary questionnaire.

[4] For example, "I prefer fresh milk in a 350 ml tetra-pack, because it contains low calorie per 100 ml than fresh milk stores in glass bottles and plastic cans"

[5] In the case of 1.1 in Table 1, it was asked whether "food borne pathogens that may be presence in fresh milk stored in a tetra-pack is comparatively lower than fresh milk sell in the market in a glass bottle and/or a plastic can". The five scales used to score on this attribute were: (1) "totally disagree"; (2) "disagree to some extent"; (3) "neither agree nor disagree"; (4) agree to some extent", and (5) "totally agree". In the case of 2.1, it was asked that whether "amount of calorie/100 ml contain in fresh milk stored in a tetra-pack is comparatively lower than fresh milk sell in the market in a glass bottle and/or a plastic can", same five scales were used for the purpose of scoring. It must be noted that there were certain modifications to the statement to reflect common perceptions of consumers in the society on these attributes (e.g. low in fat / high in minerals / high in purity etc.) and the original questionnaire is administered in the Sinhalese language.

[6] The objective of this study was not to examine whether consumers purchase or not the given product, but to assess the attributes that those recently diverted "tetra-pack loyalists" mostly valued.

explanatory variables, especially their relative size and sign were used to interpret the nature and impact of which on the consumer perceptions on quality attributes.

RESULTS AND DISCUSSION

Descriptive Statistics of MAS

The Mean Attribute Scores (MAS) calculated for each quality attribute is reported in Table 3. According to the results, consumers perceive tetra-pack as a better "package material" (4.73), those packs have a better "appearance" (4.52), and "convenience" of using in their day-to-day life (4.42) as the three major changes in quality. Overall, the attributes included in the subsets of "value" and "packaging" got the MAS more than 3.5. In terms of food safety and nutritional subsets, a number of individual attributes including 1.1 and 1.3 in the former and 2.3, 2.5 and 2.6 in the later (see Table 4) got the MAS more than 3.0 indicating that consumers judge tetra-pack provide better quality in these aspects. Conversely, consumers did not judge that tetra-pack increases quality over the substitutes with respect to certain attributes such as 1.2, 1.5 and 1.6 in food safety and 2.1, 2.2 and 2.4 in nutritional subsets.

Descriptive Statistics of FQRI

Those scores provided to 21 quality attributes by each consumer were next used to estimate the FSRI. The distribution of FQRI amongst the consumers ranged from the 0.23 (the lowest) to 0.87 (the highest) with a mean of 0.55 and Standard Deviation of 0.19. The higher FQRI means the consumer "more agree" towards the statements that denote "introduction of tetra-packs into the fresh milk market had made a considerable quality improvement with respect to these attributes, as a whole" or vise versa. The distribution was right skewed with the value of 1.98 (Figure 1).

Table 3 – Descriptive Statistics of MAS:

Subset	Attribute	MAS
1. Food Safety	1.1 Low in Foodborne Pathogen	3.25
	1.2 Low in Heavy Metal	2.91
	1.3 Low in Pesticides Residues	3.22
	1.4 Low in Food Additives	2.36
	1.5 Low in Naturally Occurring Toxins	2.75
	1.6 Low in Veterinary Residues	2.87
2. Nutritional	2.1 Low in Calories	2.73
	2.2 Low in Fat & Cholesterol	2.39
	2.3 High in Essential Minerals	3.16
	2.4 Low in Carbohydrates	2.78
	2.5 High in Protein	3.11
	2.6 High in Vitamins	3.21
3. Value	3.1 High in Purity	4.21
	3.2 High in Compositional Integrity	3.82
	3.3 Better Appearance	4.52
	3.4 Better Taste	3.89
	3.5 High Convenience	4.42
	3.6 Better Size and Style	4.06
4. Package	4.1 Better Package Material	4.73
	4.2 Better Other Information	3.47
	4.3 Better Labeling	3.91

Next, the five-ordered dependent variables ($FQRI_i$ = 1 to 5) were developed for the purpose of the OLR analysis using the "lower" and "upper" limits for the FQRI as shown in Table 4.

Figure 1 - Distribution of the values of FQRI:

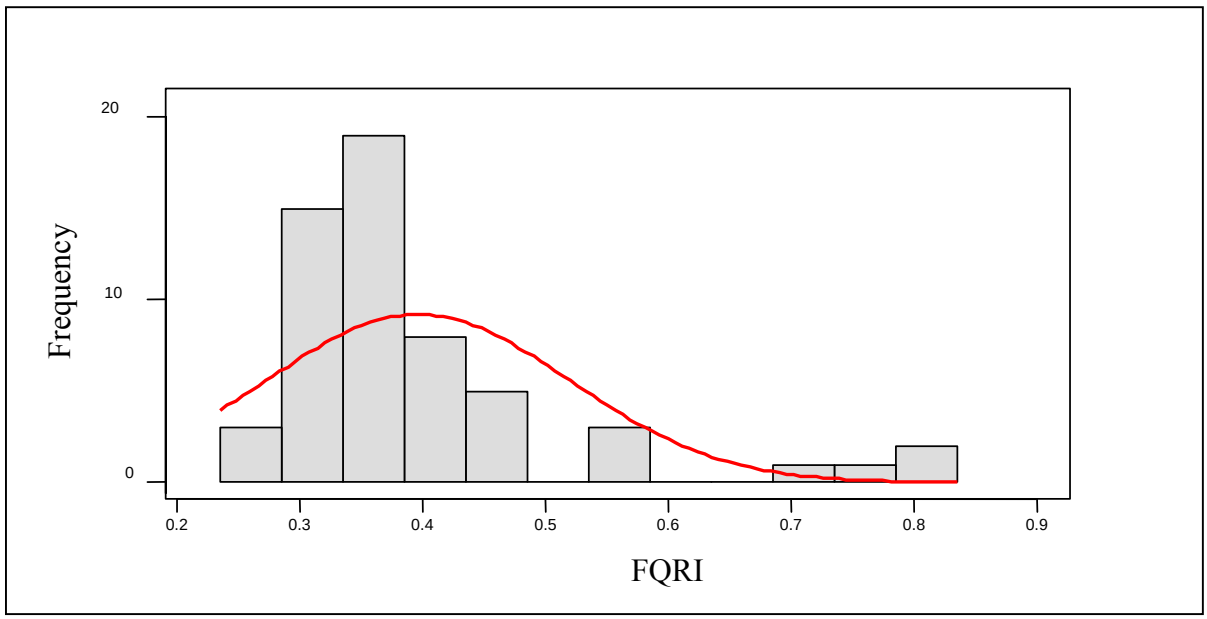

Table 4 - Ordered dependent variables of FQRI:

Dependent Variable	Limits of Ordered Variables		No of Consumers	Percentage (%)
	Lower Limit	Upper Limit		
1	0.23	0.33	34	34
2	0.34	0.50	28	28
3	0.51	0.66	18	18
4	0.67	0.77	12	12
5	0.78	0.87	08	08

Note: 0.23 = minimum value (theoretically "zero") and 0.87 = maximum value (theoretically "one")

The theory from Logistic Regression analysis suggests that consumers included in a higher order dependent variable, for example 18 consumers in "third ordered variable", prefer fresh milk in a tetra-pack because of their higher perceptions towards assured quality of which in all or many of those attributes than those consumers included in a lower dependent variable, for example 28 consumers in "second ordered variable".

Estimates from Ordered Logistic Regression

The logged odds from OLR and Marginal Probabilities calculated for five explanatory variables are reported in Table 4.

Table 4 - Results from the Ordered Logistic Regression:

Variable	Estimate	Standard Error	Marginal Probability
D=1	3.3153*	1.2218	-
D=2	8.5122*	1.8146	-
D=3	9.2380*	1.8650	-
D=4	10.0140*	1.9471	-
AGE	-5.7311***	1.2195	-0.46
GEN	-0.2439**	0.7685	-0.39
INC	1.4515**	0.5677	0.24
MRS	-1.3183	0.9695	0.17
EDU	0.6460***	0.1786	0.44

Notes: ***, ** and * denote statistical significance at 1%, 5% and 10%, respectively.

Interestingly, all, except "marital status", have a significant impact on consumers overall attitudes and perceptions towards quality. It can be observed that "age" and level of "education" of consumers have the highest impact (i.e. significant at $\rho = 0.01$), whilst other two (i.e. "gender" and "income") show moderate impact (i.e. significant at $\rho = 0.05$). The results clearly indicate that fairly older, female, educated consumers who have a higher disposable income prefer to have tetra-pack fresh milk, as they believe that it enhances the quality, especially with respect to value and package subsets.

CONCLUSIONS

This study examines the attitudes and perceptions of consumers towards the relative importance of quality attributes included in four subsets in the Caswell's food quality attributes classification (1998) using the special case of their desire to purchase fresh milk contains in the tetra-pack. The outcome of analysis that based on two indexes, namely *Mean Attribute Score* (MAS) and *Food Quality Responsive Index* (FQRI), and an Ordered Logistic regression analysis to quantity consumer behaviour in this respect suggests that the relative importance of these attributes varied with respect to socio-economic characteristics of consumers.

The majority of consumers who purchase fresh milk in tetra-packs more than 3 times a week indicate that it is as safe as other substitutes. They did not believe that it is a better product in terms of nutritional aspects of quality such as protein and vitamin level. Not surprisingly, a large portion of consumers are used to purchase it by taking into account of its "value" and "package" attributes such as its ability to secure purity of the content, attractiveness of the package, convenience to handle (small size) etc. The statistical outcome shows that age, gender, level of education and income of consumers have a significant impact, although with varied size effects, on this behavior. Older (above 35 years), and interestingly more educated (beyond the Ordinary Level) females have shown a greater interest on tetra-packs than their counterpart indicating that these value and package attributes make them loyal to fresh milk in these containers.

The results suggest that the "market" can promote the consumption of fresh milk in Sri Lanka to a greater extent if it is offered in a container with an "outlook". However, it also implies that they do not believe the market can make it safer and nutritional than fresh milk in

other types of containers, thus the "government" intervention is needed to set appropriate standards for these subsets.

REFERENCES

Borooah, V. K. 2002. *Logit and Probit: Ordered and Multinomial Models.* Series: Quantitative Applications in the Social Sciences. No. 138. Thousand Oaks: Sage Publication.

Buchanan, J. M. 1969. *Cost and Choice: An Inquiry in Economic Theory*. Markham. Chicago.

Caswell, J. A. 1998. Valuing the Benefits and Costs of Improved Food Safety and Nutrition. *Australian Journal of Agriculture and Resource Economics,* 42 (December): 409-474.

Caswell, J. A. 1992. Current Information Levels on Food Labels. *American Journal of Agricultural Economics,* 74 (December): 1196 - 1201.

Caswell, J. A., and E. M. Mojduszka. 1996. Using Informational Labeling to Influence the Market for Quality in Food Products. *American Journal of Agricultural Economics,* 78 (5): 1248-1253.

Caswell, J. A., and D. Padberg. 1992. Towards a More Comprehensive Theory of food Labels. *American Journal of Agricultural Economics,* 74(2): 460-468.

Darby, M. R., and E. Karni. 1973. Free Competition and the Optimal Amount of Fraud. *Journal of Law and Economics,* 16: 67-88.

Frazao, E., and J. E. Allshouse. 1996. Nutritionally Improved foods in Grocery Stores: 1989 – 93. *The Economics of Reducing Health Risk from Food*. J. A. Caswell (Ed.) Stores CT: Food marketing Policy Center. Pp. 149 – 161.

French, M. T., and D. M. Neighbors. 1991. A Model of Firm Costs of Compliance with Food Labelling Regulations. In: Caswell, J. A. (Ed.). *Economics of Food Safety*. Elsevier. New York. pp. 299-415

Garvin, D. A. 1987. Competing on the Eight Dimensions of Quality. *Harvard Business Review,* (November – December): 101-109.

Hair, J. F., R. E. Anderson, R. L. Tatham, and W. C. Black. 1995. *Multivariate Data Analysis with Readings*. Prentice Hall. Englewood Cliffs. New Jersey.

Hooker, N. H., and J. A. Caswell. 1998. Trends in Food Quality Regulation: Implications for Processed Food Trade and Foreign Direct Investment. *Agribusiness,* 12(5): 411-419.

Nelson, P. 1974. Advertising as Information. *Journal of Political Economics,* 81: 729-754.

Nelson, P. 1970. Information and Consumer Behavior. *Journal of Political Economics,* 78: 311-329.

Oppenheim, A. N. 1992. *Questionnaire Design, Interviewing and Attitude Measurement.* Pinter Publishers. London.

Pampel, F.C. 2000. *Logistic Regression: A Primer*. Series: Quantitative Applications in the Social Sciences. No. 132. Thousands Oaks: Sage Publications.

Pathiraja, P. H. K., and A. Ariyawardana. 2003. Impact of Nutritional Labelling on Consumer Buying Behaviour. *Sri Lankan Journal of Agricultural Economics,* 5(1): 35-46.

Powers, D. A., and Y. Xie. 1999. *Statistical Methods for Categorical Data Analysis*. Academic Press Inc.