Consumer Preferences and Willingness to Pay for Locally Grown Organic Apples: Evidence from a Conjoint Study

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Abstract. Although organic food has rapidly emerged as an important food industry in the United States and many other countries, farmers and fruit growers need more information on consumer preferences and willingness to pay for locally grown organic food products to make better production and marketing decisions. This article presents the findings from a conjoint study on consumer valuation of major attributes of fresh apples (production method, price, certification, and product origin) and the tradeoffs between price and other attributes. Analysis results based on data from 382 respondents, or 3056 observations, in the state of Vermont suggest that there is likely a significant niche market for locally grown organic apples, and many consumers, especially people who had purchased organic food, are willing to pay significantly more for organic apples produced locally and certified by the Northeast Organic Farming Association. This study also suggests that there are significant differences in preferences between respondents who had purchased organic food and respondents who had not purchased organic food, although both groups showed a strong preference and willingness to pay for locally grown apples as compared with apples from other regions.

As a result of the increasing consumer concerns about food safety and environmental quality, organic food has rapidly emerged as an important food industry in the United States and many other countries since the early 1980s (Chang and Zepeda, 2005; Lohr, 1998; Organic Trade Association, 2009; Thompson, 1998). For example, the total retail sales of organic food and beverages in the United States rose from \$178 million in 1980 to \$1 billion in 1990, \$7.8 billion in 2000, and \$23 billion in 2008 (Organic Trade Association, 2009). In relative terms, the share of organic food and beverages in total food and beverage retail sales in the United States increased from 1.9% in 2003 to 2.5% in 2005 and reached 3.5% in 2008 (Organic Trade Association, 2009). The growth in organic food is also reflected in the increasing

availability of organic food products in mainstream supermarkets as well as in local food stores and farmers' markets (Timmons et al., 2008).

The emerging organic food market has significant implications for the fruit industry because organic vegetables, fruits, and dairy products have constituted the bulk of organic food products and have shown tremendous potential for growth (Organic Trade Association, 2009). For example, whereas total apple production and sales in the United States experienced very limited growth in the past decade, sales of organic apples have increased significantly in recent years. According to the most recent data reported by Grocery Headquarters (2008), organic apples represented 4.6% of total apple sales in the United States over the 52 weeks ending 26 Apr. 2008, up from 3.5% in the previous year.

In the state of Vermont, apples have been the dominant fruit crop for many years and have played an important role in the state's agricultural economy. The 264 apple growers with 3241 acres for apple production generated a total farm value of \$12.616 million in

2007 and accounted for $\approx 1.8\%$ of the total agricultural output (U.S. Department of Agriculture, 2008). As a major fruit with a well-recognized reputation for quality, the apple was designated as Vermont's state fruit by the state legislature in 1999. However, similar to many other small farmers in the United States, apple growers are facing a host of challenges such as increasing production costs and intensifying competition from imported apples. The emerging organic food market may provide opportunities for apple growers in Vermont and other regions.

Many apple and other fruit growers are interested in organic production, but some of them have hesitated to switch to organic production partially because of the additional investment required for organic operation and certification and partially because of the lack of information on the costs and profitability of organic fruit production. The major goal of this study was to examine consumer preferences for and valuation of organic apples and to assess the market potential for locally grown organic apples. Specifically, a conjoint study was conducted to collect data and assess consumer valuation of major apple attributes, the relative importance of each attribute, and the tradeoffs between price and other attributes.

Although several studies have examined consumer or market demand for organic food products (e.g., Bernard et al., 2006; Blend and van Ravenswaay, 1998; Chang and Zepeda, 2005; Lohr, 1998; Reicks et al., 1999), this study is expected to contribute to the literature both by assessing consumer valuation of major apple attributes, especially "locally grown" and "organic," through a conjoint study and by examining the differences in preferences between consumers who have purchased organic food and consumers who have not purchased organic food. The following sections will describe our research methods and data collection procedures, present the analysis results, and summarize major conclusions and implications for apple growers.

Methods

Conjoint analysis is used in this study to examine consumer valuation of major attributes of fresh apples. Since its introduction in the early 1960s, conjoint analysis has been widely used in marketing studies for measuring consumer valuation of product attributes, including many food products such as fish (Halbrendt et al., 1995), wine (Sanchez and Gil, 1997), and fruits and vegetables (van der Pol and Ryan, 1996). The first step of a conjoint study is to select product attributes and attribute levels. On the basis of our literature review and comments from a focus group of representative consumers, four apple attributes with specific levels were selected in this study: production method (organically or conventionally grown), product origin (produced in Vermont or outside Vermont), certification [certified by the Northeast Organic Farming Association

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(NOFA) or the U.S. Department of Agriculture (USDA) or not certified], and price per pound (\$0.99, \$1.29, \$1.59, or \$1.89). The price levels were selected according to the average retail prices in Vermont and with the consideration that the price levels should be realistic and close to the prices in the marketplace, but the variation should be large enough to affect respondents' decisions.

The second step is to develop product profiles. Given the attributes and their levels, a full factorial design yielded a total of 48 possible apple profiles ("two production methods" × "two product origins" × "three certification alternatives" × "four price levels"). It was deemed necessary to reduce the number of profiles to make comparison and rating by survey respondents possible. In this study, eight profiles were selected from the 48 profiles in two steps (Table 1): 1) eight profiles that were obviously not acceptable to producers (e.g., organically grown in Vermont, certified by NOFA, and with the lowest price) or to consumers (e.g., conventionally grown outside Vermont, not certified, and with the highest price) were removed; and 2) a technique called "orthogonal design" was used to select eight profiles from the remaining list of 40 on the basis of their relative representativeness. Available in SPSS (SPSS Inc., Chicago, IL) and some other computer software, orthogonal design is a computer-based technique that has frequently been used to reduce the number of profiles according to their relative relevance in conjoint studies (e.g., Halbrendt et al., 1995; Wang et al., 2004).

Once the set of product profiles is determined, the next step is to develop and conduct a survey for collecting data. The survey in this study included three major sections: 1) general questions about the purchase of organic food; 2) conjoint valuation of apple profiles; and 3) demographic information. Although the data collection procedures are reported in the following section, the conjoint analysis model is presented in Appendix A.

Data Collection

The mail survey was conducted following the recommendations in Dillman's (1978) Total Design Method. In the end of January 2003, a greeting postcard with a brief in-

troduction of the study was sent to each of 2000 random sample Vermont households, all from a list purchased from a marketing research company. One week after the postcards were mailed, each of these households was sent a copy of the survey with a cover letter and a postage-paid reply envelope. The cover letter explained this survey and asked the primary food shopper in the household to complete the survey. An incentive of winning one of three \$100 gift certificates from Dakin Farm was offered to increase the response rate. Two weeks later, a follow-up postcard was mailed to each of the households that had not returned the survey. With a specific number on each return envelope that matched the number on the mailing list, we were able to identify which households had returned the survey and which households had not.

By the end of Mar. 2003, a total of 519 completed surveys was received. After adjusting for 341 nondeliverable addresses, the response rate for this study was 31.3% (519 of 1659). Among the 519 respondents, only 382 respondents (23.03% of the 1659 potential respondents) answered all the questions in the survey and were therefore used in our analysis.

Results

This section first presents the summary statistics of the survey and then reports the estimation results from the conjoint preference model. A total of 58.4% of the respondents was female, and this high percentage of females is likely the result of the survey instruction that the survey should be completed by the primary food shopper in the household. Almost 64% of the respondents indicated that they had purchased organic food and that their household average monthly expenditure on organic food in 2002 was \$69.30, or 19.90% of their average monthly food expenditure of \$357.90. A comparison of the sample statistics with the available demographic information of the Vermont population suggests that this group of respondents included slightly more individuals with higher education levels and higher household income and fewer individuals with children.

Our survey was likely subject to the bias that organic food consumers could be more likely to respond to the survey as compared

with individuals who had not purchased any organic food. As a limitation of this study, we could not identify or test the bias as a result of the extremely limited information on the study populations (i.e., organic food consumers and nonconsumers of organic food in Vermont).

We also examined the possible differences between the respondents who had purchased organic food and their counterparts who had not purchased organic food. Our comparison and tests based on sample statistics, not reported in this article, suggest that the two groups were not significantly different at the $P = 0.10$ level for most of the demographic variables except that organic food consumers had slightly higher education and income levels than the respondents who had not purchased organic food.

In addition to the demographic questions, the survey also included questions about reasons for purchasing or not purchasing organic food and, for those who had purchased organic food, where they made the purchases. As shown in Figure 1, the major places where respondents purchased organic food were supermarkets, farmers' markets, natural food stores, and food cooperatives. Figure 2 indicates that the leading reason for purchasing organic food was that organic food is healthier followed by organic food can help small farmers, is better for the environment, is safer, and tastes better. The survey also asked respondents who had not purchased any organic food about their reasons, and the results, reported in Figure 3, suggest that the leading reason was "I don't care if it is organic or not" followed by "organic food is too expensive," "I do not trust it is organic," and "I don't know where to buy organic food." Note that the sum of the percentages in Figures 1 to 3 is greater than 100 because each respondent could choose more than one reason. Also, the "others" in Figures 1 to 3 included all the open-ended responses to each corresponding question.

Each of the eight apple profiles reported in Table 1 was rated by each respondent on a scale of 1 to 7 with 1 being the least preferred apple profile(s) and 7 the most preferred apple profile(s) (a respondent could give the same rating to more than one profile). The average ratings, recorded in Table 1, suggest two findings. First, there were significant differences in the average rating

Table 1. Average rating of apple profiles.

Apple profile	Production method	Product origin	Certification	Price	Whole sample (n = 382)	Avg rating ^a	
						Respondents who had purchased organic food (n = 244)	Respondents who had 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 regions	None	\$0.99	3.63 (2.21)	2.78 (1.88)	5.14 (1.93)
F	Organic	Other regions	None	\$1.29	3.21 (1.73)	3.44 (1.67)	2.80 (1.75)
G	Organic	Other regions	USDA	\$1.59	3.17 (1.74)	3.72 (1.69)	2.21 (1.39)
H	Organic	Other regions	NOFA	\$1.59	3.32 (1.94)	4.00 (1.88)	2.12 (1.38)

^aThe rating scales are from 1 to 7 with 7 as the highest preference and 1 as the lowest preference. Numbers in parentheses are sds.

Fig. 1. Where organic food consumers purchased organic food (N = 244).

Fig. 2. Major reasons for organic food consumers to purchase organic food (N = 244).

Fig. 3. Major reasons for not purchasing organic food as indicated by respondents who had not purchased organic food (N = 138).

for each apple profile between the two groups of respondents (those who had purchased organic food and those who had not purchased organic food). Respondents who had purchased organic food were more likely to give a higher preference rating to profiles D, B, C, and A, whereas the respondents who had not purchased organic food were more likely to give a higher preference rating to profiles A and E. Second, the sds of the average ratings indicate that, among the respondents in each group, preferences for each apple profile were significantly different.

Such variations will also be discussed in the analysis results, presented next.

Estimation of part-worth utilities. Although the data used in our analysis included 3056 observations (382 respondents $\times$ eight profile ratings per respondent), the data were divided into two groups for estimating two separate preference models: Model A for respondents who had purchased organic food (244 respondents, or 1952 observations) and Model B for respondents who had not purchased organic food (138 respondents, or 1104 observations). This separation was

based on the result, from a structural test, that the two groups had significantly different preferences for fresh apples. The ordinary least squares procedure in SPSS was used to estimate the preference model presented in Eq. (A3) in Appendix A, and the estimated coefficients were then used to derive the part-worth utility for each attribute level in Model A and Model B, respectively (Halbrendt et al., 1995; Wang et al., 2004).

The part-worth utility estimates and their significance, based on *t* tests, for the two models are reported in Table 2. 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, the estimates represent a respondent's degree of preference for each level of each attribute. The part-worth estimates for the first model reveal that the respondents who had purchased organic food significantly preferred organically grown over conventionally grown, Vermont apples over apples from other regions, certified by NOFA over certified by USDA and over apples not certified, and lower prices over higher prices. On the other hand, the part-worth estimates for the second model indicate that the respondents who had not purchased organic food significantly preferred conventionally grown over organically grown, Vermont apples over apples from other regions, and lower prices over higher prices. The effects of certification in the second model were not statistically significant.

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 can be an important factor when organic farmers and retailers make production and marketing decisions (van der Pol and Ryan, 1996). In this study, the relative importance of each attribute was derived from the part-worth utilities in four steps: 1) utility values for alternative attribute levels were computed by multiplying the specific attribute level by the corresponding estimated parameter; 2) the highest and lowest utility values for each attribute were identified, and their difference was the utility range (*UR*); 3) the sum of the ranges overall the attributes was calculated; and 4) the relative importance (*RI*) of the *i*th attribute, expressed in percentage weight, was calculated using the following equation (Halbrendt et al., 1995):

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

Interpretation of the *RI* is quite straightforward. For example, if the *RI* 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 the attributes for the two models, reported in Figure 4, suggest that, for the respondents who had purchased organic food, product origin and price were the two most important attributes (31.67% and 28.59%, respectively) followed by production method (23.89%) and certification (15.82%). On the other hand, for the respondents who had not purchased organic food, the relative importance was 49.27% for price, 24.23% for product origin, 24.16% for production method, and 2.34% for certification.

Expenditure-equivalent index. In addition to the part-worth utilities and relative importance of attributes reported previously, it is important for organic farmers and retailers to know the tradeoffs between the attributes, especially between price and other attributes. For example, when given a choice between conventional and organic apples, what would the price difference have to be to make a consumer indifferent between the two alternatives? The answer to this question can provide useful information for producers to evaluate the tradeoffs between price and production method. The expenditure-equivalent index (EEI), developed by Payson (1994), was calculated in this study according to the following equation:

$$EEI = 1 - \frac{\sum_{i=1}^k \beta_i dc_i}{\gamma p} \quad (2)$$

where β_i is the estimated parameter for the i th attribute, γ is the estimated parameter of price, dc_i is the change in the i th attribute level, and p is the base price level. EEI can be interpreted as the proportion change in the price necessary for a consumer to be indifferent between a reference product profile and an alternative product profile with different attribute levels. When all other product profiles are compared with such a reference or base profile, it is straightforward to show that the EEI for the reference profile is equal to 1 because the second term in Eq. (2) is equal to zero.

The estimated EEIs for the two models are presented in Table 3. Each number in the table can be interpreted directly. For example, for respondents who had purchased organic food, the EEI of 2.01 for the second apple profile suggests that they were willing to pay 102% more for apples that were conventionally grown in Vermont and not certified as compared with the reference apples that were conventionally grown in other regions and not certified. As another example, in the Model B column, the EEI of 0.55 in the third profile suggests that the respondents who had not purchased organic food were willing to pay only 55% of the price for apples that were organically grown in other regions and not certified as compared with the reference apples. Similar to the estimated part-worth utilities and relative importance of attributes reported previously, the two groups of respondents were significantly different in terms of the tradeoffs

Table 2. Estimation results of part-worth utilities.

Attribute	Attribute level	Model A ^z coefficient	Model B ^y coefficient
Production method	Organically grown	0.669***	-0.661***
	Conventionally grown	-0.669***	0.661***
Product origin	Vermont	0.887***	0.663***
	Other regions	-0.887***	-0.663***
Certification	NOFA-certified	0.397***	-0.008
	USDA-certified	0.092	0.068
	Not certified	-0.489***	-0.060
Price	Price level at \$0.99	-1.763***	-2.965***
	Price level at \$1.29	-2.297***	-3.864***
	Price level at \$1.59	-2.832***	-4.762***
	Price level at \$1.89	-3.366***	-5.661***
Intercept		6.591***	8.164***
F-Statistic		71.391	181.802

^zModel A: Respondents who had purchased organic food.

^yModel B: Respondents who had not purchase organic food.

***Significant at the 0.01 level.

Fig. 4. Relative importance of apple attributes.

Table 3. Estimated expenditure-equivalent index (EEI) for apple profiles.

Price	Production method	Product origin	Certification	EEI	
				Model A ^z	Model B ^y
0.99	Conventional	Other regions	Not certified	1.00	1.00
	Conventional	Vermont	Not certified	2.01	1.45
	Organic	Other regions	Not certified	1.76	0.55
	Organic	Vermont	Not certified	2.77	1.00
	Organic	Other regions	NOFA	2.26	0.57
	Organic	Vermont	NOFA	3.27	1.02
	Organic	Other regions	USDA	2.09	0.65
	Organic	Vermont	USDA	3.09	1.04

^zModel A: Respondents who had purchased organic food.

^yModel B: Respondents who had not purchased organic food.

between price and other attributes. Note that the estimated results for respondents who had purchased organic food seem to be much more logical than the results for respondents who had not purchased organic foods. One possible explanation is that the respondents who had not purchased organic foods either did not understand the tradeoffs between attributes or were not serious in completing the survey and their responses did not reflect their true preferences.

Conclusions and Implications

In response to the growing need for information for fruit growers to capture the

potential opportunities in the emerging organic food market, this study has examined consumer preferences and willingness to pay for fresh apples with different product attributes (production method, product origin, certification, and price) through a conjoint study in the state of Vermont. Starting with a random sample of 2000 households, a data set of 382 respondents, or 3056 observations collected from the survey, were used to estimate the part-worth utility and relative importance of each attribute and the tradeoffs between price and other attributes for the respondents who had purchased organic food and the respondents who had not purchased organic food, respectively.

The survey and conjoint analysis results suggest five conclusions with significant implications for organic food producers in general and apple growers in particular. First, nearly 64% of the respondents had purchased organic food, and their average household expenditure on organic food in 2002 was \$69.30, or 19.90% of their average monthly expenditure on food, suggesting that Vermont is likely one of the leading states in organic food consumption in the country. This is also consistent with the finding that Vermont had the highest per-capita direct food sales from farmers to consumers in the nation (USDA, 2008). As a leader in promoting local and organic food production and consumption, Vermont's experience can be useful for other states in developing their food policy and programs.

Second, the survey indicates that most organic food consumers purchased their organic food products from supermarkets (66.9%), farmers' markets (51.9%), natural food stores (50.2%) and food cooperatives (44%). Because farmers' markets, natural food stores, and food cooperatives are almost as important as supermarkets for organic food shoppers (Fig. 1), opportunities exist for organic farmers to sell their products to consumers either directly at farmers' markets or through natural food stores and food cooperatives. This is particularly important for small producers who generally are not able to sell their products through supermarkets because of quantity and other restrictions.

Third, the estimation results for the two conjoint models, one for the respondents who had purchased organic food and the other for respondents who had not purchased organic food, suggest that the two groups are significantly different in their preferences and willingness to pay for organic apples. Such differences should be incorporated into the efforts to promote organic food in general and organic apples in particular. For example, price coupons may encourage some consumers who have not purchased organic food to try organic apples. Also, information on the reasons for purchasing organic food and reasons for not purchasing organic food, reported in this study, can help organic farmers and organizations develop effective marketing strategies and educational materials for promoting organic food. For example, information and educational materials on the benefits of organic food and on certification regulations and procedures may change the negative attitudes of some consumers who have not purchased organic food.

Fourth, both groups of respondents showed a strong preference for apples produced in Vermont as compared with apples from other regions. This finding is important for both organic and conventional apple growers in Vermont. They should highlight their apples as Vermont-grown and can sell at higher prices because many consumers are likely willing to pay a premium price for Vermont apples produced organically or conventionally as compared with apples from

other regions. As reported by Timmons et al. (2008), the sales of locally grown food, directly from farmers to consumers or indirectly through supermarkets and food stores, have increased significantly in the United States in the past two decades, and Vermont has been a leader in the efforts to increase local food in its food system. Note that "Vermont apples" are presented as a local product rather than a product brand in the study and the finding may not suggest that Vermont apples are better than apples from other regions.

Fifth, although this study was based on a household survey in the state of Vermont and had certain limitations, some of the findings such as the significant differences between consumers who had purchased organic food and consumers who had not purchased organic food may have general applications for organic farmers and apple growers in other regions. Also, the conjoint analysis method and procedures used in this study may be applicable to studies on consumer preferences for other food products in Vermont and other regions.

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Appendix A. Conjoint Analysis Model

The economic theory behind conjoint analysis can best be represented by the Lancaster utility maximization model (Lancaster, 1966). Whereas the Lancaster model assumes that the utility or satisfaction from a product is a function of its specific attributes, conjoint analysis extends the Lancaster model by including price as a product attribute. Considering that each product in the marketplace is always characterized by its physical, functional, quality, and price attributes, the conjoint approach is generally believed to reflect the real decision-making situation of consumers (Reddy and Bush, 1998; Wang et al., 2004). A comprehensive review of the conjoint approach and its applications is available in Cattin and Wittink (1982), Green and Srinivasan (1978, 1990), Green et al. (2001), and Wittink and Cattin (1989).

Although the first three steps in conducting a conjoint analysis were presented in a previous section, the fourth step is to choose an appropriate compositional model and estimate preference model parameters. In our conjoint survey, each participant was asked to give a preference rating to each of the eight apple profiles in a range from 1 to 7 with 1 for a profile(s) with the least preference and 7 for a profile(s) with the highest preference. The preference rating, R , was then specified as a function of the attributes:

$$R = f(\text{Production method}, \\ \text{Product origin, Certification, Price}) \quad (\text{A1})$$

If $U_{\min}$ is the utility or satisfaction level of the least preferred choice and $U_{\max}$ is the utility or satisfaction level of the highest preferred choice, then the relationship between a consumer's utility (U) or satisfaction and preference rating can be presented as:

$$R = (7 - 1) \frac{U - U_{\min}}{U_{\max} - U_{\min}} + 1 \quad (\text{A2})$$

It is straightforward to show that when a consumer's utility (U) is equal to the utility level of the least preferred choice ($U_{\min}$), the consumer 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 ($U_{\max}$), the consumer would give that choice a rating of $R = 7$.

Assuming that production method, product origin, and certification are dummy variables and that price is in linear functional forms, the conjoint preference model for an apple can be written as:

$$R_{ij} = \beta_0 + \beta_1 PM_j + \beta_2 L_j + \beta_3 C_{1j} + \beta_4 C_{2j} \\ + \beta_5 P + e_{ij} \quad (\text{A3})$$

where R_{ij} is the preference rating by the i th respondent for the j th profile, PM_j is a dummy variable for production method, L_j is a dummy variable for product origin, C_{1j} and C_{2j} are dummy variables for certification,

P_j is the price, and e_{ij} 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. 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 coefficients β_1 to β_5 are the part-worth estimates associated with the respective levels of production method, product origin, certification, and price.