Consumer preference and demand for organic food:

Evidence from a Vermont survey

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Abstract

While organic farming has been identified as an effective way to improve food safety and environment quality, the adoption of organic production and processing is highly determined by the market demand for organic food products. To assess the market potential for organic apples and milk, a conjoint analysis is conducted in the state of Vermont to examine consumer evaluation of major product attributes and their tradeoffs. Results suggest that there is likely a significant niche market for organic apples and milk and many consumers, especially people who have purchased organic food products, are willing to pay more for organic apples and milk produced locally and certified by NOFA.

Introduction

As a result of the increasing concerns about food safety and environmental quality, organic food has rapidly emerged as an important food industry in the U.S. and many other countries since the early 1980s (Thompson 1998, Lohr 1998). For example, the total retail organic food sales in the U.S. rose from $178 million in 1980 to $1 billion in 1990, and reached $7.8 billion in 2000 (Vandeman and Hayden 1997, Myers and Rorie 2000). In the state of Vermont, as reflected in the increasing number of healthy and natural food stores and increasing availability of organic foods in the mainstream supermarkets, more and more Vermont consumers have started to purchase organic food, especially organic vegetables and fruits (Bazilchuk 2000). However, on the production side, many farmers are still hesitant to adopt

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organic farming due to the lack of information on market demand and the profitability of organic farming.

The major goal of this study was to examine consumer preference and valuation of organic food and to provide information that is needed for the organic food industry to expand its market and improve its profitability. Specifically, a conjoint analysis is conducted to assess consumer evaluation of important attributes of apples and milk and the relative importance of each attribute. Apples and milk were selected in this study partially because they are the most important farm products in Vermont and the northeast region and partially because fresh fruits and milk have been among the top selling organic food products in Vermont and across the country.

While several recent studies have examined consumer or market demand for organic food products (e.g., Eastwood 1997, Blend and Ravenswaay 1998, Lohr 1998, Reicks et al. 1999, Govindasamy et al. 2000, 2001, McCluskey 2000, Conner 2001, Jans and Fernandez-Cornejo 2001), this study contributes to the literature by examining consumer preference for major product attributes of apples and milk through a conjoint analysis and deriving marketing implications. This study has also examined the impacts of demographic variables on consumer preference and willingness to pay for organic apples and milk.

Methods

This study examines consumer preferences for organic apples and milk using conjoint analysis. Conjoint analysis is often defined as a de-compositional method that estimates the structure of consumer preferences such as part-worth utilities and the relative importance of product attributes (Green and Srinivasan 1990). Since its introduction in a mathematical

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psychology and application in the early 1960s, conjoint analysis has been one of the most widely used behavior-based methods to measure consumer valuation of product attributes. As a tool for developing effective product design, conjoint analysis has been used extensively in marketing research to estimate the impact of selected product or service characteristics on customer preferences for the product or service (Cattin and Wittink 1982, Wittink and Cattin 1989). For comprehensive reviews of conjoint studies, please refer to the papers by Green and Srinivasan (1978, 1990), Wittink and Cattin (1989), and Green et al. (2001).

The economic theory behind conjoint analysis can best be represented by the Lancaster's utility model in consumer economics (Lancaster 1966). In the Lancaster model, it is assumed that the attributes of goods provide utility to individuals and each specific good contains a fixed set of attributes with specified levels. The Lancaster model assumes that utility is a function of a set of attributes and that individuals purchase goods only for the purpose of obtaining attributes that provide utility or satisfaction. The conjoint model can be viewed as an extension of the Lancaster model by including price as a product attribute.

Conjoint analysis was selected as a major approach for this study because it takes a holistic view of a product. While other methods of preference measurement such as contingent valuation often focus on how preferences are affected by changing one attribute at a time, conjoint analysis asks the respondent to rate a product profile by evaluating the entire product as a package of individual attributes. The approach is generally believed to better reflect the real decision-making situation of consumers (Reddy and Bush 1998).

The first step in a conjoint analysis is the selection of product attributes and attribute levels. Based on our findings from previous studies and a focus group, four attributes were

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selected for apples and five attributes for milk. Table 1 presents the selected apple and milk attributes and the levels for each attribute.

The second step is to conduct an experimental design and construct a survey instrument to collect data. Given the attributes and levels in Table 1, a full factorial design yielded a large number of profiles for both apples and milk and it is almost impossible for a respondent to rate all of them. Note that some price levels for milk apply only to one-gallon container and others apply only to 0.5-gallon container. It was deemed necessary to reduce the number of our profiles to make it possible to be included in the survey. In this study 8 profiles were selected for apples and 12 profiles were selected for milk using a technique called "orthogonal design". See Table 3 and Table 4 for the selected apple and milk profiles. Available in SPSS and some other computer software, orthogonal design is a computer-based technique that has been frequently used to choose a particular number of profiles according to their relative relevance (e.g., Halbrendt et al. 1995).

Once the set of product profiles was constructed, a survey was developed and conducted to collect data for the study. The survey in this study included four major sections: (a) General questions about purchase of organic food and concerns, (b) conjoint valuation of apple profiles, (c) conjoint valuation of milk profiles, and (d) opinions about organic food industry and demographic information of the respondent and his or her household.

The last step in a conjoint analysis is to choose an appropriate compositional model and estimate model parameters. In the conjoint survey, each participant was asked to give a preference rating to each of the profiles in a range from 1 to 7, with 1 being the least preferred and 7 being the most preferred profile. The overall preference, *R*, was then specified as a function of the apple attributes in this study.

(1) $R = f$ *(Production method, Locality, Certification, Price)*

If U_{min} is the utility level of the least preferred choice and U_{max} is the utility level of the most

preferred choice, then the relationship between consumer's utility (U) and preference rating can

be presented as:

(2)
$$R = (7-1)\frac{U - U_{min}}{U_{max} - U_{min}} + 1$$

It is straightforward to show that when a consumer's utility (U) is equal to the utility level of the

least preferred choice (U_{min}), he or she would give that choice a rating of $R = 1$. On the other

hand, when the consumer's utility (U) is equal to the utility level of the most preferred choice

(U_{max}), he or she would give that choice a rating of $R = 7$.

Assuming that production method, location and certification are dummy variables, and

price is in linear functional forms, the conjoint preference model for apple can be written as:

(3) $R_i = \beta_0 + \beta_1 PM + \beta_2 L + \beta_3 C_1 + \beta_4 C_2 + \beta_5 P + e_i$

where R_i is the preference rating by the ith respondent, PM is a dummy variable for production

method, L is a dummy variable for location, C_1 and C_2 are dummy variables for certification, P is

price, and e_i is the error term. The dummy variables in this model are coded using the effects

coding scheme. For example, $C_1 = 1$ and $C_2 = 0$ represent NOFA certified, $C_1 = 0$ and $C_2 = 1$

stand for USDA certified, and $C_1 = -1$ and $C_2 = -1$ represent not certified. Although not

traditionally used in econometric modeling, the effects coding has been widely used in conjoint

analysis, because it is particularly appropriate with nominal scales when each group is most

conveniently compared with the entire set of groups rather than with a single reference group

(Cohen and Cohen 1975). The intercept β_0 is the overall mean preference rating, and the

coefficient β_1 to β_5 are the part-worth estimates associated with the respective levels of

production method, location, certification and price. The model for milk is very similar to equation (3) except that it has one additional dummy variable for container size.

Data collection

A sample of 519 consumers in the state of Vermont completed the mail survey in which they provided information about their consumption patterns, preferences and willingness to pay for organic food, their opinions about organic food industry in Vermont, and their individual household demographic information.

The data collection process was completed between January and March 2002. The mail survey was conduced based on the recommendations in Dillman's Total Design Method (1978). A greeting postcard with a brief introduction of the study was first sent to each of 2,000 randomly selected Vermont households in the end of January 2002. One week after the postcards were mailed, each of these households was sent a copy of the survey, a cover letter and a postage-paid reply envelope. The cover letter explained this survey in detail and asked the primary food shopper in the household to fill out the survey. Two weeks later, a follow-up telephone call was administered to remind the people who had not returned their surveys. Since the people who would like to fill in the survey might probably not be able to find the survey after two weeks, the follow-up survey packets were sent to those people who still indicated their willingness of participation of this survey.

By the end of March 2002, we received 519 completed surveys. After adjusting for non-deliverable addresses, the response rate for this study was 31.3% (519 out of 1,659). However, a particular difficulty with mail surveys is that not all respondents answer all the questions. In this survey, out of the 519 respondents, 382 (or 23.0% of the sample) answered the conjoint

questions and all of the demographic questions. The descriptive statistics of the demographic variables are presented in Table 2.

Results

This section will first present the summary statistics and then report the estimation results from the conjoint preference models. By comparing the two columns of the statistics in Table 2, it indicates that there is no significant difference between the whole sample and the sample used in this study. For example, among the received 519 surveys, the respondents' per household monthly average expenditure on organic food is $72.7 with standard deviation of $93.1, while among the sample (382) used this study, the respondents' per household monthly average expenditure on organic food is $74.3 with standard deviation of $96.9. Figure 1, Figure 2 and Figure 3 present the summary information regarding where consumers purchase organic food, the primary reasons purchasing organic food for the people who buy organic food and the primary reasons not purchasing organic food for the people who do not buy organic food, respectively.

The results of average rating for each apple and milk profile are reported in Table 3 and Table 4, respectively. It is noted that the variation in the average rating for most of the eight apple profiles and 12 milk profiles is quite large. This indicates that consumers do have a quite strong preference for certain profiles as compared to other profiles. For example, it is observed that apple A, B, C and D are generally among the top 4 apple profiles, and apple E, F, G and H are generally among the bottom 4 apple profiles. This observation suggests that consumers are more willing to purchase local food products. It is also straightforward to see there are significant differences in the average ratings between the people who have purchased organic

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food and people who have not purchased any organic food. People who have purchased organic food are more likely to give a higher preference rating to organically and Vermont produced apples and milk certified by NOFA, while the respondents who have not purchased organic food are more likely to give a higher preference rating to conventionally and Vermont produced products due to their low prices.

Estimation of part-worth utilities

While the sample used in conjoint model for apples contained 3056 observations (382 x 8), it was divided into two groups: people who have purchased organic food (1952 observations) and people who have not purchased organic food (1104 observations). This was due to the results of structural test that there were significant differences between these two groups. According to equation (3), OLS is used to estimate the parameters of the conjoint model and the part-worth utilities are then derived directly from OLS estimation.

Table 5 presents the part-worth utility estimates and *t*-values associated with each attribute level for the two groups for the apple model. The estimates of part-worth utility indicate how effective or influential each attribute level is in the formation of respondents' preferences for the product. In other words, they represent respondents' degree of preference for each level of each attribute. The part-worth estimates for the first group of respondents shown in Table 5 reveal that those consumers who have purchased organic food preferred the following level of each of the four attributes: organically grown, produced in Vermont, certified by NOFA and priced at $0.99. And the part-worth estimates for people who have not purchased organic food indicate that those consumers prefer the following level of each of the four apple attributes: conventionally grown, produced in Vermont, certified by USDA and priced of $0.99. However,

for both groups the strength of preference provided by different attributes varies, and the certification appears to be the weakest one compared to others. The *t* values associated with each level (except certification) were statistically significant at the level of 0.01, indicating that they contribute significantly in explaining the variance in consumer preference rating.

The part-worth utility estimates for the milk model are reported in Table 6 for the two groups of respondents. The interpretations and conclusions from the table are similar to that for the apple models.

Relative importance of product attributes

Although the estimated part-worth utilities provide useful information regarding consumer preference for the attributes, they do not provide a direct measurement of the relative importance of these attributes. The relative importance of attributes is an important piece of information for organic farmers and retailers in making their production and marketing decisions. In this study, the relative importance for each attribute is derived from the part-worth utilities of each level of attributes. The calculation procedures are as follows: (a) utility values for alternative attribute levels are computed by multiplying the specific attribute level by the corresponding estimated parameter, (b) the highest and lowest utility values for each attribute are identified and their difference is the utility range (*UR*), (c) the sum of the ranges over all the attributes is calculated, and (d) the relative importance (*RI*) of the *i*th attribute, expressed in percentage weight, is calculated using the following equation (Halbrendt et al. 1995):

(4)
$$RI_i = 100 \times \frac{UR_i}{\sum_{j=1}^{n} UR_j}$$

Interpretation of the relative importance (*RI*) is quite straightforward. For example, if the relative importance of one attribute is found to be twice that of another attribute, it can be inferred that the first attribute is twice as important as the other attribute in the determination of consumer preference.

Estimation results of the relative importance of apple attributes for people who have purchased organic food and people who have not purchased organic food are depicted in Figure 4. Results suggest that, for the respondents who have purchased organic food, location is the most important attribute with a relative importance of 31.67%, but, for the respondents who have never purchased organic food, price is the most important attribute with a relative importance of 49.27%. Results also show that certification is significantly less important than other attributes for both groups of respondents.

Similarly, the estimation results for milk are reported in Figure 5. Results suggest that price and production methods are the important attributes, followed by certification, for both groups of people.

Demographic effects

To accomplish the objective of identifying the socioeconomic factors that affect consumer acceptance of organic food, we developed an alternative function form for conjoint preference model by including demographic information that respondents provided in the mail survey. The estimation results, not reported in this paper, generally indicate that consumers who have higher preference rating are likely to be young, with few household members and with few children, live in the Northeastern Kingdom, and have a higher household income, while the

estimation parameters for genders, education and marital status do not show any significant effects.

Conclusions and implications

This study has examined consumer demand and preference for organic apples and milk to provide information that is useful to organic farmers and retailers in making their production and marketing decisions. To obtain the necessary information, a conjoint survey was designed and administered to collect data from 2,000 randomly selected Vermont households.

The major conclusions from this study include: First, results of summary statistics from the survey show that 56.9% of Vermont consumers purchased organic food in 2001, as opposed to 33.3% in the U.S. (nationwide average) (Hartman Group 2000). The percentage of people's average organic food expenditure ($72.7) was 20% of their average total food expenditure ($354.9) per month in Vermont. These results indicate that, in the state of Vermont, there is quite a large consumer base for organic food and the market potential is promising.

Second, results from conjoint analysis show that price was considered as an important attribute for Vermont consumers, followed by production method and location for apple consumers and production location and certification for milk consumers. The estimated measures of the relative importance of the attributes can provide farmers and retailers with information regarding the importance of each attribute relative to other attributes in determining consumer preferences. For example, location contributed to the largest percentage (31.7%) of the preference rating of apple consumers who have purchased organic food, while price contributed to the largest percentage (49.3%) for apple consumers who have not purchased organic food. In other words, location (produced in Vermont) was an important factor to the

organic food buyers and price was not that important to them. However, price was crucially important to the consumers who have never purchased organic food. These results represent an encouraging message to organic apple farmers and retailers who are located in Vermont. It basically implies that they can charge a price premium for organic apples without significantly decreasing their sales.

Third, the results from the regression model with demographic variables indicate that young people with higher income, smaller household size and fewer children were willing to pay more for organic food. People living in the Northeastern Kingdom (rural area in Vermont) are willing to pay more for organic food than people living in Chittenden County (urban area of Vermont). This suggests that organic farmers and retailers should promote their organic products not only in urban areas but also make effort to make them available to rural consumers.

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Table 1. Apple and milk attributes and levels

Attributes	Attribute Levels for Apples	Attribute Levels for Milk
Production method	Organically grown Conventionally grown	Organically grown Conventionally grown
Location	Vermont Other states	Vermont Other states
Certification	NOFA certified USDA certified Not certified	NOFA certified USDA certified Not certified
Price	0.99/lb 1.29/lb 1.59/lb 1.89/lb	$1.89 $2.19 $2.99 $3.29 $3.59 $4.49 $4.99
Container size		0.5 gallon 1 gallon

Table 2. Descriptive statistics of survey respondents

Variables	Full Sample (n = 519)	Sample Used (n = 382)
Buy organic food	56.9%	63.9%
Monthly food expenditure	mean=354.9, std=172.3	mean=357.9, std=177.3
Monthly organic food expenditure	mean=72.7, std=93.1	mean=74.3, std=96.9
Age	mean=53, std=15	mean=50, std = 13
Gender		
Female respondent	59.5%	58.4%
Male respondent	40.5%	41.6%
Household income		
Less than $35,000	28.3%	24.9%
$35,000 - $49,999	20.5%	21.3%
$50,000 - $74,999	24.7%	26.0%
Over $75, 000	26.6%	27.7%
Education		
High school or less	21.7%	16.8%
Some college / associate	27.8%	29.6%
Bachelor's degree	22.0%	23.9%
Graduate or professional degree	28.5%	29.7%
County of residence		
Chittenden county	34.0%	36.0%
Northeastern Kingdom	4.7%	3.7%
Other counties	61.3%	60.3%
Number of people in household		
One person	17.1%	12.6%
Two persons	42.1%	40.7%
Three persons or more	40.7%	46.7%
Number of children in household		
No child	71.6%	66.7%
One child or more	28.4%	33.3%
Marital status		
Single	14.4%	14.5%
Married	66.9%	73.2%
Other	16.9%	12.3%

Table 3. Average rating of apple profiles

Apple Profile	Production Method	Location	Certification	Price	Whole Sample (n=382)	Respondents who have purchased organic food (n=244)	Respondents who have not purchased organic food (n=138)
A	Conventional	Vermont	None	$0.99	5.25 (1.93)	4.56 (1.98)	6.46 (1.03)
B	Organic	Vermont	None	$1.59	4.42 (1.87)	4.97 (1.56)	3.46 (1.97)
C	Organic	Vermont	USDA	$1.89	3.97 (2.02)	4.79 (1.70)	2.51 (1.71)
D	Organic	Vermont	NOFA	$1.89	4.15 (2.24)	5.12 (1.93)	2.45 (1.66)
E	Conventional	Other state	None	$0.99	3.63 (2.21)	2.78 (1.88)	5.14 (1.93)
F	Organic	Other state	None	$1.29	3.21 (1.73)	3.44 (1.67)	2.80 (1.75)
G	Organic	Other state	USDA	$1.59	3.17 (1.74)	3.72 (1.69)	2.21 (1.39)
H	Organic	Other state	NOFA	$1.59	3.32 (1.94)	4.00 (1.88)	2.12 (1.38)

* The rating scales are from 1 to 7 with "7" being the highest preference and "1" being the lowest preference. Numbers in the parentheses are standard deviations.

Table 4. Average rating of milk profiles

Milk Profile	Production Method	Location	Certification	Container Size	Price	Whole Sample (n=382)	Respondents who have purchased organic food (n=244)	Respondents who have not purchased organic food (n=138)
A	Conventional	Vermont	None	0.5 gallon	$2.19	4.93 (2.09)	4.43 (2.06)	5.68 (1.91)
B	Organic	Vermont	NOFA	0.5 gallon	$3.29	3.68 (2.21)	4.46 (2.07)	2.50 (1.87)
C	Organic	Other state	NOFA	0.5 gallon	$2.99	3.06 (1.92)	3.62 (1.93)	2.21 (1.56)
D	Conventional	Other state	None	0.5 gallon	$1.89	3.32 (2.25)	2.69 (1.95)	4.28 (2.34)
E	Organic	Vermont	USDA	0.5 gallon	$3.29	3.43 (1.95)	4.10 (1.84)	2.43 (1.66)
F	Organic	Other state	USDA	0.5 gallon	$2.99	2.85 (1.72)	3.36 (1.74)	2.06 (1.37)
G	Conventional	Vermont	None	1 gallon	$3.59	4.45 (2.22)	4.19 (2.16)	4.84 (2.25)
H	Organic	Vermont	NOFA	1 gallon	$4.99	3.23 (2.19)	4.06 (2.16)	1.99 (1.56)
I	Organic	Other state	NOFA	1 gallon	$4.49	2.65 (1.82)	3.22 (1.93)	1.79 (1.21)
J	Conventional	Other state	None	1 gallon	$3.29	2.96 (2.10)	2.45 (1.82)	3.73 (2.27)
K	Organic	Vermont	USDA	1 gallon	$4.99	3.04 (2.02)	3.74 (2.03)	1.99 (1.47)
L	Organic	Other state	USDA	1 gallon	$4.49	2.44 (1.71)	2.93 (1.82)	1.70 (1.21)

* The rating scales are from 1 to 7 with "7" being the highest preference and "1" being the lowest preference. Numbers in the parentheses are standard deviations.

Table 5. Estimation results of part-worth utilities for the apple model

Attribute	Level	Respondents who have purchased organic food		Respondents who have not purchased organic food	
		Part-worth	t-Statistic	Part-worth	t-Statistic
Production Method	Organically grown	0.669	4.41***	-0.661	-3.60***
	Conventionally grown	-0.669	-4.41***	0.661	3.60***
Location	Vermont	0.887	10.93***	0.663	6.76***
	Other states	-0.887	-10.93***	-0.663	-6.76***
Certification	NOFA certified	0.397	4.36***	-0.008	-0.077
	USDA certified	0.092	1.01	0.068	0.614
	Not certified	-0.489	-5.37***	-0.060	-0.537
Price	Price level at $0.99	-1.763	-2.85***	-2.965	-3.97***
	Price level at $1.29	-2.297	-2.85***	-3.864	-3.97***
	Price level at $1.59	-2.832	-2.85***	-4.762	-3.97***
	Price level at $1.89	-3.366	-2.85***	-5.661	-3.97***
Intercept		6.591	7.44***	8.164	7.63***
F-Statistic		71.391		181.802	
Adjusted R^2		0.153		0.450	

*** Significant at the 0.01 level.

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Table 6. Estimation results of part-worth utilities for the milk model

Attribute	Level	Respondents who have purchased organic food		Respondents who have not purchased organic food	
		Part-worth	*t*-Statistic	Part-worth	*t*-Statistic
Production Method	Organically grown	1.361	5.67***	-1.134	4.25***
	Conventionally grown	-1.361	-5.67***	1.134	4.25***
Location	Vermont	0.832	7.31***	0.434	3.43***
	Other states	-0.832	-7.31***	-0.434	-3.43***
Certification	NOFA certified	0.835	3.48***	-0.528	-1.98**
	USDA certified	0.526	2.19**	-0.606	-2.27**
	Not certified	-1.361	-5.67***	1.134	4.25***
Container size	0.5 gallon	-0.972	-2.17**	-0.282	-0.57
	1 gallon	0.972	2.17**	0.282	0.57
Price	Price level at $1.89	-2.826	-2.56***	-1.340	-1.09
	Price level at $2.19	-3.274	-2.56***	-1.553	-1.09
	Price level at $2.99	-4.470	-2.56***	-2.120	-1.09
	Price level at $3.29	-4.919	-2.56***	-2.333	-1.09
	Price level at $3.59	-5.367	-2.56***	-2.545	-1.09
	Price level at $4.49	-6.713	-2.56***	-3.183	-1.09
	Price level at $4.99	-7.460	-2.56***	-3.538	-1.09
Intercept		8.897	4.31***	5.443	2.37**
F-Statistic		50.390		172.346	
Adjusted R^2		0.088		0.336	

** Significant at the 0.05 level. *** Significant at the 0.01 level.

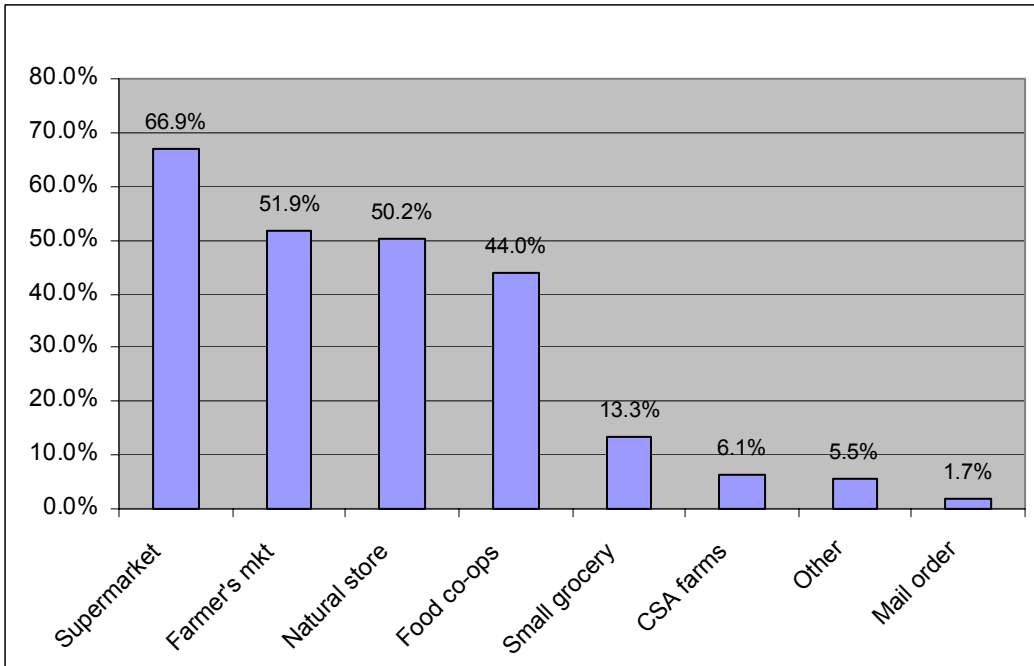**Figure 1. Where do you purchase organic food?**
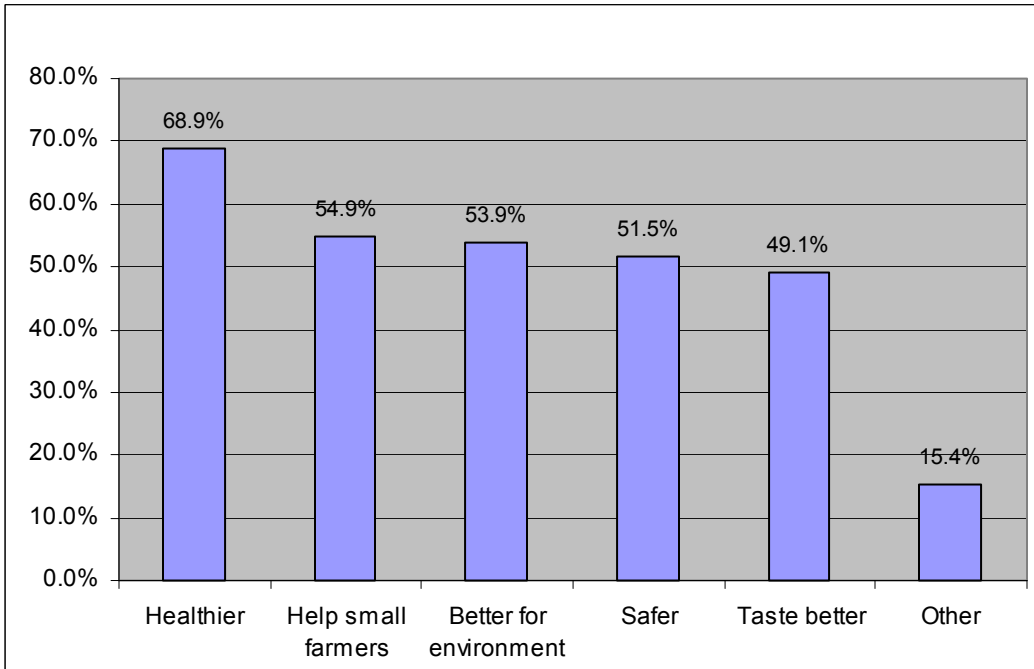

Figure 2. Why do you purchase organic food?

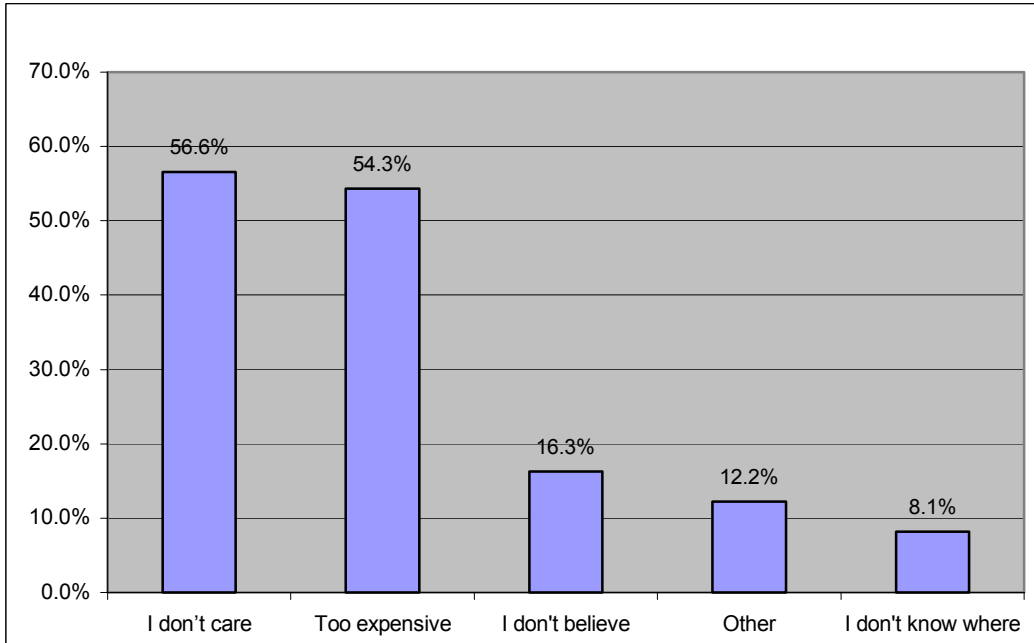**Figure 3. Why do you not purchase organic food?**
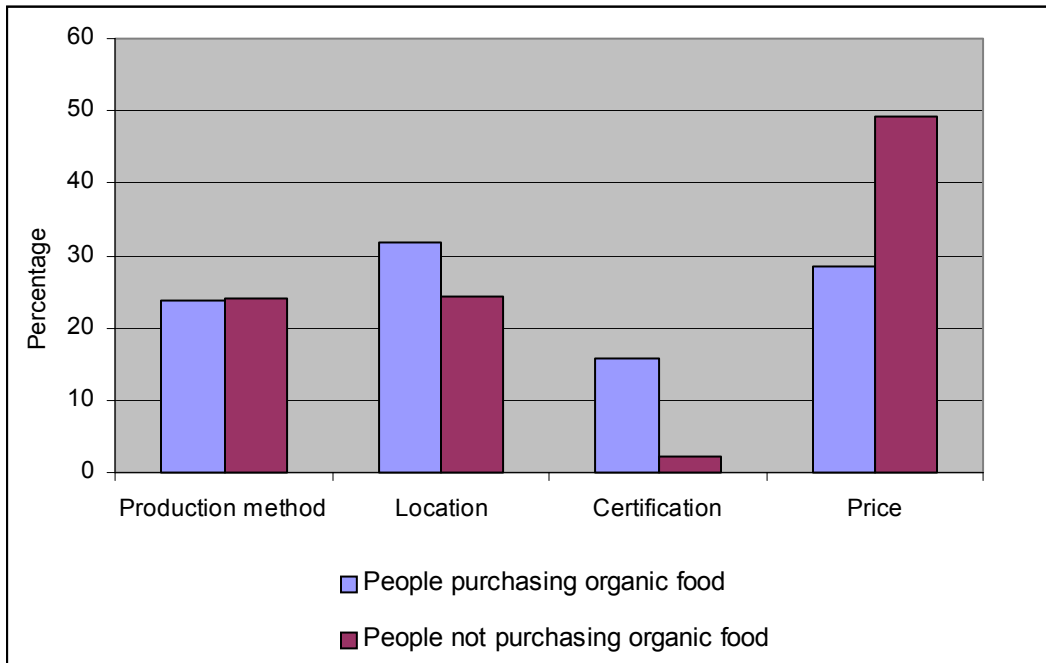

Figure 4. Relative importance of apple attributes

Figure 5. Relative importance of milk attributes

■ People who purchased organic food

■ People who did not purchase organic food