Short Research Article

A Conjoint Analysis on Consumers' Revealed Preferences for Products from Coconuts in Madurai City India

Abstract

India *per se* being leader nation in coconut production, only 2 per cent hardly utilized for value addition. To discern the pull factors causing consumer preference for coconut products, a study was conducted among different income group of consumers from Madurai city of Tamil Nadu. Five coconut value-added products like desiccated coconut, processed tender coconut, skimmed coconut milk, skimmed coconut milk powder and neera were selected for the study. The objective of the study is to evaluate the performance and specific factor influencing the marketing of selected coconut products and to study the market opportunities of the selected coconut product based on the consumer preference. Conjoint analyses, Multi-log linear function, Dummy variable model, ANOVA with two qualitative variable model were used in the study to find the factors influencing the marketing of selected coconut product. The result from all the analysis conclusively showed that income is the main factor influencing the market opportunities of selected coconut products.

Keywords: consumer preference, income groups, market opportunities and conjoint analysis

Introduction

Coconuts are a that scientists believe came from the South Pacific region. The sailors aboard Vasco da Gama's ships gave the coconut its name. They called it "Coco", named after a grimacing face or hobgoblin. When the "Coco" came to England, the suffix of nut was added and that's how the name came about. Coconut palm (Cocos nucifera Linn.) is known to use from time immemorial. It is nobly described in ancient Indian Literature as 'Kalpavriksha' (tree of paradise), the tree that grants all that one wishes of the palm. Each and every part of the palm is utilised in one or the other way in our national and domestic economy.

Global perspective

The coconut is mainly a tropical crop grown currently in about 90 countries spread over Asia Pacific, Africa and America. Ninety per cent of the world coconut production comes from

The tropical belt. During2014, world area and production of coconut are estimated to be 12196 million hectares and 69836.36 million nuts respectively (Asian and Pacific Coconut Community (APCC) Statistical Year Book 2014). India (31.02%), Indonesia (23.41%) and Philippines (21.04%) are the major producers of coconut in the world, and together they account for about 75 per cent of the total world production. Other important coconut growing countries are Srilanka, Mexico, Vietnam, Thailand, Brazil and Ivory Coast. The study trend is particularly prominent in alternative food markets, characterised by the emergence of eco- or socially labelled products and participation in alternative food marketing channels where locally or regionally produced foods are available, such as farmers markets and community supported agriculture programs (Howard and Allen 2010).

Indian Scenario

In India, *ipso facto* coconut possesses a documented history of nearly 3000 years. The crop is extensively grown in the Western Coasts and has a profound influence on the economy of many southern states. During 2016, area and production are estimated to be 2088.44 million hectares and 22167.45 million nuts respectively (Coconut development board). Kerala (33.5%), Tamil Nadu (27.83%) and Karnataka (23.13%) are the major producers of coconut in India, and together they account for about 85 per cent of the total production. Other coconut growing states are Andhra Pradesh, West Bengal, Odisha and Gujarat. Previous research using the same data considered how the values consumers place on these labels may vary by where consumers shop, which may be at least partly explained by drivers commonly considered in the consumer psychology literature (Onozaka et al., 2010; Onozaka & Mcfadden, 2011).

It is a well-acknowledged fact that India is one of the largest producers of coconut. Coconut in India is predominantly a smallholders crop contributing to about Rs.83,000 million annually which is about 2% of the contribution of agriculture & allied sectors with more than 10 million farming families *si-nequa non*-dependent on the crop for their livelihood. Even though a major producer of coconut, India consumes more than 50% of its coconut production of 15.84 billion nuts per annum as raw nuts for culinary and religious purposes. 35% of the production is utilized for conversion to copra, 11% for tender nuts, 2% for seed purposes and hardly 2% is utilised for value addition and industrial purposes. As such, there is a need for the country to devote more intensive research & technology transfer on utilization and product diversification in both food and non-food uses, so that the practice of fixing the price of coconut based on the existing market price of coconut oil could be done away with.

The objective of the study is to evaluate the performance and specific factor influencing the marketing of selected coconut products and to study the market opportunities of the selected coconut product based on consumer preference.

Literature for foresight

Myszczszyn (2000) analysed the food demand and change in consumer preference for food in households of Poland. The study revealed that the average income of Polish , in general, has been increasing, particularly among the non-farming population, since 1994. The demand for food products had been relatively stable although it remained 5 per cent lower than in 1988. The structure of demand was changing with the increasing preference for processed foods

and greater awareness of health and dietary factors among the consumer population. The study also suggested the producers to face new set of challenges to meet stricter food quality standards.

Garibay and Jyotiz (2003) analysed the market opportunities and challenges for India organic product. He said that major domestic markets are cities like Mumbai, Bangalore, Delhi, Chennai and Hyderabad. Organic consumers are generally found in the urban upper-middle class or upper class, though some sellers do state that lower-middle-class families in smaller towns, especially families with children, also number among their clients. Organic vegetables and fruits are the major organic products desired by Indian customers. The market has not grown large so far due to lack of marketing initiatives from key players (producers, traders, NGOs, etc.), the low awareness of organic products from customers and their higher price. However, there seems to be increasing health awareness spreading among the literate part of the Indian population, and pesticides were broadly discussed in the media as a likely source of various health problems.

Dhamotharan et al. (2015) stated that geographic origin plays other more direct roles in determining consumer behaviour through symbolic or cultural values attached to the region.

Onozaka and McFadden (2011) studied the increasing use of sustainability labels in the marketplace, this study analyses the differential values and interactive effects of sustainable production claims (organic, fair trade, and carbon footprint) and location claims through a conjoint choice experiment. Locally grown is the highest valued claim, and its value is further enhanced with fair trade certification, but carbon-intensive local products are discounted more severely than those sourced from other locations. Some negatively valued claims (imports and carbon footprint) can be mitigated by combining them with other claims (organic and fair trade).

Methodology

Choice of the study area

Madurai city of Tamil Nadu state was purposively selected for the study considering the development and trade environment for range of products. It is a consumer based study, hence the urban areas of Madurai city were selected. K-pudhur and Surveyor colony were selected for low-income group, Thallakulam and BB kulam were selected for middle-income group, K.K.nagar and Annanagar were selected for high income and working women groups.

Sampling

About 105 consumers were selected from in and around Madurai city to represent low income, middle income and high-income group of 30 each. Fifteen households of working women group were selected. The respondent preference of coconut product namely, desiccated coconut, processed tender coconut, coconut skimmed milk, coconut skimmed and neera for the study. The respondent was selected through Simple random sampling technique.

Data collection

The present study was based on the primary data collected by survey method. Primary data is collected from the respondents by contact them personally using interview schedule.

Analytical tools

Conjoint analysis, Multi-log linear function, Dummy variable model, ANOVA with two qualitative variable model was used in the study to find the factors influencing the marketing of selected coconut product.

Conjoint Analysis

Conjoint analysis is a marketing research technique that can provide valuable information for new product development and forecasting, market segmentation, pricing decisions, advertising, distribution, competitive analysis and repositioning. Consumers are forced to make trade-offs as they decide which products to purchase. Green and Rao (1971) and Green and Wind (1975) applied conjoint analysis as a new technique in decision making and advanced conjoint analysis models were developed by Louviere (1988) and Green and Srinivasan (1990) in the past.

Conjoint analysis decomposes the judgment data into components, based on the qualitative attributes of the products. Numerical part-worth utility value is computed for each level of each attribute. Large part-worth utilities are assigned to the most preferred levels, and small part-worth utilities are assigned to the least preferred levels. The attributes with the largest part-worth utility range are considered the most important in predicting preference. Conjoint analysis is a statistical model with an error term and a loss function (Kuhfeld, 2010).

The nonmetric conjoint analysis finds a monotonic transformation of the preference judgments. The model, which follows directly from conjoint measurement, iteratively fits the ANOVA model until the transformation stabilises. The R square increases during every iteration until convergence, when the change in R square is essentially zero. The following formula shows a nonmetric conjoint analysis model for three factors:

The model could be used for different types of coconut product with different attributes and prices. The Y_{ijk} term is subject's stated preference for coconut product with i and j^{th} level attributes and k^{th} level price. The grand mean is μ and error is $\varepsilon_{ijk.}$Nonmetritc conjoint analysis

finds a monotonic transformation of the preference judgments. The model which follows directly from conjoint measurement iteratively fits the ANOVA model until the transformation stabilizes. The R square increases during every iteration until convergence, when the change in R square is essentially zero. The following formula shows a nonmetric conjoint analysis model for three factors;

$$\Phi(Yijk) = \mu + \beta 1i + \beta\ 2j + \beta\ 3k + \beta\ ijk$$

where $\Phi(Yijk)$ designates a monotonic transformation of the variable y.

Details of the six classes and six attributes considered for the consumer's preference towards coconut product by conjoint analysis are given below in table 1.

Table 1. Products and attributes

Class	Six products	1 = 'raw coconut' 2 = 'desiccated coconut' 3 = 'processed tender coconut' 4 = 'coconut skimmed milk ' 5 = 'coconut skimmed milk powder' 6 = 'neera'
Attributes	Taste	1 = 'poor' 2 = 'moderate' 3 = 'good'
	Flavour	1 = 'low' 2 = 'Medium' 3 = 'high'
	Price	1 = 'low' 2 = 'medium' 3 = 'high'
	Availability	1 = 'low' 2 = 'medium' 3 = 'high'

	Shelf life	1 = 'low' 2 = 'medium' 3 = 'high'
	Time consuming	1 = 'yes' 2 = 'no'

Multi-log linear regression function

For examining the factors influencing the consumption of selected coconut product multi-log linear regression function of the following form is used

$\text{Log } Y = F (X_1, X_2, X_3, D_1)$

Where,

Y = monthly consumption of coconut

X_1 = monthly income of consumers

X_2 = number of family members

X_3 = monthly coconut expenditure (i.e., amount spent on coconut)

D_1 = food habit (veg or non-veg) Dummy variable

Dummy variable model

To analyze the statistical significance difference among the income groups, dummy variable model is used as follows

$Y = \beta_1 + \beta_2 D_1 + \beta_3 D_2 + \beta_4 D_3 + \mu$

Y = monthly income of the consumers

D_1= 1- middle income group; 0- for others

D_2 = 1-high income group; 0- for others

D_3 = 1-woking women group; 0- for others

ANOVA with two qualitative variable model

To analyze the influence of qualitative variable (consumptive habits), ANOVA with two qualitative variable model is used. The specification of the model is given below

$Y = \beta_1 + \beta_2 D_1 + \beta_3 D_2 + \mu$

Y = monthly income of the consumers

D_1 = food habit (1= non-veg; 0 = veg)

D_2 = consumption (1= consumers using value added products; 0= not using)

Results and discussion

Table 2. Consumer Preference towards Coconut products: Conjoint Analysis of Ranks 1
19:57 Monday, June 14, 1993

The TRANSREG Procedure

Monotone(Rank)
Algorithm converged.

Root MSE	2.23497	R-Square	0.9704
Dependent Mean	18.50000	Adj R-Sq	0.9550
Coeff Var	12.08092		

Utilities Table Based on the Usual Degrees of Freedom

Label	Utility	Standard Error	Importance (% Utility Range)	Variable
Intercept	27.271	0.85029		Intercept
Products Raw Coconut	0.628	2.39125	25.352	Class.ProductsRaw_Coconut
Products Desiccated coco	0.924	1.32013		Class.ProductsDesiccated_coco
Products Processed tende	-10.895	1.31603		Class.ProductsProcessed_tende
Products Coconut skimmed	0.945	1.45891		Class.ProductsCoconut_skimmed
Products Coconut skimmed	1.389	1.26983		class.productsCoconut sKimmed
Products Neera	-13.294	1.63290		Class.ProductsNeera
Taste poor	0.000	0.00000	17.212	Class.TasteLow
Taste moderate	3.411	1.04514		Class.TasteMedium
Taste good	4.869	1.50224		Class.TasteHigh
Flavor Low	0.000	0.00000	22.268	Class.flavor Low
Flavor Medium	2.394	1.10517		Class.flavor Medium
Flavor High	3.675	1.30386		Class.flavor High
Price Low	0.296	1.28964	24.885	Class.PriceLow
Price Medium	0.300	2.55925		Class.PriceMedium
Price High	1.498	1.89465		Class.PriceHigh
Available Low	0.000	0.00000	3.558	Class.AvailableLow
Available Medium	-0.858	1.27548		Class.AvailableMedium
Available High	1.138	1.47935		Class.AvailableHigh
Shelf low	0.000	0.00000		class.shelflow
Shelf Medium	0.000	0.00000	0.000	Class.ShelfMedium
Shelf High	0.000	0.00000		Class.ShelfHigh
Timeconsuming Yes	-13.305	2.69126	23.725	Class.TimeconsumingYes
Timeconsuming No	0.000	0.00000		Class.TimeconsumingNo

The standard errors are not adjusted for the fact that the dependent variable was transformed and so are generally liberal (too small).

From table 2. The part - worth of each attribute is calculated using conjoint analysis through the application of SAS software to translate the respondent's relative importance values or utilities. The most important attribute indicated by the consumer is coconut products. The importance's attached to the products were25.35 per cent. Among these attributes, skimmed coconut milk powder was most preferred. This is reflected by the utility value attached to it (1.389). The skimmed coconut milk was next in the order with the utility value of (0.945).This was followed by desiccated coconut (0.924), raw coconut (0.628). Neera and tender coconut has

negative utility. The main reason *nitty-gritty* could be neera (is a sap product) and processed tender coconut is considered to be health drink and they are not in their convention

Next to the product, the important attribute indicated by the consumer was price. The importance attached to the price was 24.88 per cent. Among the three attributes of low, medium, high price, the high price was preferred by the consumer. This was reflected by the utility value attached to it (1.498) and this was followed by medium and low price. However, the inference has to be carefully drawn. In general the consumers for coconut products are comparatively with better paying capacity and hence willing to pay for a 'premium price'.

Next to price, the important attribute indicated by the consumer was time consuming. If the product takes some time-consuming process, it has negative utility (-13.305) on consumer preference over that product. This attribute was followed by flavor with 22.27 per cent and taste 17.21 per cent.

Thus it has been understood that from the selected coconut products mainly skimmed coconut milk powder was preferred by the consumers for the taste and flavour irrespective of its price.

Table 3. Factors influencing the consumption of selected coconut product

S.No	Variables	b-coefficient	P-value
1	Intercept	7.0685	1.8187
2	income	0.0335	0.0006**
3	family members	-0.026	0.4548
4	food habit	-0.015	0.7989
5	amount spent	0.0213	0.0102**
6	R^2 value	0.955	

** denotes P-value at 1 per cent level of significance

From table 3. The results of multi-log linear analysis conclusively showed that the study has strong evidence of income and amount spent on coconut *tour de force* for preference by the consumers to make a purchase of coconut product. This has been confirmed by highly significant P- value at one per cent level of significance in both these among other variables. A per cent increase in monthly income and amount spent on coconut increases the monthly consumption of coconut products by 3.35 per cent and 2.13 per cent respectively. Hence, a higher income and the amount spent on coconut is a binding for consumer preference towards coconut products.

Table 4. The statistical significance difference among the income groups

S.No	Variables	b-coefficient	Standard error	P-value
1	Intercept	13926.67	6687.803	0.0398
2	middle	32740	9457.981	0.0007**
3	high	139406.7	11342.621	0.0003**
4	working	138073.3	11583.613	0.0005**
5	R^2 value	0.748		

** denotes P-value at 1 per cent level of significance

From table 4. The selected groups are analyzed through dummy variable model to prove the income difference among the consumers is statistically significant. From the result, it is found that P-value is extremely low in all the variables at 1 per cent level of significance. So we can infer from the intercept value, the mean value of low-income group is 13.926.67 from which the middle, high and working women income groups have an ascent of 2.35, 10 and 9.91 times respectively.

Affected consumptive habits

Person's predisposition is the most important factor for influencing consumption of coconut products. To understand it, an ANOVA model with two qualitative variables viz., a vegetarian/non-vegetarian and consumption/non-consumption with the income of the respondent consumers were studied and the result are discussed and presented below,

$$Y_i=30807.89 + 20684.66\ D_{2i} + 101806.20\ D_{3i}$$

$$(0.0045)^{**} \quad (0.0957)^{**} \quad (0.0012)^{**}$$

Where

Y= monthly income

D_1 = food habit (1= non-veg; 0 = veg)

D_2 = consumption (1= consumers using value added products; 0= not using)

** denotes P-value at 1 per cent level of significance

The result conclusively showed that the habits and income has a strong effect on the consumption of coconut products. From the above regression result, an increase of monthly

income of 20685 from the mean monthly income of 30808 has a positive effect on the consumption of coconut products among non-vegetarian consumers i.e., for an actual average income of 51493 (303808+20685). Similarly among vegetarians, a high income of 101806 from the mean level i.e., 132614 (303808+101806) has a positive effect on the consumption of coconut products. The reason being consumers are much price sensitive to coconuts in general and whenever the price goes up, needless to say for coconut products. However this has less impact among high income group, since they have a number of working women want to save timings in their cooking activities expressed by the respondents during the course of the survey. The results are further confirmed by highly significant P-value including for base category intercept.

Summary and conclusion

Ever increasing consumerism, consumer choice and innovation paves way for agro-product line coconut products in an easy to cook form. In this juncture, a study in Madurai city was conducted to know the underlying factors at the consumer level for penetration of the products. The result of the study indicated though there is awareness, consumer of the low and middle income group are reluctant to make a purchase. However, the product is well recognised among high and working women group considering its edge over advantage in the creation of productive working hours. To this group, the higher prices in value addition never become serious disincentive. There is little reason for homemakers in culinary art *mutatis mutandis* to enjoy cost effectiveness.

Hence, it is suggested large scale processing of coconut products. Through large scale of economies, cost can be cut down to bring down the price and eventually the market for the coconut product amid consumer expands.

Reference

Myszczszyn, J. 2000. Factors influencing the level and differentiation of consumption of food products. Floria Universities Agricultural Stetinensis Oeconomica; No. 38. Cab Abstract: pp. 299-306.

Howard, P. H. and P. Allen. 2010. Beyond Organic and Fair Trade? An Analysis of Ecolabel Preferences in the United States. Rural Sociology 75(2): 244–269.

Onozaka, Y., G. Nurse, and D. Thilmany McFadden. 2010. Defining Sustainable Food Market Segments: Do Motivations and Values Vary by Shopping Locale? American Journal of Agricultural Economics 2010; doi: 10.1093/ajae/aaq152

Onozaka, Y., & Mcfadden, D. T. (2011). Does Local Labeling Complement or Compete with Other Sustainable Labels? A Conjoint Analysis of Direct and Joint Values for Fresh Produce Claim. American Journal of Agricultural Economics, 93(3), 693–706. doi:10.1093/ajae/aar005

Salvador, V. Garibay and Katke Jyoti. 2003. Market opportunities and challenges for India organic product. Research Institute of Organic Agriculture; research report.

Yuko, Onozaka and Dawn Thilmany McFadden. 2011. Does local labeling complement or compete With other sustainable labels? a conjoint Analysis of direct and joint values for fresh Produce claims. Amer. J. Agr. Econ; 93 (3) : pp. 693-706.

Dhamotharan, P. G., Devadoss, S., & Selvaraj, K. N. (2015). Estimation of Consumers' Willingness to Pay for Geographic Indications Bananas Using Conjoint Analysis. Journal of International Food & Agribusiness Marketing, 27(2), 65–78. doi:10.1080/08974438.2013.833574