Market segmentation of Milk - *"A Study on Consumer preferences in Kanchipuram District"*

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Abstract

As milk is a very important component of the Kanchipuram diet, this study explores consumer preferences for milk in Kanchipuram and also tries to determine consumers types based on their preferences and socio-demographic factors. To reach these objectives, this study designed a conjoint choice experiment survey and collected primary data in the of Kanchipuram District. Then the data was analyzed using Latent class approach to determine milk consumer classes based on the product attributes. Conjoint choice experiment with latent class analysis indicates that the most important attribute for Kanchipuram consumer is "fat level". Also four consumers groups were identified with their specific characteristics for each group. This study provides useful information to different stakeholders including milk producers and importers. The milk industry and its marketers may benefit from this information by using it to strategically market their milk to different groups.

Key-words: Milk, consumer preferences, market segmentation, Conjoint Choice.

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1. Introduction of the study
2.

As milk is a very important component of the people's diet, this study explores consumer Preferences for milk in kanchipuram and also tries to determine consumers types based on their Preferences and socio-demographic factors. To reach these objectives, this study designed a conjoint choice experiment survey and collected primary data in the most populated cities of kanchipuram. Then the data were analyzed using Latent class approach to determine milk consumer classes based on the product attributes. Conjoint analysis is a better method for determining consumer preferences than the other methods of research that have previously been used because in compositional models, customers' explicit perceptions or beliefs about each attribute of a product are measured separately, but conjoint analysis takes a holistic view of a product. In other words, a researcher asks the respondent to rate his or her preference for a product by evaluating the entire product.

Conjoint choice experiment with latent class analysis indicates that the most important attribute for consumer is "fat level". Also four consumers groups, 9.2%, 28.1%, 42.6% and 20.1% were identified with their specific characteristics for each group.

This study provides useful information to different stakeholders including milk producers and importers. The milk industry and its marketers may benefit from this information by using it to strategically market their milk to different groups.

2.Statement of the problems:

Milk is among the traditionally produced agricultural goods in kanchipuram. The dairy industry, and along with it the milk collection system, are still in the course of modernizing structures and technologies. In the late 2000's, the first private milk processing plants were established in different regions of the country. Most small processing units use traditional craftsmanship technologies until today. Actually there are a number of modern processing plants operating successfully, although these are struggling with the competition from informal markets. Nevertheless, consumers are discovering their preference for processed products.
In the last ten years kanchipuram has gone through a lot of changes, which has also been reflected in the people's diet, product preferences and quality. As milk is a very important component of the people's diet, in

this study we are trying to focus in different preferences of consumers toward milk attributes. These preferences might lead to market segmentations, in which producers and policy makers might focus to improve the product quality and to meet the consumers' needs.

The evolution experienced by the food sector along with the availability of higher computational power has greatly changed in the last ten years the models analysts employ to explore the purchase and consumption patterns of the post-industrial society. Nowhere is the change in determinants of food selection by consumers more evident than in urban consumers are furthest removed from food production processes, and hence more dependent on cues and labeling information. Typical food products must now compete in markets, which are wider and more segmented than they have ever been. Within this context, the purpose of this research is to analyze and contrast the preferences of urban Tamilnadu consumers with regards to milk, which is a traditional component of the diet, widely adopted throughout the kanchipuram area. Due to the significance of livestock and milk production, particularly in rural areas, the government has selected the milk sector as a policy priority. The Indian government and Tamilnadu dairy society are inclined to support primary production and the dairy industry.

3. Objectives
4.

The main purpose of this study is to analyze if there are differences in the consumers preferences in choosing milk in the market, especially to differentiate consumers' behavior towards fresh and UHT milk. In other words the study tries to find out how different consumers consider different attributes of milk, when they buy the product. From these differences we can than determine the market segmentation towards this. Determine the differences in consumer's preferences on milk in kanchipuram district and the three taluk were selected i.e., Uthiramerur, Sriperumbudur, and Chengalpattu.

5. Hypothesis of the study:

Different consumers regarding, age, education, sex, income level etc. react differently towards different milk attributes (fat level, milk type, purchasing place and price).

5.1 Milk production in Kanchipuram

Livestock production is seen as a backbone of kanchipuram agriculture. Tamil Nadu, with a daily milk production of 145.88 lakh litres, is one of the leading states in milk production in India. And the Tamil Nadu milk cooperatives play a major role in the development dairy within the state. The milk cooperatives of Tamil Nadu, with the help from the government and National Dairy Development Board (NDDB), have played substantial roles in taking the state to the current position. Besides, NDDB also undertakes methodical approach and appropriate strategy for the enlistment of Tamil Nadu milk cooperatives.

The dairy development programmes in Tamil Nadu have been implemented through a wide network of co-operatives, which follow the 'Anand Model' of the state of Gujarat. The model follows three-tier structure where primary milk producers' co-operative societies remain at the base level. In the district level, there is a union of producers' co-operative societies, whereas, Federation of District Co-operative Milk Producers' Union remain at the top (state) level of the structure.

In Tamil Nadu, Milk Producers' Cooperative Societies function at the village level, where milk producers get enrolled as members. The members get animal health cover for their animals; breed improvement is also carried out. District unions collect the milk produced at the village societies. Livestock products constitute a main source of food, and a high share of production still serves for subsistence purposes and as feeding for the calves. Dairy activities have a long tradition in kanchipuram due to the favorable natural resources for dairy production. In the plains, cattle production is dominant, while in the hills and mountains, sheep and goat production are more suitable. Traditional dairy products are yoghurt, butter, curd and different kinds of cheese from cow, sheep and goat milk.

Milk production and collection system (mainly cow milk) in kanchipuram is characterized by the existence of the informal (direct selling from farmers) and formal market channels (collection & distribution by dairies). Milk production in Kanchipuram suffers still from problems of quality assurance.
Procedures

The main focus of this study is exploring consumer preferences for milk in kanchipuram. Purchasing decisions of a product are usually based on the combination of product attributes along with socio-demographic variables that influence the preferences for these attributes. Similar is the case with milk.

Conjoint analysis has been frequently used in most types of marketing research. According to Green, Krieger and Wind (2001), "Conjoint analysis is, by far, the most used marketing research method for analyzing consumer trade-offs" and is chosen as the method of research to be used in this study for determining consumers' preferences for milk. Conjoint analysis is defined as "Any decomposition method that estimates the structure of a consumer's preferences (e.g. part-worth, importance weights, ideal points) given his/her overall evaluations of a set of alternatives that are specified in terms of levels of different attributes" (Green and Srinivasan 1978). Although the foundation of conjoint analysis techniques was constructed in the 1920s, Luce and Tukey's 1964 paper is generally regarded as the beginning of conjoint analysis literature (Green and Srinivasan 1978). Conjoint analysis is a better method for determining consumer preferences than the other methods of research that have previously been used because in compositional models, customers' explicit perceptions or beliefs about each attribute of a product are measured separately, but conjoint analysis takes a holistic view of a product. In other words, a researcher asks the respondent to rate his or her preference for a product by evaluating the entire product.

This approach is thought to reflect the situation that buyers encounter in real life". (Reddy and Bush 1998). Conjoint analysis has been utilized in a number of agricultural studies. For example, Frank et al. (2001) evaluated consumer preferences for color, price and Vitamin C content of bell peppers; Campbell et al. (2004) looked at price, color, size, seediness, blemishes, production region label and organic production to evaluate consumer preferences for Satsuma mandarins; Halbrendt et al. (1991) observed buyer-preferences for farm-raised hybrid striped bass by studying fish size, product form, seasonal availability and purchase price; Halbrendt et al. (2010) looked also in the consumer preferences for olive oil attributes or characteristics such as cost, type, and taste and how these are used to make purchasing decisions, as well as to look at the types of consumers that prefer specific attribute combinations in Kanchipuram.

Stages for a Conjoint Choice Experiment and Analysis

Selection of attributes

Description: The first stage is related to the definition of the most important attributes in the milk purchase process. Attributes were selected based on a focus group input and an extensive literature review.

Assignment of Attribute levels

Description: After the attribute selection in the first stage, the range of each attribute is to be determined in the second stage. Attribute levels were determined by literature reviews and by focus group comprised of experts in the field.

Choice of experimental design

Description: Statistical design theory is used to combine the levels of the attributes into a number of alternative product profiles to be presented to respondents. Depending on how many choice sets and/or profiles are included in the experiment, one can have either a complete or fractional factorial designs. In our case, we have a fractional factorial design to reduce the number of attribute level combinations while allowing the efficient estimation of the effects of the individual attributes ('main effects').

Construction of choice sets

Description: The SSI Web program using the Random Method that incorporated orthogonal array was used to create the profiles in the survey. Using a SSI Web program, the profiles identified by the experimental design are then paired and grouped into choice sets to be presented to respondents. For this study, there was one pair per set, 12 pairs of product profiles per respondent, and 7 versions of the 12 pairs of product profiles.
Data collection Survey was conducted via face-to-face interviews over the period of time December 2010-January 2011, by selected graduated students under the supervision of the main researchers of the study.

Data analysis: Data is analyzed with latent class approach using Latent Gold 4.0 software The first and second step in the conjoint analysis is to establish the attributes of the product, milk, and also their levels. Green and Srinivasan (1990) reported that survey respondents have difficulty assessing more than six characteristics. In this study are used four attributes for milk: fat level, milk type, place of purchase and price. These attributes of milk are chosen because consumers seems to be very sensitive towards these (Cela, Mece., Musabelliu, 2009) and also from the focus groups that were consulted before the study was undertaken. The table bellow shows the attributes with their correspondent levels.

Milk attributes and their levels

Attributes	Levels		
Fat level	0%	1.5%	3.2%
Milk type	UHT Import	UHT Domestic	Fresh pasteurized
Place of purchase	Supermarket	Local Shop	Local Shop
Price/Ltr	80	30	20

The third and the forth step are related to the experimental design and construction of choice sets. Using the full-profile method would result in respondents evaluating all 54 (3x3x2x3=54) hypothetical products. According to Hair et al. (1998), consumers can easily analyze as many as20 conjoint scenarios. However after 20, the responses become less accurate and less symbolic of their true preferences. Conjoint Designer randomly created 12 product profiles and suggested that number to be sufficient to measure values for all other combinations of attributes. Even though some of these created profiles may seem unrealistic in respect to price and quantity, Moore and Holbrook (1990) mention this will not affect the results. "While respondents do notice that some profiles are less realistic than others, differences in realism do not appear to affect judgments about purchase likelihoods".(Moore and Holbrook 1990).

Example of a pair of milk scenarios

Attributes	Profile- A	Profile- B	Profile- C
Fat level	3.2%	0%	1.5%
Milk type	UHT Domestic	UHT imported	Fresh pasteurized
Place of purchase	Local Shop	Supermarket	Local Shop
Price/Ltr	30	80	20

The fifth step is the data collection and the survey on the consumers of milk in the three regions we have chosen, Sriperumbudur, Uthiramerur and Changelpetu. The survey consisted of 2 sections: first part of the questionnaire consists of choosing the12 pairs of product profiles with varying attribute level developed using Sawtooth Software and the second part consists of additional questions that include the socio-demographic details of each respondent. The sample size that has been employed in the estimation is 250 and includes consumers of milk, who regularly buy the product from large and small retailers. The design covers 3 taluk of the kanchipuram district: Changelpetu (population around 11 lakhs), Sriperumbudur (population around 5 lakhs) and Uthiramerur (population around 2 lakhs) representing three main taluk of the Kanchipuram district.

A total of 250 face-to-face surveys were selected, thereby meeting the sample size requirements according to the above formula. A stratified random sampling (relative to weight of each district population on total population) is applied. This procedure results in 143 customers in Changelpetu area, 61 customers in Uthiramerur area and 46 in Sriperumbudur area. These cities are chosen to analyze choice behavior in large urban markets, so as to measure and characterize the product perception and preferences of consumers living far from the place where milk is produced. A face to face interview has been applied during the period of time December 2010 - January 2011.

Respondents Profiles

In this survey 250 samples were completed and yielded a response rate of 95%. In this sample, 77% of the respondents were female versus 23% male. Most respondents were educated as 51.3% of the respondents had a university degree. Data also revealed that the average age of the respondents was 38 years old and that most of the respondent (50%) had an income level between 60000 – 80000 rupees. When compared the sample population to the Albanian data for 2009, the survey population has more female and more educated respondent. The age and income distribution of the sample population are comparable with kanchipuram.

Conjoint Model Specification and Estimation

The conjoint choice experiment is closely linked to random utility theory. Respondents' utility can be described as the function of attributes and social demographics. The function can be divided as two parts: the deterministic and observable parts and the error parts (Chan-Halbrendt,2007).

1) $U = V(X) + e(X, Z)$

Where:

U represents the utility of the choice,

V(X) represents the deterministic and observable part,

e (X,Z) represents the error part.

The reason of a particular choice is assumed that the chosen one has higher utility for respondents than others in conjoint choice experiment. The possibility that respondent choose
profile A rather than profile B can be presented as follows:

2) $P[(V_{na} + e_{na}) > (V_{nb} + e_{nb})] = P[(V_{na} > V_{nb}) > (e_{na} > e_{nb})]$

Where:

na means the respondent n chooses profile a.

The error term is assumed that they are independently and identically distributed with an
Extreme-value (Gumbel) distribution. The distribution is defined as follows:

3) $P(e \leq t) = F(t) = \exp(-\exp(-t))$

The probability that individual n chooses profile i can be described as follows (McFadden, 1974):

4) $P_{ni} = \exp(\eta x_{ni}) / \Sigma_{ih=1} [\exp(\eta x_{nh})]$

Where:

Pni is the probability of respondent n choosing profile i, η denotes a scale parameter, Xni is the deterministic component that is assumed to be a linear function of explanatory variables.

Equation 4 can be rewritten for LCA to give the following equation:

5) $P_{ni}|m = [\exp(\eta_m \beta_m Z_{ni})] / \Sigma_{ih=1} [\exp(\eta_m \beta_m Z_{nk})]$

Where:

Pni |m means the probability of individual n who choose profile i belongs to class m, means the class-specific scale parameter and βm is the class-specific estimated utility parameter, Zni are explanatory variables of Xni.

The probability for individual n in class m choosing profile i can be described by both milk attributes and individual socio-demographic variables and is represented by Equation 6 below for parameter estimation.

6) $P_{ni}|m = f(F, TY, P, PP, A, G, I, LE)$

Where:

F = Fat level: 0%, 1.5%, 3.2%

TY = Type of milk: UHT imported, UHT domestic, Fresh pasteurized.

P = Price of milk: 80rupees/Liter, 30 rs/Liter, 20rs/Liter,

PP = Place of Purchase: Supermarket, Local shop.

A = Age

G = Gender: female, male.

I = Income level

LE = Level of education: primary school, secondary school, university diploma, beyond university diploma.

All variables are qualitative and effects coding scheme versus dummy variable coding is used for categorizing the qualitative variables.

Results and discussion

The first decision on getting the best results for our study is related to the number of classes we choose as a best fit for our milk market segmentation. For this study we have chosen the "Consistent Akaike Information Criterion". (CAIC) is among the most widely used measures for deciding how many segments to accept. CAIC was proposed by Bozdogan (1987), and an application similar to ours one is described in Ramaswamy et al. (1993). Like all measures we report here, CAIC is closely related to the log likelihood. Our implementation of CAIC is given by the formula:

$CAIC = -2 \text{ Log Likelihood} + (nk + k - 1) \times (\ln N + 1)$

where k is the number of groups, n is the number of independent parameters estimate per group, and N is the total number of choice tasks in the data set.

Unlike our other measures, smaller values of CAIC are preferred. CAIC is decreased by larger log likelihoods, and is increased by larger sample sizes and larger numbers of parameters being estimated. CAIC is not very useful for assessing the absolute level of fit of a particular solution, but it is sometimes useful when looking across alternative solutions with different numbers of groups, as well.

CAIC values estimation according to the model

Model	Akaike Value (Variance)
2-Class Model	5911
3-Class Model	5778
4-Class Model	5606
5-Class Model	5482

For this study we have taken the 4-Class Model as the best fit to explain the milk market segmentation based on the chosen attributes of the product. In the following table are given the consumers share for each group.

Group size according to different models

Model by class number	Estimated group size (%)					Total(%)
2-Class Model	23.2	76.8	-	-	-	100
3-Class Model	28.2	50.3	21.5		-	100
4-Class Model	9.2	28.1	42.6	20.1	-	100
5-Class Model	7.3	16.1	36.0	29.7	10.9	100

Results from the Latent Gold analysis show the following results, According to the results below we can see what the characteristics are for each of the consumer classes that we have determined. For the first class can be seen that fat level is significant and that the consumers within this class like no fat content milk (0% fat level) and dislike high fat level milk. Also they prefer domestic UHT milk towards imported and fresh milk, they prefer to by the milk in the trusted local shops and for them price is not significant. For the first class the origin of the milk is the most important attribute.

Estimated t values for 4 Class Model

	Class-1	Class-2	Class-3	Class-4
Class Size (%)	9.2	28.1	42.6	20.1
Fat level (Attributes) 0%	3.67	4.7	-3.59	-4.5
1.5%	-	7.2	15.32	-
3.2%	-4.71	-11.6	-8.87	6.61
Milk Type: UHT Imported	-7.03	-	2.44	-9.43
UHT Domestic	12.19	-	-	-4.19
Fresh Pasteurized Milk	-2.4	-	-	17.89
Price	-	-	2.37	-2.38
Place of purchase: Super Market	-2.02	-2.02	-	4.2
Local Shop	2.02	2.02	-	-4.2

For the second class (28.1%), we can see that they prefer low fat content milk (0% and 1.5%) and to purchase their milk in the trusted local shops, but for them the price and the type of milk is not significant. This class has chosen the fat level as the most important attribute. The third class (42.6%) is the larger group and has chosen the fat level as the most important attribute. This class includes consumers that prefer low fat content, UHT imported milk (1.5%). For they the place of purchase is not significant. They also prefer to pay a higher price for their milk. This is because the consumers often relate the higher price with the quality. In the forth group (20.1%) there are consumers that like high fat level, fresh pasteurized milk and they prefer to purchase the product in the supermarket. Also this class has chosen the fat content as the main attribute.

Importance of milk attributes according to the classes

Attribute	Importance according to class			
Class Size (%)	Class 1 (9.2%)	Class 2 (28.1%)	Class 3 (42.6%)	Class 4 (20.1%)
Fat Level	25.14	87.89	70.76	22.27
Origin	63.76	3.67	11.64	56.98

| Place of purchase | 7.97 | 3.92 | 5.41 | 12.83 |
| Price | 3.12 | 4.51 | 12.19 | 7.91 |

Conclusion :

This study is aims to focuses on consumers' preferences for milk in Kanchipuram. The idea that motivated this research is that before any course of action supporting the domestic milk production industry can be undertaken, we need to know what consumers want. Milk producers must meet consumers' demand for milk when there is demand in order to remain competitive. Once we are able to clearly describe the existing demand for milk, a marketing strategy can be properly developed.

This study makes it possible to identify four milk consumers groups according to their preferences on the product attributes. All these groups represent different potential market segments with specific characteristics. The elaboration of the data shows that the most important attribute for the milk consumers is the "fat level". According to the results three of the four groups (representing 90.8% of the survey) have chosen fat level as the mail important attribute. At the end of the study four classes with the following characteristics were identified

Characteristics of each class

Class	Class characteristics
1	UHT domestic no fat milk, purchased in the trusted local shops.
2	Low fat level milk, purchased in the trusted local shops
3	UHT imported low fat level milk.
4	Fresh pasteurized high fat level milk, purchased in the supermarket.

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