

Identifying Latent Constructs amongst Egoistic Determinants of Attitude towards Organic Fruits and Vegetables through Exploratory Factor Analysis

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Abstract: There are multiple reasons for an individual to have positive attitude to consume organic fruits and vegetables. The Organic food literature is abounding with contradictions with respect to the demographic profile as an indicator for being/not being an organic food consumer. Along with demographic, psychographic and the geographical indicators a SEM should be constructed. This will help in explaining and predicting the consumption behavior and an individual becoming an organic fruits and vegetable consumer. Attitude towards organic fruits and vegetables will be the psychographic variable. The determinants of attitude towards Organic fruits and vegetables fall in the categories of altruistic and egoistic intent of an individual. The egoistic determinants are benefits which get accrued to an individual self. The Altruistic determinants are set of benefits which are external to an individual and impact the environment and the society. There are many features from the egoistic domain which decide and drive the propensity to consume organic fruits and vegetables. An exploratory factor analysis on all the above egoistic features is the centerpiece of the research paper. Eleven benefit features of organic fruits and vegetables were scored by seven hundred forty nine respondents from Mumbai and Navi-Mumbai. The instrument on which the seven hundred and forty nine respondents scored used a likert type questionnaire with seven balanced scale option. An exploratory factor analysis reduced the eleven variables into two factors. The two surrogate variables (factors) are nutrition - sensory benefits and safety benefit. A confirmatory factor analysis would be a natural progression for the research to confirm the association of the latent constructs and the associated measured variable in the theoretical model.

Keywords: Exploratory Factor Analysis, Organic fruits and vegetables, Nutrition benefit, sensory benefit, safety benefit. Egoistic and Altruistic benefit.

Introduction:

Organic food consumption has seen an increase in consumption in recent years and there are statistics abound to this. There are numerous motivations for an individual to consume organic food. Health benefit is one of these. Pesticide and fertilizer free is one of these. Organic food being richer in mineral, vitamins is another set of benefit perceived by consumers. Organic food being tastier, having good appearance, smell and shelf life are another set of benefits perceived by consumer. All these variables (benefits) at individual level can be measured and used along with the demographic variable to develop a predictive model. To develop a theoretical model, which can be used to do explanation of the attitude towards organic fruits and vegetable consumption, the latent constructs among these measure constructs need to be identified. Factor analysis is used as a data reduction technique to identify the latent constructs.

Significance of the study:

India has a strong tradition and strength in organic farming. The traditional knowledge on sustainable farming practices still exists. In remote areas of the country, chemical-free agriculture is still being practiced by default.

While higher revenues are currently achieved by exporting certified organic produce, the future growth of the organic segment will be influenced most significantly by developments in domestic markets within India. Effective marketing of organic products in local, regional and national markets could make a major contribution to securing the livelihoods of smallholder producers, and sustainable development of the country's organic food sector.

For developing an explanatory model identification of latent construct is required hence exploratory Factor analysis is done.

Literature review:

1. Organic fruits and vegetables look superior to non- organic fruits and vegetables:

People shop with their eyes. There is a clear relationship between willingness to accept blemishes and organic purchasing behavior (Goldman & Clancy, 1991). Eighteen percent of shoppers who are concerned about pesticides would be willing to buy blemished produce whereas only 6 percent of shoppers who are unconcerned about pesticides would be willing to buy blemished produce. (Ott, 1990) However, when it is made known that the blemished produce is "organic," consumers are more likely buy blemished organic produce. Other studies show the negative effect on consumer demand of blemished produce is only slight (Goldman & Clancy, 1991; Sparling and McKenzie, 1992; Estes et al., 1994; Tregear et al., 1994). Bad looking or poor appearance compared to conventional products can be reason not to buy organic food. If appearance of an organic product is not satisfying for consumers, they can feel cheated and additionally they can think that also has low quality (Radman, 2005; Zanolli et al., 2004). Some studies show that consumers have a strong resistance to blemishes. Ott (1990) found that sixty two percent of consumers would be unwilling to accept any decrease in appearance quality when purchasing organic produce and 88 percent would be unwilling to accept insect-damage on pesticide residue-free produce. A previous review of literature (Beharrell & MacFie, 1991) found that people estimate a food's quality by appearance. The degree to which blemishes cause people, who would otherwise buy organic produce to choose not to, is ambiguous, but it is important that organic foods be as visually appealing as possible or people are less likely to buy them.

Lin et al. (1986) shows that the more organic or pesticide-free produce is preferred, the less appearance is important. Jolly & Norris (1991) found that eleven out of twelve supermarket chains surveyed rated organic produce appearance as worse than non-organic produce and believed that their customers held the same view. Anecdotal evidence indicates that, while the appearance of organic produce was inferior to conventional produce in the 1980's, the quality of what is for sale now has improved greatly. In one study, Conklin et al. (1991) actually found that organic apples had fewer defects than non-organic apples.

2. Organic fruits and vegetables are tastier than non-organic fruits and vegetables.

Eating tasty food is a general motive for everybody to satisfy your needs. Most organic consumers think that organic products taste more natural, intense and rich in flavor. German occasional buyers are mostly affected from the taste of the organic products. (Zanolli et al., 2004) On the other side, frequent buyers and elder people find organic products tastier and this is the one of the main reason for Croatians to purchase organic food. Also Croatian women find organic products tastier than men. (Radman, 2005) However, some western European studies showed that, taste is one of the main buying motives for men. (Hofmann, 2006). Taste is another basic attribute of organic food that affects food purchasing decisions. Jolly & Dhesi (1989), Jolly & Norris (1991), and Sparling et al. (1992) found consumers perceived no difference in taste between conventionally grown and organic produce. Morgan et al. (1990), Estes et al. (1994), and The Packer (1996) found that consumers believed that organic produce tastes better than conventional produce. Sparling et al. (1992) found that non-organic produce consumers do not view organic produce as tasting better than conventional produce, but organic produce consumers do believe organic produce taste better than conventional. Estes et al. (1994) found that survey respondents cite "better taste" as the primary reason for buying organic produce. In only one reviewed study consumers rate the taste of conventionally-grown produce as superior to organic produce.

3. Organic fruits and vegetables look fresher than non-organic fruits and vegetables.

Freshness is another factor that influences consumers' produce decisions. Consumers rate in-store freshness as the same between conventional and organic produce (Sparling et al., 1992). Retail produce buyers say organic produce tend to have a shorter shelf life than conventional produce and that this characteristic decreases consumers' demand for organic produce. However, the frequency of this response was very weak. Estes et al. (1994) found that the third most frequently mentioned reason for purchasing organic produce is freshness. The Packer (1996) found that 17 percent of organic produce consumers cite increased freshness as a major reason for purchasing organic produce.

A characteristic related to freshness is shelf life, i.e., how long organic fruit and vegetables will keep. Jolly & Norris (1991) and Morgan et al. (1990) find the majority of produce managers rate organic produce's keeping qualities as worse than that of conventionally-grown produce. Sparling et al. (1992) finds that consumers see no difference in the keeping quality of organic produce versus conventional produce. Other consumers cited organic produce's longer shelf life as a reason for purchasing organic produce (Morgan et al. 1990). There seems to be no consensus regarding organic produce's keeping qualities as compared to the keeping qualities of conventionally-grown produce.

4. Organic fruits and vegetables smell goods as compared to non organic fruits and vegetables.

The first defined group of sensory attributes involves the physical features such as taste, smell, color and appearance (Wierenga, 1983; Peattie, 1995). Several studies have found that sensory aspects of foods like taste, smell, look and texture to be among the important criteria in organic food purchases (Roddy et al, 1996; Schifferstein and Ophuis, 1998; Magnusson et al, 2001; McEachern (2002). Krystallis and Chryssohoidis (2005) stated that taste, nutritional value, environmental benefit had also influenced the purchase of organic food.

5. Organic fruits and vegetables have more vitamins/minerals and fibers than non - organic fruits and vegetables.

If produce is grown in healthy soil, the produce should contain sufficient vitamins and minerals. There is no scientific reason to believe that organic fruit and vegetables absorb more vitamins and minerals than those exposed to chemicals (i.e., organic foods are not necessarily more nutritious than conventional vegetables, and vice versa). However, most studies find that respondents believe organic produce is more nutritious than conventional produce. Sparling et al. (1992) found most consumers view nutritional benefits of the two types of produce as the same, although 9 percent of retail produce buyers cite organic produce being "more nutritious" as the main reason they believe consumers purchase organic produce. Other studies such as Jolly & Dhesi (1989), Morgan et al. (1990) and Estes et al. (1994) found that both purchasers of organic produce and non-purchasers of organic produce as well as retail produce buyers believed that organic produce was more nutritious than conventional produce.

6. Organic fruits and vegetables do not have additives and preservatives

Organic produce consumers may be thought of as having a general concern for how their food is treated. A study by Jolly et al. (1989) looked at consumers' concern for artificial coloring, additives, preservatives, and irradiation. Differences were found between purchasers and non-purchasers of organic food in their levels of concern for these food treatments. The authors found that buyers of organic produce have a statistically significant higher level of concern for artificial coloring, additives and preservatives, and irradiation, than non-buyers.

7. Organic fruits and vegetables are not subjected to radiations

Almost every consumer research indicates "health" as a dominant motivation towards organic consumption. (Alvensleben, 1997; Backer, 2004; Davies et al., 1995; Radman, 2005; Padel and Foster, 2005; Wier and Calverley, 2002; Zanolli et al., 2004; Zakowska, 2007) People want to intake organic products for better health conditions or maintaining the present situation. Moreover, preventing and treating illnesses or food allergies is another health related attribute. When keeping the health condition, avoiding the intake of chemical residues is also further motive that is mentioned in surveys. Especially less additive, pesticide, fertilizer and more vitamin and mineral content of fruits and vegetables is seemed to be responsible from own health protection attitude. (Padel and Foster, 2005; Zanolli et al., 2004)

8. Organic fruits and vegetables are free from fertilizer and pesticide residues.

Consumers' concern for pesticides has been addressed by a number of studies. Generally, consumers of organic food are concerned with exposure to pesticides and the effect of pesticides on their health and the health of the environment. All studies reviewed found consumers' concern for pesticides to be important and influential in the purchases of organic produce.

Morris et al. (1993) found that more Americans are concerned with the effects of pesticides on their health than are concerned about the effects of second hand smoke, air pollution, food poisoning, or hormones in meat and milk. Purchasers of organic produce had a greater concern for pesticide residues than did non-buyers (Jolly & Dhesi, 1989; Jolly, 1991). Similarly, organic produce consumers rated protection from pesticide residues in food the second most important reason for supporting organic agriculture out of a list of seven commonly-cited reasons for supporting organic agriculture. (Goldman & Clancy, 1991). It is known that consumers of organic produce often purchase organic foods to avoid consuming pesticide residues. Ninety-one percent of organic produce purchasers have concerns about the health effects of pesticides used in production of conventional produce (Morris et al., 1993). Sachs et al. (1987) find that the number of people with concerns about consuming pesticides used on conventional produce is increasing.

Consumers who held negative perceptions about pesticides had an increased likelihood of purchasing organic produce and an increased willingness to pay for organic produce. Ott (1990) found 50 percent of shoppers were "concerned about pesticides" and were willing to pay more for CPRF (Certified Pesticide-Residue-Free) produce versus 33 percent who were unconcerned. Jolly & Norris (1991) found that eight out of

twelve respondents ranked organic produce as better than conventional produce because of fewer chemical residues.

Fifty-two percent of consumers said they are "very concerned" or "extremely concerned" about pesticide residues when selecting produce (Cook, 1992). A large majority of Americans (84%) want the federal government to encourage farmers to reduce their application of chemicals (Morris et al., 1993), and one of the actions supported in a poll conducted by the Public Voice for Food and Health Policy was a reduction in subsidies to farmers who use agricultural chemicals. Ott (1990) found that 67 percent of those surveyed were concerned enough about pesticides that they were willing to pay a premium for CPRF produce. CPRF is viewed by consumers as making food safer.

Bruhn et al. (1992) found that 15 percent of consumers who had concerns about pesticides actually purchased organic produce. Similarly, The Packer (1996) reported that twelve percent of buyers bought organic produce for their lack of chemicals. Sparling et al. (1992) observed 30 percent of purchasers of organic produce cited concern for pesticide residues as their main reason for making these purchases. In the same study, 21 percent of purchasers of organic produce cited concern for health as their main reason for doing so, which could also mean they had concerns about pesticide residues.

Closely related to consumers' concern for pesticides is their concern for health and the food they buy. Concern for health was found to be important by all studies reviewed, except Jolly & Dhesi (1989). Sparling et al. (1992) found that 21 percent of purchasers of organic produce cited concern for health as their main reason for doing so, and 54 percent of UK organic produce consumers bought organic produce out of concern for health (Tregear et al., 1994). The Packer (1996) reported that 16 percent of purchasers of organic produce say they chose organic produce for health reasons.

Organic produce consumers may be thought of as having a general concern for how their food is treated. A study by Jolly et al. (1989) looked at consumers' concern for artificial coloring, additives, preservatives, and irradiation. Differences were found between purchasers and non-purchasers of organic food in their levels of concern for these food treatments. The researchers found that buyers of organic produce have a statistically significant higher level of concern for artificial coloring, additives and preservatives, and irradiation, than non-buyers. Jolly (1991) also found that buyers of organic poultry had a statistically significant higher level of concern for all three treatments, as well. People who buy organic produce seem to be people who are concerned about how their food is treated.

Objective

Primary objective

To reduce the number of variables (egoistic determinants) used in the study using factor analysis and appropriately give surrogate name to the identified factors

Secondary Objective

To do an inferential data analysis on the identified factor using gender and marital status as the grouping demographic variable.

Hypothesis

H₀₁: There is no significant difference in the perceived Nutrition and Sensory benefits between Male and Female - Accepted

H₀₂: There is no significant difference in the perceived Safety benefit between Male and Female - Accepted

H₀₃: There is no significant difference in the perceived Nutrition and Sensory benefits between Married and Unmarried - Accepted

H₀₄: There is no significant difference in the perceived Safety benefit between Married and Unmarried - Rejected

Methodology:

Data collection: Data was collected from 749 respondents using Snowball sampling technique. Questionnaire using balanced scale with seven score was used to get the response. The respondents are from Mumbai and Navi Mumbai. Factor analysis of the response was done using SPSS version 23.

Data Analysis and Interpretation: The factor analysis led to reduction of eleven variables converging to two factors, surrogate name is given in as below. This led us to fulfillment of objective number one. After this step average of the factor 1 was taken by totaling individual scores of V14, V15, V22, V23, V24 and V25 and then dividing the total by 6. The average of the factor 2 was taken by totaling individual scores of V18, V19, V20 and V21 and then dividing the total by 4. This became individual scores of factor 1 and factor 2. Normality

testing was done and since the data on factor 1 and factor 2 was found not to be normally distributed Mann Whitney U test was done to check for distribution across gender and marital status.

Bartlett’s Test of Sphericity (as in figure 1 in annexure) can be used to test for the adequacy of the correlation matrix, that is, the correlation matrix has significant correlations among at least some of the variables. If the variables are independent, the observed correlation matrix is expected to have small off-diagonal coefficients. Bartlett’s Test of Sphericity tests the hypothesis that the correlation matrix is an identity matrix, that is ,all the diagonal terms are 1 and all off-diagonal terms are 0.If the test value is large and the significance level is small(<0.05),the hypothesis that the variables are independent can be rejected. In the present analysis, Bartlett’s Test of Sphericity yielded a value of 5449.752 and an associated degree of significance smaller than 0.00.Thus, the hypothesis that the correlation matrix is an identity matrix is rejected. The Total Variance Explained (as in figure 2) section presents the number of common factors extracted, the eigen values associated with these factors, the percentage of total variance accounted for by each factor, and the cumulative percentage of total variance accounted for by the factors. While 2 factor shave been extracted, it is obvious that not all 2 factors will be useful in representing the list of 11 variables. In determining how many factors to extract to represent the data, it is helpful to examine the eigen values associated with the factors. Using the criterion of retaining only factors with eigen values of 1or greater, the first eleven factors will be retained for rotation (SPSS default procedure).These two factors account for 67.99% of the total variance. The remaining Nine factors together accounts for only about 32.01%of the variance. Therefore, a model with these two factors may be adequate to represent the data.

Factors and the variables therein as per the rotated component matrix

Factor number	Variable number						
Factor 1	14	15	17	22	23	24	25
Factor 2	18	19	20	21			

Surrogate name for these factors:

Factor 1: Surrogate factor name: Nutrition and Organoleptic (Sensory) benefit provided by Organic F & V	
Variable number 14	Organic fruits and vegetables have more vitamins than non- organic fruits and vegetables.
Variable number 15	Organic fruits and vegetables have more minerals than non- organic fruits and vegetables
Variable number 17	Organic fruits and vegetables is high in fiber than non- organic fruits and vegetables.
Variable number 22	Organic fruits and vegetables looks superior than non- organic fruits and vegetables
Variable number 23	Organic fruits and vegetables are tastier than non-organic fruits and vegetables.
Variable number 24	Organic fruits and vegetables look fresher than non-organic fruits and vegetables.
Variable number 25	Organic fruits and vegetables smell goods as compared to non organic fruits and vegetables.

Factor 2: Surrogate factor name: Safety benefit provided by Organic F & V	
Variable number 18	Organic fruits and vegetables are free from fertilizer residues.
Variable number 19	Organic fruits and vegetables does not have pesticide residues
Variable number 20	Organic fruits and vegetables does not have additives and preservatives
Variable number 21	Organic fruits and vegetables are not subjected to radiations

Conclusion:

The primary motive for consumers of organic fruits and vegetables consumption is richness in vitamins, minerals, superior in looks, superior in taste, fresh looks, good smell goods, free from fertilizer and pesticide residues, free from additives and preservatives, and finally are not subjected to radiations. The exploratory factor analysis based on eigen value criterion of more than one gave two factors. These two factors account for 67.99% of the total variance. The remaining Nine factors together accounts for only about 32.01%of the variance. These factors can used to represent the eleven variables and build a theatrical model and confirm the same using structured equation modeling.

There is no significant difference in the perceived Nutrition and Sensory benefits and the safety benefit between Male and Female. There is no significant difference in the perceived Nutrition and Sensory benefits between married and unmarried. However there is a significant difference in the perceived Safety benefit between married and unmarried.

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Annexure

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.932
Bartlett's Test of Sphericity	Approx. Chi-Square	5449.752
	df	55
	Sig.	.000

Figure 1

Total Variance Explained									
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6.476	58.872	58.872	6.476	58.872	58.872	4.324	39.310	39.310
2	1.004	9.127	67.999	1.004	9.127	67.999	3.156	28.688	67.999
3	.711	6.465	74.463						
4	.540	4.909	79.372						
5	.509	4.628	84.001						
6	.414	3.762	87.763						
7	.345	3.133	90.896						
8	.298	2.707	93.603						
9	.277	2.515	96.118						
10	.254	2.313	98.432						
11	.173	1.568	100.000						

Extraction Method: Principal Component Analysis.

Figure 2

Tests of Normality						
	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
F1_avg	.087	749	.000	.963	749	.000
F2_avg	.072	749	.000	.975	749	.000

a. Lilliefors Significance Correction

Hypothesis Test Summary				
	Null Hypothesis	Test	Sig.	Decision
1	The distribution of F1_avg is the same across categories of Gender.	Independent-Samples Mann-Whitney U Test	.687	Retain the null hypothesis.
2	The distribution of F2_avg is the same across categories of Gender.	Independent-Samples Mann-Whitney U Test	.954	Retain the null hypothesis.

Asymptotic significances are displayed. The significance level is .05.

Hypothesis Test Summary				
	Null Hypothesis	Test	Sig.	Decision
1	The distribution of F1_avg is the same across categories of Marital_status.	Independent-Samples Mann-Whitney U Test	.268	Retain the null hypothesis.
2	The distribution of F2_avg is the same across categories of Marital_status.	Independent-Samples Mann-Whitney U Test	.020	Reject the null hypothesis.

Asymptotic significances are displayed. The significance level is .05.