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Consumer Preference of Organic Vegetables in the Coimbatore City of Tamil Nadu: An Application of Logistic Regression Model

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ABSTRACT

The organic food industry in India remains export oriented. Though the production is growing rapidly, yet the domestic market still remains relatively small. The information on consumer preferences for organically grown fresh vegetables could be expected to provide perspectives on increasing organic domestic consumption. Thereby, an attempt has been made to investigate the factors influencing the consumer preference to purchase organic vegetables in the Coimbatore city in Tamil Nadu. Results indicated that consumers with high income, higher education and relatively older in age prefer to purchase organic vegetables. Logistic regression analysis revealed that age; education; health awareness levels; and income of the consumers along with price of the produce; distance of the market and availability of the produce are important factors in the consumer preference of organic vegetables. Garrett's ranking technique was employed to explore the constraints perceived in the purchase decision of the organic produce. Price of the produce was perceived as the major constraint followed by inadequate availability and lack of information.

Key words *Consumer Preference, Logistic regression, Garrett's ranking, Coimbatore, India*

Interest in organically produced food is increasing throughout the world in response to concerns about conventional agricultural practices, food safety and human health concerns (Gregory, 2000), animal welfare considerations (Harper, and Makatouni, 2002) and concern about the environment (Wandel, and Bugge, 1997). These concerns, along with observed organic consumer behavior has led, in part, to emergence of various groups of organic consumers, namely environmentalists, food phobics, healthy eaters, humanists, welfare enthusiasts, and hedonists (Davies, et al., 1995). The future of organic agriculture will, to a large extent, depend on consumer demand. Thus, a consumer-oriented approach to understand organic agriculture is important.

It could be argued that a human conception of consumer decision making and behavior towards organically grown products is consistent with Lancaster, 1996 notion that consumers demand the characteristics inherent in such products. The quality characteristics of organic produce constitute into consumers' demand for improved health and overall well-being. Consumer preference for organically grown vegetables is based on a perception that organic has more desirable characteristics such as human health, food safety and environmental stewardship, taste and nutritive value.

Although there is some knowledge and awareness about organic products, consumers are not consistent in their interpretation of what is organic. The most common definitions of an organically produced food emphasize the technology or production practices and principles used, and/or the 'organic philosophy' (Bourn, and Prescott, 2002). Thus, while some definitions highlight dimensions such as 'biological' or 'natural production systems' (Klosky, and Tourte, 1998) and 'green' or 'environment friendly' (Goldman, and Hylton, 1972), others emphasize the limited use of artificial chemicals in organic production (FAO, 1999), or its general philosophy (Torjusen, *et al.*, 1999).

Consumers typically understand the broad issues about organic foods, many tend not to understand the complexities and niceties of organic farming practices and organic food quality attributes. Concern for human health and safety (Bourn, and Prescott, 2002), which is a key factor that influences consumer preference for organic food, is consistent with observed deterioration in human health over time and, therefore, motivates consumers to buy organic food as insurance or investment in health.

The decision to adopt a strategy depends on a variety of factors (Calatrawa-leyva, *et al.,* 2005), socio-economic characteristics of the consumer and other factors. There are several factors which affects the awareness level on organic foods among the consumers. It has been empirically investigated that socio-demographic profiles, food buying behaviour and nutritional knowledge of the consumers are most likely to affect the awareness level and purchase decisions of organic foods (Briz, and Ward, 2009). Consumers with high income often buy organic food to reflect on their awareness and status (Gracia, and Magistris, 2007). (Bhaskaran, and Hardley, 2002) hypothesized that older consumers (i.e., more than 55 years) tend to make

preventive health decisions, partly because of health vulnerability and an awareness that they are generally at higher health risk than younger individuals. However, in some of the studies age factor does not seem to play an important role. Few studies have resulted that younger are more aware of organic food and seeming slightly more willing to pay for purchase the same (Stevens, and Garmon, 2007). Education is described by various researches as an important factor of awareness and purchase motive of organic food (Idda, *et al.*, 2008). Consumers with higher education are more likely to buy organic food products (Gracia, and Magistris, 2007). Gender and size of family are also critical to awareness and purchase of organic food. It is women who buy organic food in larger quantity and more frequently than men (Arvanitoyannis, and Krystallis, 2004). Households with smaller family size are found to more aware of organic food and showing attitude of willingness to pay for organic purchase (Idda, *et al.*, 2008). Presence of children in family positively influences the organic food purchase (Solar, and Sanchez, 2002).

(O'Donovan, and McCarthy, 2002) reported product availability and price as key inhibitors to consumers' demand for organic foods in Ireland. By comparison, they also reported that among Irish respondents who did not purchase organic food, 43 per cent indicated it was too expensive, 28 per cent cited lack of availability, while 29 per cent were just not interested. According to (Davis, *et al.*,1995), two-thirds of non-buyers of organic food in Ireland reported they would buy organic if it was easily available.

Further, majority of such researches were carried out in developed countries, and hence the consumer awareness and preferences for organic food in developing world is mostly unknown. Therefore, there is an urgent need to investigate the demand status of organic food particularly in developing countries such as India. As consumer knowledge and awareness is an important drive for the growth in the organic food market, therefore an investigation of consumers' attitude and behaviour towards organic food may help both consumers of organic interest and marketers of organic food. It may also help government to design strategies for consumer education on the benefits of going organic.

The present study aims at analysing the factors affecting preference level of consumers on organic vegetables, using a structured survey of 60 respondents from 6 outlets of Coimbatore city. As awareness, knowledge and preference on various attributes of organic foods is fundamental for creating market demand for organically grown products, this study explores the level of understanding among the consumers on different aspects of organic foods. Further, the study also indentify the most likely socio-demographic, food safety and consumer information factors affecting the preference level using a logistic regression model. The study was to help define the applicability, equitability and enforceability of consumer preference with the following objective: (i) to identify the factors that affect the consumer preference and consumption of organic vegetables, and (ii) to identify the constraints faced by the respondents in purchase of organic vegetables.

MATERIALS AND METHODS

The entire study was based on the data collected from the organic consumer's of Coimbatore city where approximately 20 organic outlets are present. Among these outlets 6 outlets were randomly selected. Among the regular customers of these outlets 10 consumers per outlet constituting a sample size of 60 respondents were selected. The selected consumers were interviewed and the information related to the study was collected with the help of pre-tested well structured interview schedule to understand their preferences towards organic vegetables by personal interview method. The collected data were subjected to percentage analysis, logistic regression analysis, Garrett's ranking technique to draw meaningful inferences to justify the importance of organic vegetables for food safety, human health and environment.

Analytical Tools

Percentages were worked out to study the age-wise, education-wise and income-wise distribution of the organic consumers. Apart from this, the econometric tools like Logistic regression and Garrett's Ranking Technique have also been employed in this study as given below,

Logistic Regression Analysis

This study recognized the influence of various attributes including that of personal and social attributes of the consumer, the distance between organic outlet, price of organic vegetables, consumers' health, income of the consumer and availability of organic vegetables on consumers' decision to prefer organic vegetables or otherwise.

The factors influencing the decision were analyzed using Logistic regression model. The use of the logit model is consistent with the literature on adoption (Alson et al., 1995) which described the

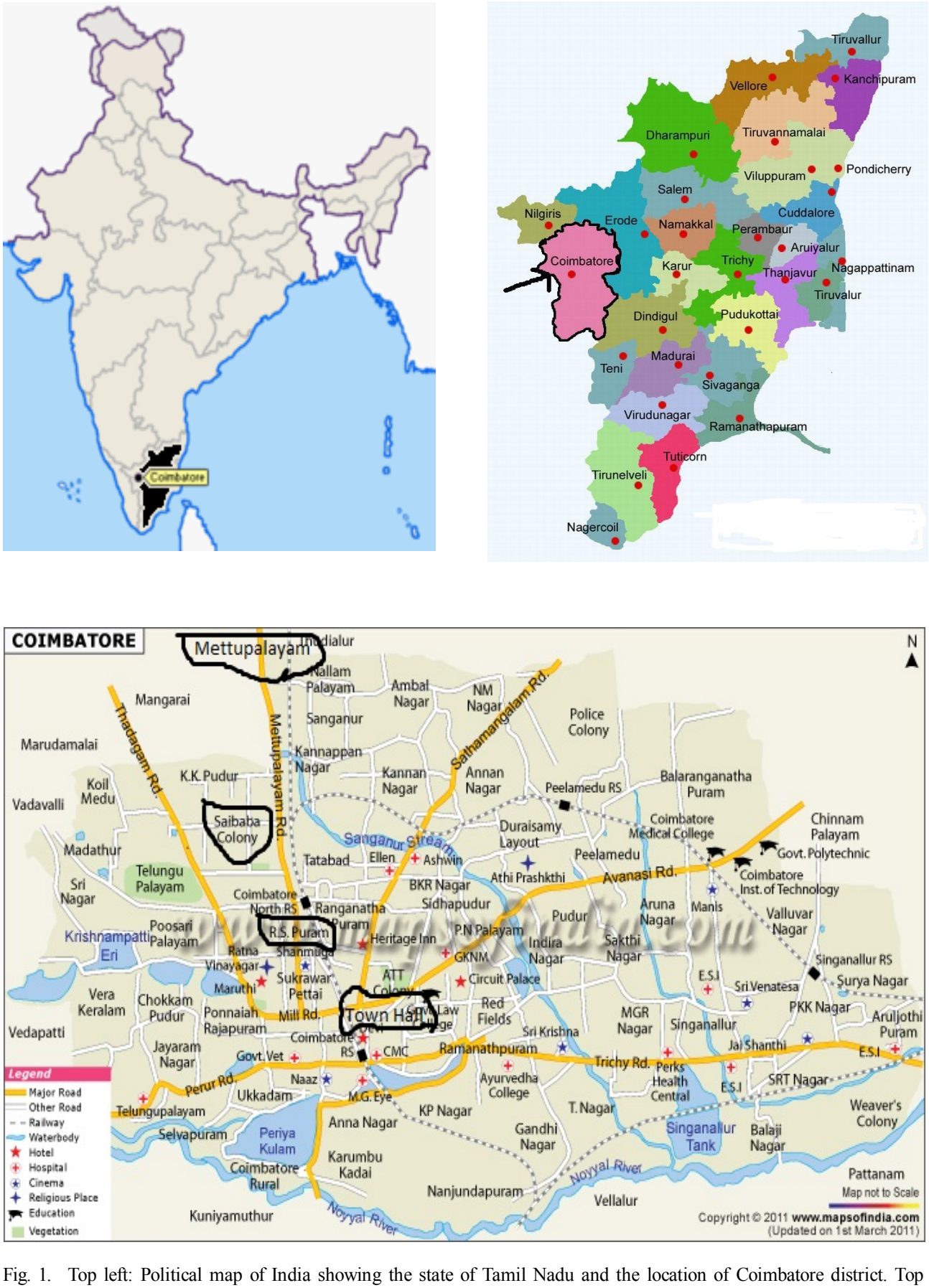

Fig. 1. Top left: Political map of India showing the state of Tamil Nadu and the location of Coimbatore district. Top Right: State map of Tamil Nadu showing Coimbatore district. Bottom: Study locations in the urban areas of Coimbatore City, Tamil Nadu.

adoption process as taking on a logistic nature. The Logit model have also been applied in several adoption studies (Kato, 2000).

(Hosmer, and Lemeshew, 1989) pointed out that the logistic distribution (logit) has advantage over the others in the analysis of dichotomous outcome variable. It is extremely flexible and easily used model from mathematical point of view and results in a meaningful interpretation. The binary logistic model does not make the assumption of linearity between dependent and independent variables and does not assume homoskedasticity (CIMMYT, 1993). Hence, the logistic model is selected for this study. The binary dependent variable was defined as 1 if the consumer prefers organic vegetables and 0 otherwise. This paper focuses on consumers' preference of organic vegetables, which signifies their willingness – or lack thereof – to buy organic vegetables. As posited earlier, consumers' purchase intention is affected by 7 factors. Therefore the relationship between purchase intention and the 7 factors is concluded as follows: consumers' purchase intention of organic vegetables = F (age, education, income, etc.) + random disturbing factor. The probability that a consumer prefer organic vegetables was postulated as a function of some socioeconomic, demographic characteristic and other (distance, price, health, income, availability) factors. This paper adopts the logit model of binary choice, confines the number of dependent variable within the [0–1] scope and utilizes the maximum likelihood estimation method to compute the regression parameter. Therefore, the cumulative logistic probability model is econometrically specified as follows:

$$P_i = F(Z_i) = F(\delta + \sum \lambda_i X_i) = \left[\frac{1}{(1+e^{-z_i})} \right] \quad (1)$$

Where Pi is the probability that a consumer will prefer organic vegetables or not given Xi; e denotes the base of natural logarithms, which is approximately equal to 2.718; Xi represents the ith explanatory variables; and g and l are parameters to be estimated. (Hosmer, and Lemeshew, 1989) pointed out that the logit model could be written in terms of the odds and log of odds, which enables one to understand the interpretation of the coefficients. The odds ratio implies the ratio of the probability (Pi) that a consumer will prefer to the probability (1-Pi) that the consumer will not prefer organic vegetables:

$$(1 - P_i) = \left[\frac{1}{(1 + e^{z_i})} \right] \quad (2)$$

Therefore,

$$\left[\frac{P_i}{1-P_i} \right] = \left[\frac{1+e^{z_i}}{1+e^{-z_i}} \right] = e^{z_i} \quad (3)$$

The natural log of equation (3), will give:

$$Z_i = \ln\left[\frac{P_i}{1-P} \right] = \delta + \lambda_1 X_1 + \lambda_2 X_2 + ... + \lambda_m X_n \quad (4)$$

If the disturbance term (*i*) *U* is taken into account, the logit model becomes:

$$Z_i = \delta + \sum_{i=1}^{m} \lambda_i X_i + U_i \quad (5)$$

Equation (3) was estimated by maximum likelihood method. This procedure does not require assumptions of normality or homoskedasticity of errors in predictor variables.

The logit equation was fitted to find out the determinants influencing the consumption of organic vegetables. The model used in this study is given below.

$$Z_i = \delta + \lambda_1(\text{AGE}) + \lambda_2(\text{EDN}) + \lambda_3(\text{DIS}) + \lambda_4(\text{PRI}) + \lambda_5(\text{HLT}) + \lambda_6(\text{INC}) + \lambda_7(\text{AVAI}) + U_i$$

Where,

$Z_i = Y$

λ_1 to λ_7 - Coefficients of independent variables

δ - Intercept

U_i - Error term

The description of the variables and their expected signs are given below in Table 1.

Table 1. Definition of the Variables in the Logistic Regression Model

Variable	Expected Effect (sign)
Y, Consumer preference, (1 if the consumer prefers organic vegetables, 0 otherwise)	
AGE, Age of the consumer (in years)	+ / -
EDN, Educational status of the consumer (in years)	+ / -
DIS, Distance of organic outlet from consumer's residence (in km)	+ / -
PRI, Price of organic vegetables (Rs. / kg)	-
HLT, Health Awareness level of the consumer (Scale of 1 to 5)	+
INC, Income of the consumer (Rs. / Annum)	+ /-
AVAI, Availability of the organic vegetables to the consumers, (1 if organic vegetables are available to consumer, 0 otherwise)	+ /-

Garrett's Ranking Technique

In order to rank the constraints faced in consumption of organic vegetables, the Garrett's ranking technique (Hendry, and Worth, 1969) was employed. The order of merit assigned by the respondents was converted to ranks by using the formula, Per cent position= 100 (R_{ij}-0.5) N_j

Where,

R_{ij}- Rank given for the i^{th} factor by the j^{th} respondent; N_j - Number of factors ranked by the j^{th} respondent.

The per cent position of each rank thus obtained was converted into scores by referring to the table given by Garrett. For each factor, the scores of individual respondents were added together and the mean score was calculated. Then based on the mean scores, the ranks were given. These mean scores for all the factors were arranged in the descending order and the most important factors were identified.

RESULTS AND DISCUSSION

The details on age-wise distribution of the sample households in Coimbatore city is presented in Table 2. From the table, it could be observed that as the age of consumers increase the probability of preference of organic vegetables also increase. The aged consumers would more likely prefer to organic vegetables because of its safety, indigenous in nature and taste. Further, around 33 per cent of the sample organic consumers belonged to the age group of above 60 years. Nearly, 26 per cent of them were in the age group of 46 to 60 years and 23 per cent were in the age group of 36-45 years and 16 per cent were in the age group of below 35 years. Almost 60 per cent of the sample respondents fall in the age group of above 45 years which indicates that older consumers tend to make preventive health decisions, partly because of health vulnerability and an awareness that they are generally at higher health risk than younger individuals as seen elsewhere.

The educational status of sample respondents is presented in Table 3. It could be observed from the table that around 60 per cent of the sample organic vegetable consumers have completed collegiate level of education, followed by the consumers who have completed the secondary school of education accounting for 23 per cent and 10 per cent of the consumers had higher secondary level of education and only 6 per cent of the total organic vegetable consumer households had elementary level of education. Overall, it is shown that the literates prefer organic vegetables than the illiterates. This is because literates are more conscious about health. It is clear that literacy is directly proportional to organic vegetables consumption.

The income-wise distribution of sample respondents is presented in Table 4. It could be observed from the table that around 42 per cent of the sample organic consumers have a monthly income of above Rs. 60,000 followed by the consumers with a monthly income between Rs. 30,000-60,000 and 23 per cent of the consumers with a monthly income below Rs. 30,000. Overall, it is shown that the consumers with higher income prefer organic vegetables than the consumers with lower income (The income of nearly 75 per cent of the respondents were more than Rs. 30,000). It is observed that income is directly proportional to organic vegetables consumption.

The analysis of the determinants of consumer preference of organic vegetables was carried out in the study. In addition, the marginal impacts of changes in the independent variables on the probability of preference were also determined. The interpretation of these marginal impacts is dependent on the unit of measurement of the independent variables. The result of the analysis of consumer preference is presented in Table 5. The log-likelihood, the Pseudo R^2 and the LR (Chi^2) (significant at 1 per cent level), implies that the

Table 5. Logistic Estimates of the factors that affect Consumer Preference

Determinants	Coefficient	Std. Err.	Marginal Effects
Age (years)	0.161	0.085	0.058
Education (years)	0.063***	0.145	0.666
Distance (km)	-0.341***	0.186	0.066
Price (Rs. / kg)	-1.076***	0.648	0.097
Health Awareness (1 to 5)	**1.215****	**0.587**	**0.039**
Income (Rs. / annum)	**0.001****	**0.000**	**0.027**
Availability	0.653	1.206	0.588
Constant	-9.010	4.784	
Log likelihood		= -15.14356	
LR chi^2 (10)		= 52.82	
Prob > chi^2		= 0.0000	
Pseudo R^2		= 0.6356	

Note: **significant at 5 per cent level; ***significant at 10 per cent level

model was well fitted and the explanatory variables used in the model were collectively able to explain the consumers' decision to prefer organic vegetables. Many of the included variables were statistically significant in determining the consumers' decision to prefer organic vegetables. The coefficient of age of the farmer was positive (0.161) and significant at 10 per cent level in the model. It could be assumed that as the age of consumers' increase the probability of preference of organic vegetables. This could be due to the fact that aged consumers would be more likely to prefer organic vegetables because of its safety, indigenous in nature and taste. The result of the marginal effects also revealed that an additional year to the age of the consumer would increase the probability of preference of organic vegetables by 0.058 per cent. The coefficient of access to educational qualification (0.063) was positive and significant at 10 per cent level. Probably, education could make the consumer to become more of health conscious. Marginal effects show that among the sample consumers an increase in education by one more year of study would increase the probability of preference of organic vegetables by 0.666 per cent. The coefficient of distance of organic outlet was found negative (-0.341) and significant at 10 per cent level. This shows that consumers with large distances of organic outlet have less probability of preference of organic vegetables.

Price had negative influence (-1.076) and was found to be significant at 10 per cent level. It was observed that with increase in price of organic vegetables there was less probability of preference of organic vegetables. This was due to the fact that, the rise in prices of organic vegetables would lead to reduction in quantity demanded. The coefficient of health (1.215) significant at 5 per cent level, income of consumers (0.001) significant at 5 per cent level and availability of organic vegetables (0.653) significant at 10 per cent level had positive influences on consumer preference of organic vegetables. It was observed that probability of preference of organic vegetables increased because of health value. Many consumers expressed that they shifted to organic vegetables because it is safe to consume and indigenous in nature without the use of chemicals and is environment friendly. Marginal effects also indicated that the probability of preference of organic vegetables increases by 0.039 per cent for every unit increase in the consumers' awareness on health issues. Similarly, for every unit increase in income and availability of organic produce were also found to increase the probability of preference by 0.027 per cent and 0.588 per cent respectively.

In order to assess the constraints faced by organic consumers, Garrett's ranking technique was employed. The result is presented below in Table 6.

It could be observed from the table that high price ranking I is the major constraint which influence the purchase of organic vegetables with the mean score of 56 followed by limited or inadequate supply ranking II with the mean score of 28 and finally lack of information is also one of the factor which influence the purchase decision of organic vegetables ranking III with the mean score of 15. Overall, it is observed that high price than the conventional vegetables is the major constraint influencing the purchase decision of the consumers of organic vegetables.

Table 3. Constraints cited by respondents in the purchase decision of organic vegetables

Perceived Constraints	Source	Rank
Higher price than conventional produce	56.15	I
Limited / inadequate supply	28.85	II
Lack of information	19.00	III
Inadequate organic outlets	15.19	IV
Doubts over authenticity of the organic produce	10.22	V
Perceiving no difference between organic and conventional produce	8.13	VI

Source: Author's survey

This study investigated the factors influencing the consumer preference to purchase organic vegetables and the constraints faced by the respondents in purchase of organic vegetables. Survey results showed that almost 60 per cent of the sample respondents fall in the age group of above 45 years which indicates that older consumers tend to make preventive health decisions, partly because of health vulnerability and an awareness that they are generally at higher health risk than younger individuals. About 60 per cent of the sample organic vegetable consumers have completed collegiate level of education and this implies that higher education was more likely an important factor influencing the purchase motive of organic vegetables. Around 42 per cent of the sample organic consumers have a monthly income of above Rs. 60,000 and it reflects that the consumers with high income often buy organic vegetables to reflect on their awareness and status. The logistic regression suggests that age, education, health, income, price, distance and availability are important factors in consumer preference of organic vegetables. Garrett's ranking technique suggests that price is the major constraints faced by the consumers in making purchase decisions of organic vegetables followed by limited or inadequate supply, lack of information and inadequate organic outlets.

Keeping in view of the results of the study, the policy suggestions concluded are: To encourage farmers and to create awareness among the consumers, the accreditation programme for certification, norms for organic production and promotion of organic farming under the National Programme for Organic Production (NPOP) should be implemented vigorously. Government intervention by providing subsidy is the immediate requirement to encourage farmers who grow crops organically. Public extension system should focus exclusively on creating organic farmers' association. Steps may be taken to create awareness among the consumers through educating and publicizing by all possible means and mass media about the importance of organic products and its health benefits to tap the domestic and export market demand. Government should think of introducing MSP for organic products separately to control the high price of organic products which is the major factor that affects the consumption of organic vegetables. Organic certification labels should be provided for organic products, by the government indicating the date of manufacture and the date of expiry. This label is the guarantee for consumers that the product is organic.

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