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# **Empirically Evaluating Consumer Characteristics and Satisfaction with Organic Products**

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*Ramu Govindasamy*

*Marc DeCongelio*

*John Italia*

*Bruce Barbour*

*Karen Anderson*



**Department of Agricultural, Food and Resource Economics**

**Rutgers Cooperative Extension**

**New Jersey Agricultural Experiment Station**

**Cook College**

**Rutgers, The State University of New Jersey**

**New Brunswick, New Jersey 08901**

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*Ramu Govindasamy*

*Marc DeCongelio*

*John Italia*

*Karen Anderson*

*Bruce Barbour*



Ramu Govindasamy is an Assistant Professor & Extension Specialist in Marketing,  
Marc DeCongelio is a Graduate Assistant in the Department of Agricultural, Food & Resource Economics,  
John Italia is a former Program Associate,  
Bruce Barbour is Chair of Agriculture & Resource Management Agents Department & Assistant Director of Extension, and Karen Anderson is the Executive Director of the Northeast Organic Farming Association of NJ.

***Correspondence Address:***

Ramu Govindasamy, Assistant Professor  
Department of Agricultural, Food and Resource Economics  
Cook College

Rutgers, The State University of New Jersey  
55 Dudley Road, New Brunswick, New Jersey 08901-8520  
Phone: (732) 932-9171 ext. 254

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## ***Table of Contents***

---

Acknowledgements .....	ii
Executive Summary .....	iv
I. Introduction .....	1
II. Data Description.....	5
III. Methodology.....	19
IV. Empirical Results .....	28
V. Conclusions .....	49
VI. References .....	54
VII. Appendix I.....	57
VIII. Appendix II.....	63

## ***List of Tables***

---

Table 1: Description of Explanatory Variables for Logistic Models.....	21
Table 2: Consumers that have ever Purchased Certified Organic Produce (Model One) .....	31
Table 3: Prediction Success For Model One .....	31
Table 4: How Frequently Consumers Choose Fresh Vegetables and Produce that are Organically Grown (Model Two).....	34
Table 5: Prediction Success For Model Two .....	34
Table 6: Do Consumers feel that Organic Produce is of a Higher Quality than Conventional Produce (Model Three).....	38
Table 7: Prediction Success For Model Three .....	38
Table 8: Would Consumers be willing to pay 10 percent or more for Organic than Conventional Produce (Model Four).....	42

## ***List of Tables (continued)***

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Table 9: Prediction Success For Model Four .....	42
Table 10: Would Consumers be willing to pay 20 percent or more for Organic than Conventional Produce (Model Five) .....	45
Table 11: Prediction Success For Model Five .....	45
Table 12: Model Comparison .....	48

## ***List of Figures***

---

Figure 1: How frequently do you check the ingredient label on the food you purchase? .....	6
Figure 2: Have you ever purchased certified organic produce? .....	6
Figure 3: How often do food advertisements in the newspapers help you decide which food items to purchase? .....	6
Figure 4: How often do newspaper articles/ television/radio reports on food safety issues help you decide which food items to purchase? .....	6
Figure 5: Do you regularly shop at more than one food store in order to purchase advertised specials? .....	7
Figure 6: Is organic produce available from the store from which you most often purchase groceries? .....	7
Figure 7: Would you switch supermarkets to be able to purchase organic produce? .....	8
Figure 8: Do you grow fruits or vegetables for consumption at your home? .....	8
Figure 9: Have you visited a pick-your-own farm in the past year? .....	9
Figure 10: Have you visited a Farmers' Market in the past year? .....	9
Figure 11: Approximately how often do you visit Farmers' Markets during months in which they are open? .....	9
Figure 12: Have you visited a roadside produce stand in the past year? .....	9

## ***List of Figures (continued)***

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Figure 13: Suppose your favorite fresh vegetable that you purchase regularly costs \$1 per pound. Would you pay slightly more for organic certified produce?.....	10
Figure 14: How important are the following to you when purchasing fresh produce? .....	11
Figure 15: Organically produced food uses no synthetic pesticides and are normally labeled as such in the super-market. How frequently do you choose fresh food and vegetables that are organically grown? ....	12
Figure 16: How do you think organically grown produce compares to conventionally grown produce in supermarkets and other retail facilities, in terms of quality?.....	12
Figure 17: How do you think organically grown produce compares to conventionally grown produce in supermarkets and other retail facilities, in terms of variety?.....	12
Figure 18: How do you think organically grown produce compares to conventionally grown produce in supermarkets and other retail facilities, in terms of price? .....	12
Figure 19: Does your family consciously eat healthy foods?.....	13
Figure 20: Do the availability and quality of fresh produce affect where you do most of your food shopping?.....	13
Figure 21: If you have purchased organically grown produce at least occasionally, what are the four organic fruits or vegetables you have purchased most often? .....	14
Figure 22: Do any members of your household have nutritional related health problems?.....	15
Figure 23: Have you heard or read any news reports about integrated pest management (IPM)? .....	15
Figure 24: How do you feel about the following?.....	16
Figure 25: Please select the amount and types of produce you purchased in 1999.....	17
Figure 26: How do you feel about the following statements? .....	18

## ***Executive Summary***

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Organic production has been practiced in the U.S. since the late 1940s. The distinction between organic and conventional produce is that organic produce is grown with a maximum of five percent synthetic pesticide residues and no prohibited USDA substance can be used on the land three years prior to producing organic produce. No genetic engineering is to be used on the crops, and no antibiotics are to be used on the livestock (USDA, 2001). Organic produce is sold at a premium above the price for conventional produce due to the increased production costs associated with following these rules. Price premiums vary greatly among different organic products and retail facilities. Consumers of these comparatively higher priced items traditionally have been the more affluent, educated members of the younger generation who have felt the need to pay more for organic produce mainly based on the better quality and the absence of pesticide residues.

Estimated sales of organic produce in 2001 range between \$5.5 and \$6.5 billion dollars, as compared with \$2.1 billion in 1995 or \$3.3 billion in 1998 (Dimitri and Richman, 2000). The organic produce market has grown rapidly since the late 1980s when the media publicized the dangers of pesticide residues. However, the even quicker growth in the late 1990s may be attributed to the relatively stronger economy.

The purpose of this study is to document a profile of the typical organic consumer in the northeastern U.S., specifically for the purpose of this study in New Jersey, New York, and Pennsylvania. Specifically, the objectives are to determine consumer characteristics such as:

- The demographic statistics of organic purchasers, including income level, education level, household size, etc.
- The perception of organic produce compared to conventional produce in terms of prices, variety, and quality.
- Consumer willingness to pay for organic compared to conventional produce.



The majority of consumers, 64 percent, purchased mostly conventional produce and some organic produce when choosing their fresh produce. Tomatoes were the most commonly purchased vegetables among organic produce, bought by 25% of the respondents. Also, organic farmers in the same area reported growing tomatoes more than any other organic crop (Govindasamy et al., 2000). Organic lettuce was purchased by more than a fifth of respondents. Organic carrots, apples and broccoli were organic products that were purchased by more than 10 percent of respondents.

The demographic characteristics of organic produce buyers include the following:

- Smaller sized households,
- Households with less children,
- Households that spend more in general on produce monthly,
- Households in the suburbs, as compared to urban or rural areas,
- Female shoppers,
- Younger shoppers,
- More educated shoppers,
- Higher income households, and
- Non-married households.

Five econometric models were formulated to:

- Document the characteristics of consumers who bought organic produce at least once in the past.
- Document the characteristics of consumers who bought organic produce frequently.
- Document the characteristics of consumers who thought that organic produce is of a higher quality than conventional produce.
- Document the characteristics of consumers who are willing to pay 10 percent or more for organic produce than conventional produce.
- Document the characteristics of consumers who are willing to pay 20 percent or more for organic produce than conventional produce.

The logit framework is used in this analysis because its asymptotic characteristic constrains the predicted probabilities to a range of zero to one. The estimation method is the maximum likelihood estimation (MLE). Hence, given certain organic consumer characteristics, the probability that the consumer has bought organic produce at least once in the past is found. Similar explanations exist for the other four models. The five models are estimated using information obtained from the consumers' questionnaire located in Appendix I at the end of this report.

Almost half of the respondents had purchased organic produce at least once in the past. Consumers who are willing to switch supermarkets to buy organic and who are ready to buy additional organic if it were more readily available had purchased organic produce at least once in the past. They also frequently purchase organic apples, organic carrots or organic spinach, and feel that organic is priced higher than conventional produce. These consumers also live in Pennsylvania (as compared to living in New Jersey or New York), in the suburbs, have attended at least some college, shop according to the availability of fresh produce, are married, are under 50 years of age, and have fewer than four people living in their household.

About ten percent of the respondents had purchased organic produce on a frequent basis. These respondents are most likely to be consumers who are willing to switch supermarkets to buy organic produce and are ready to buy additional organic produce if it were more readily available. They also frequently purchase organic apples or organic spinach and believe that organic produce is not priced higher than conventional produce. They have likely heard or read news reports about IPM, visit farmer's markets less frequently, and are female.

Almost one-third of the respondents feel that organic produce is of a higher quality than conventional produce. These respondents are most likely to be consumers that are willing to switch supermarkets to buy organic produce and are ready to buy additional organic produce if it were more readily available. These consumers also frequently purchase organic carrots or organic spinach and feel that organic produce is priced

higher and has more variety than conventional produce. They are more likely to live in Pennsylvania, grow their own fruits or vegetables and visit farmer's markets less frequently. They also have fewer than three children, are under 50 years of age, are not married, and are female.

Almost one-quarter of the respondents stated that they would be willing to pay a premium of 10 percent or more for organic produce than conventional produce. These respondents are most likely to be consumers that grow their own fruits or vegetables, are willing to switch supermarkets to buy organic produce and are ready to buy additional organic produce if it were more readily available. They also frequently purchase organic carrots and believe that organic produce is priced higher than conventional produce but that it does not have more variety than conventional produce. They also are not greatly affected by price when purchasing fresh produce, feel that residues from pesticides and herbicides are a serious hazard and frequently shop according to the availability of fresh produce. Additionally, these consumers have fewer than three children in their household and are under 50 years of age.

Almost ten percent of the respondents stated that they would be willing to pay a premium of 20 percent or more for organic produce than conventional produce. These respondents are most likely to be consumers that are willing to switch supermarkets to buy organic produce and are ready to buy additional organic produce if it were more readily available. They frequently purchase organic produce carrots, are not greatly affected by price when purchasing fresh produce, and shop according to the availability of fresh produce. These consumers are not married and are under 50 years of age.

## ***Introduction***

---

Estimating the demand for organic produce is perhaps one of the most salient challenges facing organic growers in the northeast. A primary challenge results from the perception of and the concern by consumers that suspected or known cancer-causing chemicals are being used in food production and processing with unknown long-run health risks (Archibald and Marsh, 1988). The concern persists even as farmers achieve significant gains in reducing chemical use by adopting Integrated Pest Management (IPM) practices (Tavernier et al., 1995), and developing organic farms. For example, the Northeast Organic Farming Association of New Jersey certifies 61 organic and transitional organic farms. Forty-nine of these farms are in New Jersey and cover an area of 1352 acres.

The growth of the organic farms and acreage devoted to the production of organic foods signals a willingness on the part of consumers to pay for pesticide free food even if it results in higher food prices. In 1992, organic food sales represented approximately 26% of gross retail agricultural sales in New Jersey (Govindasamy and Nayga, 1996a; Govindasamy, Nayga, and Thatch, 1995). Further research in Delaware shows that young females in Delaware with a high school education or less, and other consumers with at least some post-graduate work were the groups most likely to regularly purchase organic foods (Byrne et al., 1990). These results are supported by Groff et al. (1993).

A study of the Delmarva region, which includes areas in the states of Delaware, Maryland and Virginia suggests that consumers were both interested in food-related issues and concerned about government policy and regulations related to food (Byrne, 1992). The three major factors that influence consumer's purchasing decisions were freshness, flavor and nutrition. Byrne finds that food safety and healthfulness were more important than price. Availability and price are the major constraints to organic sales and the majority of the survey respondents expressed a preference to purchase organic foods at supermarkets or familiar roadside stands.

The literature review provides several factors that need to be considered when examining the demand for organic foods. While past findings have addressed those factors individually, the need exists for a study to integrate those factors into a comprehensive model that incorporates individual and household preferences, consumer market, and the production behavior of organic farmers.

The objectives of this project are being accomplished in two phases. Phase I of the project addressed producer characteristics such as average acreage required to support an organic farm, variety, modes of advertising used, price strategies, business hours, and marketing channels such as wholesale, retail and direct will be documented. Econometric models were developed to examine the impact of location of the market on sales volume. Provision of consumer facilities such as restrooms, farm tours, picnic areas, petting zoos, food and drink item areas, and festivals featuring various crops, hayrides, and others were also examined. Other activities such as the provision of related products (pies, bakery items and apple cider) were investigated to document their role in enhancing the profitability of farming. The relationship between sales volume, and the share of related products were also examined. In Phase II, a survey was designed to collect information on the characteristics of consumers and their households with respect to organic foods. The survey contained demographic characteristics of consumers visiting organic food markets and document consumer behavior regarding the purchase of fruits and vegetables, freshness, quality, quantity, and other information on organic foods. Consumer attitudes to non-organic foods such as the perceived risk associated with concerns about pesticide residue and the use of chemicals and fertilizers in foods was examined. Consumer characteristics such as quantity of organic produce bought on a monthly basis, the total amount of money spent on produce each month, and the number of visits to farmer's markets per month will also be collected.

A nationwide survey of the organic food industry shows that sales of organic foods are close to \$3 billion a year and growing at an annual rate of more than 20 percent (McEnery, 1996). Despite this growth many retailers indicate that consumer demand for

organic foods is small although several do not carry organic foods (Ireland and Falk, 1990). This contradiction suggests a need to document the existing structure of the organic food industry and analyze the shopping habits of consumers. Such an analysis involves an examination of consumer perceptions regarding price, quality, availability of organic foods, and the relationship between organic and conventional foods.

Increasingly, a measurable amount of farmland is being converted from traditional agricultural production to the production of organic foods. Analysis of data provided to USDA's Agricultural Marketing Service (AMS) by private and state organic certification organizations reveals that more than a million acres of U.S. farmland was involved in the production organic foods in 1994 (USDA, 1995). This acreage represents 0.12% of the total U.S. farmland and produces organic foods, which accounts for 1% of U.S. agricultural output (Sauber, 1994). The output consists of a wide array of organic crop, livestock, and poultry products either directly from 4,050 certified organic farmers or through 500 processors and distributors who are certified to handle organic food and fiber (Dunn, 1995). Further, 42% of mainstream stores stock an average of 12 organic foods (Food Marketing Institute, 1989). This figure could increase as consumers gain confidence in the "organic" label (Dunn, 1995) and as national standards for the production and handling of organic foods are standardized under USDA's proposed Organic Foods Production Act of 1990.

While the standardization of regulations may help increase profits for the organic food industry, consumer concern over food safety may, in part, be responsible for the growth of the industry. Such concern has increased since 1960's with consumers ranking pesticide residues, followed by antibiotic and hormone use, nitrites, irradiation, additives, preservatives and artificial colors as their most worrisome food safety concern (Food Marketing Institute, 1989). A NFO Research (1989) study also finds that 50% of the consumers perceive chemicals to be one of the greatest threats to food safety. These concerns were recently highlighted by the case of Alar (daminozide) and apples, and the Chilean grape tampering scare in which some imported grapes were found to be laced with cyanide (Senauer, 1989). The health related issues have increased the demand for organically grown foods and the need for a better understanding of

consumer and household preferences, perceptions, socioeconomic backgrounds as well as some knowledge of farmers and marketers of organically grown produce. This information is needed in order to guide agricultural policy makers and to enhance the possibility of sustained growth in the organic food industry. More recently, the USDA has now officially standardized the rules for labeling products as 'organic.' While these rules were not yet enacted when this survey was administered, the effects of these new rules will have an effect on consumer consumption patterns. Future research efforts will include variables for the labeling of products as "Organic" or "100% Organic." Appendix II contains the specifics of the rulings and as well as the certification processes.

## ***Data Description***

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A survey was developed in the spring of 2000 at Rutgers University to collect data on organic consumer characteristics. The survey was created with input from the coalition members and included questions dealing with the demographics of each consumer respondent. A list of 1097 households located in New Jersey, New York and Pennsylvania was randomly selected. A survey packet, which included the questionnaire, a cover letter explaining the purpose and importance of the project, a postage-paid return envelope, and one dollar as a small incentive for participation was included in each envelope sent to consumers. The survey packets were distributed by mail in March of 2000.

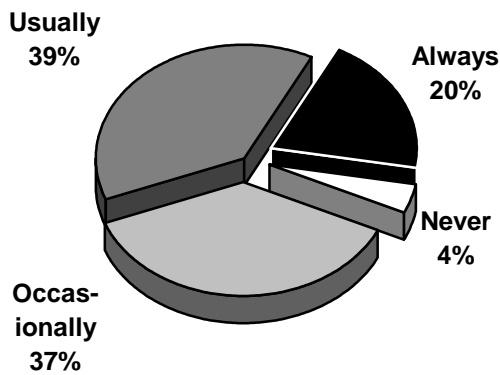
Of the 1097 questionnaires sent to consumers, approximately 563 were completed and returned within three weeks of the initial survey mailing. Four weeks after the survey packets were mailed, a reminder post card was mailed to the 534 participants who had not yet returned the survey. The reminder mailing produced an additional 43 responses for a total of 606 returned responses. The consumer survey yielded a response rate of 55 percent.

Forty-five percent of the respondents reported that they had purchased organic produce at least once in the past. The respondents indicated that tomatoes, lettuce, carrots and apples are the most commonly bought organic produce among fruits and vegetables. Seventy-one percent of the respondents reported that organic produce is available from the store from which they most often purchase groceries. Sixty-seven percent of the respondents reported that they would pay slightly more for organic produce. Freshness is the most important quality that respondents seem to be concerned with when purchasing fresh produce, more than ripeness or even price. Fifty-three percent of respondents stated that they would buy more organic produce if it were more readily available, and 67 percent stated that they would buy more organic produce if it were cheaper.



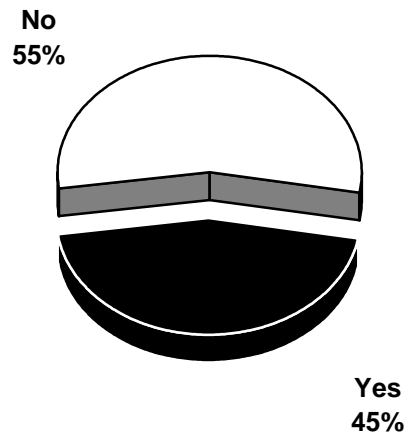
The majority of respondents, 59 percent, stated that they either usually or always check the ingredient label on the food that they purchase (Figure 1). Forty-five percent of respondents stated that they had purchased certified organic produce in the past (Figure 2).

**Figure 1**  
*How frequently do you check the ingredient label on the food you purchase?*



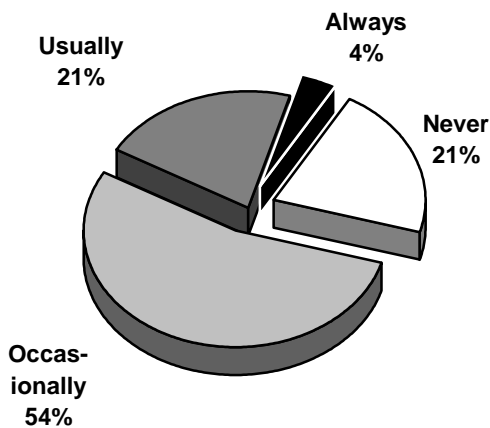
N = 603

**Figure 2**  
*Have you ever purchased certified organic produce?*



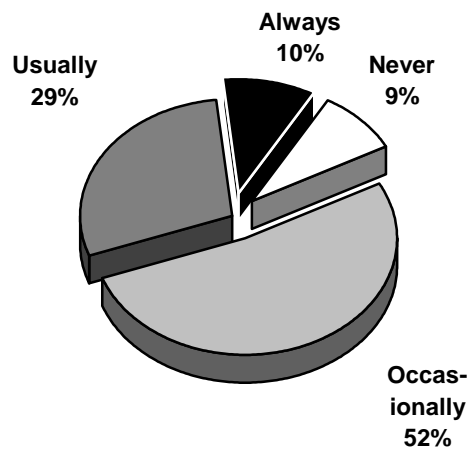
N = 598

**Figure 3**  
*How often do food advertisements in newspapers help you decide which food items to purchase?*



N = 604

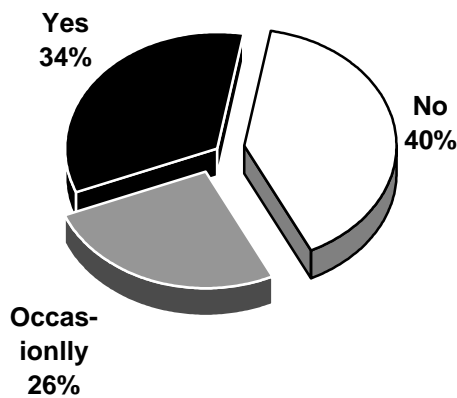
**Figure 4**  
*How often do newspaper articles/television/radio reports on food safety issues help you decide which food items to purchase?*



N = 603

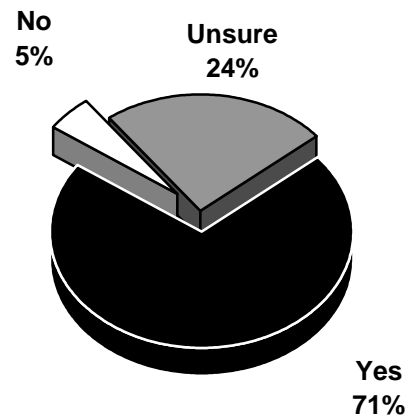
Seventy-five percent of the respondents feel that food advertisements in the newspaper either occasionally or usually help them to decide which food items to purchase (Figure 3). However, about a fifth of respondents feel that newspapers never play a role in consumption decisions. Eighty-one percent stated that newspaper articles/television/radio reports on food safety issues either occasionally or usually help them to decide which food items to purchase (Figure 4). Food safety issues have consistently played a significant role in consumption decisions among consumers in the US.

**Figure 5**  
*Do you regularly shop at more than one store in order to purchase advertised specials?*



N = 605

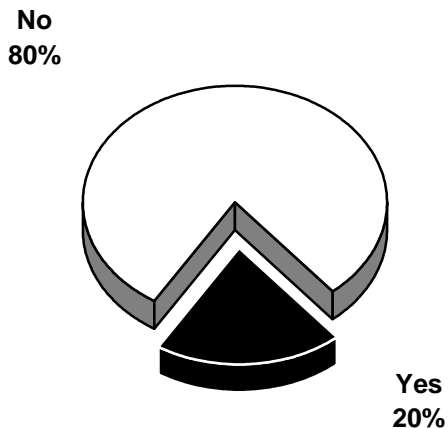
**Figure 6**  
*Is organic produce available from the store from which you most often purchase groceries?*



N = 594

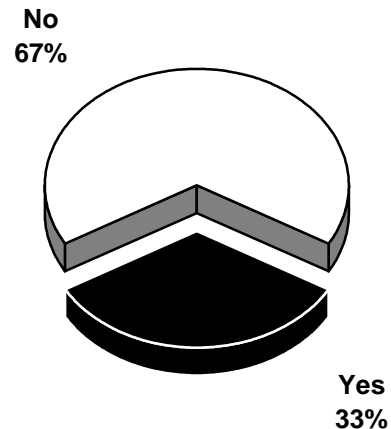
Sixty percent of respondents stated that they regularly or occasionally shop at more than one store in order to purchase advertised specials (Figure 5). This shows a willingness on the part of consumers to change stores in order to purchase certain items. While 71 percent of respondents indicated that organic produce is available at the store from which they most often purchase groceries, almost a quarter of respondents are not even sure if their grocery store stocks organic produce (Figure 6).

**Figure 7**  
**Would you switch supermarkets to be able to purchase organic produce?**



N = 583

**Figure 8**  
**Do you grow fruits or vegetables for consumption at your home?**

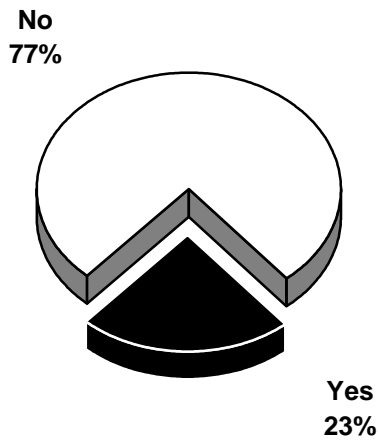


N = 604

Conversely, when asked if they would switch supermarkets to be able to purchase organic produce, 80 percent of respondents stated that they would not do so (Figure 7). Consumers are more apt to switch stores when searching for bargains than for organic produce. One-third of the respondents stated that they do grow fruits or vegetables for consumption at their home (Figure 8). This reflects a fair amount of interest in fruits and vegetables and also indicates an interest in *fresh* produce.

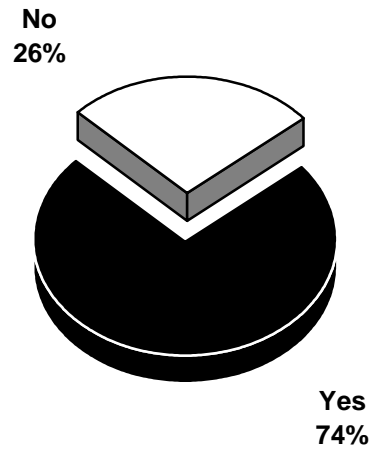
Only about a quarter of respondents have visited a pick-your-own stand in the past year (Figure 9). This should not be the focus of organic produce marketing efforts. However, almost three-quarters stated that they have visited a farmer's market in the past year (Figure 10). Again, this symbolizes the public's interest in fresh fruits and vegetables. It also identifies the fact that farmer's markets can readily be used to market organic produce.

**Figure 9**  
*Have you visited a pick-your-own farm in the past year?*



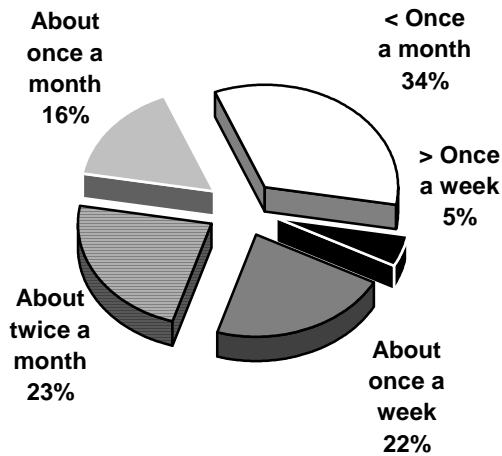
N = 604

**Figure 10**  
*Have you visited a farmers' market in the past year?*



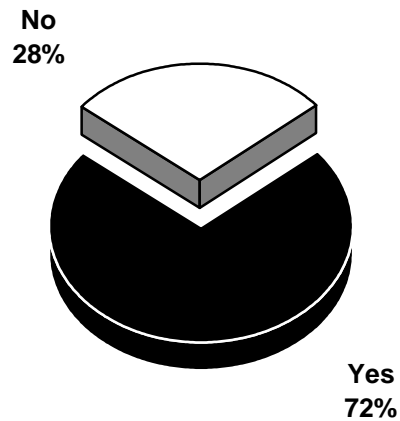
N = 603

**Figure 11**  
*Approximately how often do you visit farmers' markets during months in which they are open?*



N = 550

**Figure 12**  
*Have you visited a roadside produce stand in the past year?*



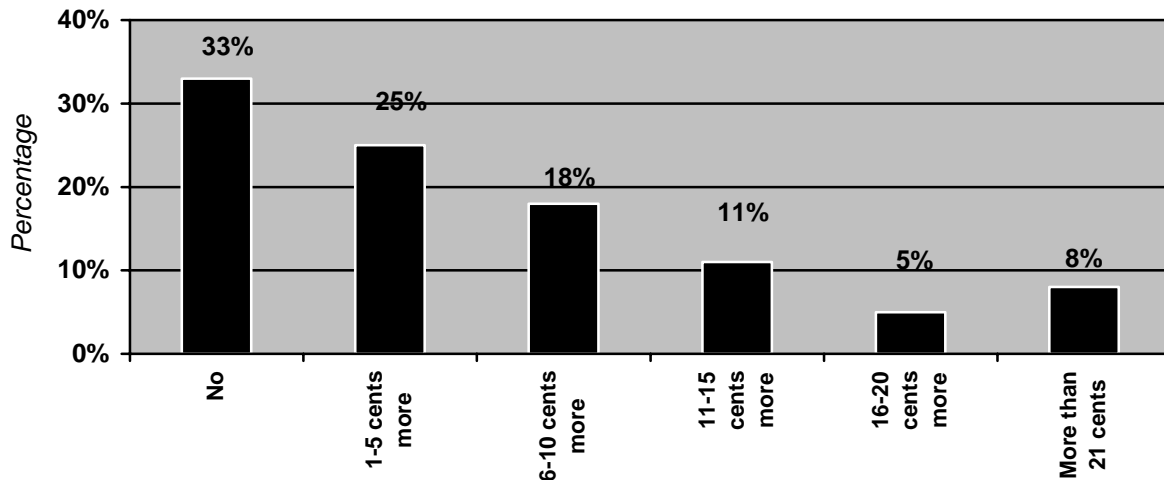
N = 605

While slightly more than a third of respondents stated that they visit farmer's markets less than once a month during the months that they are open, about two-fifths visit about once or twice a month. Twenty-two percent stated that they visit farmer's markets about once a week. Five percent visit more than once per week (Figure 11). Almost

three-quarters of respondents stated that they have visited a roadside produce stand in the past year (Figure 12).

### **Figure 13**

**Suppose your favorite fresh vegetable that you purchase regularly costs \$1 per pound. Would you pay slightly more for organic certified produce?**



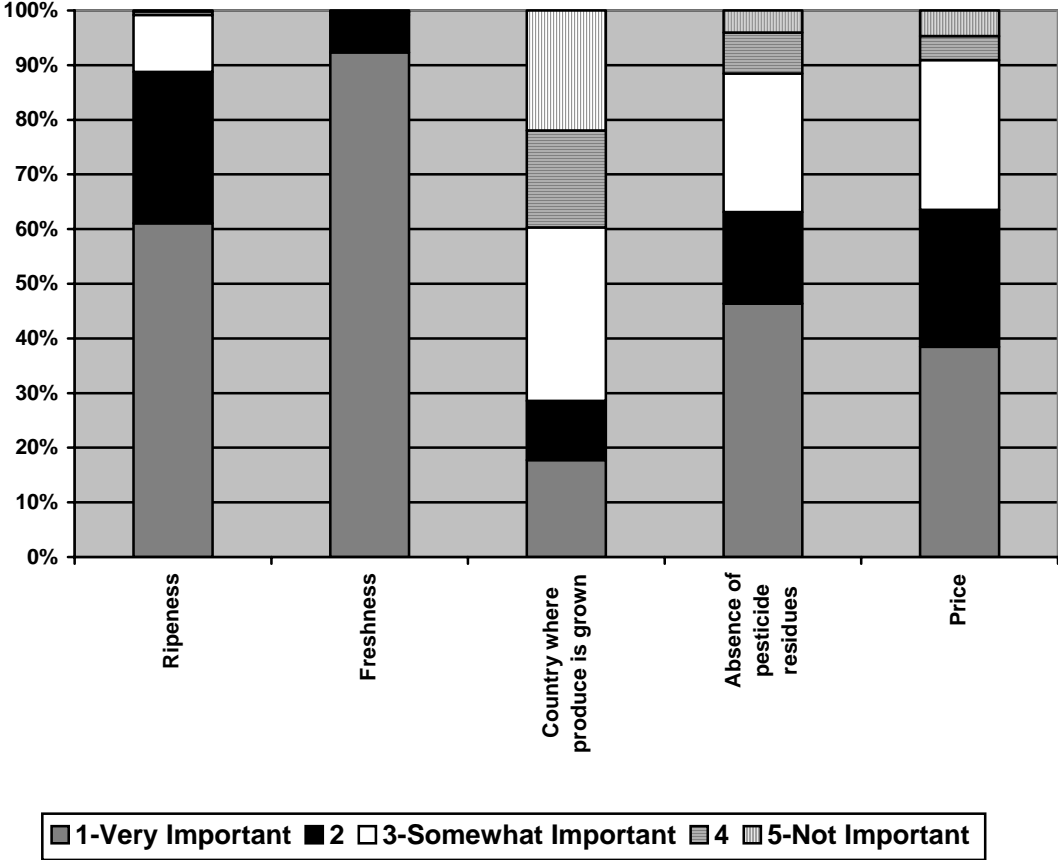
N = 590

While a third of respondents stated that they would not pay slightly more for organic produce, a quarter of the respondents stated that they would pay between one and five cents more for a dollar's worth of organic produce (Figure 13). Eight percent stated that they would pay *more* than 21 cents for a dollar's worth of organic produce.

Respondents consider freshness as the most important quality when compared to ripeness, the country where the produce is grown, the absence of pesticide residues and even price when purchasing fresh produce (Figure 14). Over 90 percent of respondents stated that freshness is 'very important' in their purchasing decisions. The country where the produce is grown ranked least important, as almost a quarter of respondents considered it 'not important.' The absence of pesticide residues seem to be equally important as price is to consumers.

**Figure 14**

*How important are the following to you when purchasing fresh produce?*

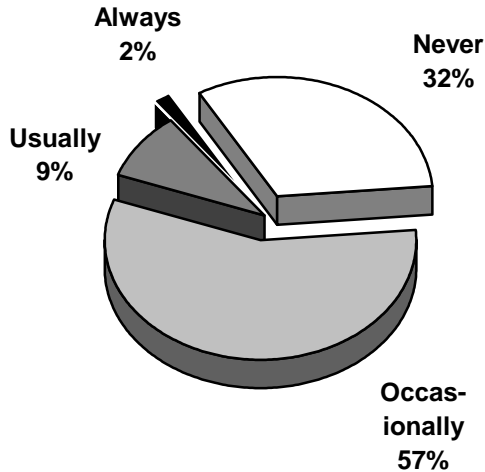


Most respondents, 57 percent, stated that they occasionally choose fresh food and vegetables that are organically grown (Figure 15). Thirty-two percent stated that they had never purchased organic produce. Eleven percent usually or always purchase organic produce.

While slightly more than a third of respondents are unsure how organically grown produce compares to conventionally grown produce in supermarkets and other retail facilities, almost a third feel that organic produce is of higher quality (Figure 16). Thirty percent feel that the two are the same in quality, while four percent feel that organic produce is of lower quality than conventional produce.

**Figure 15**

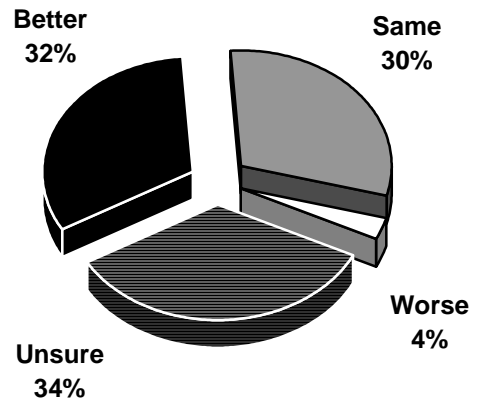
*Organically produced food uses no synthetic pesticides and are normally labeled as such in the super-market. How frequently do you choose fresh food and vegetables that are organically grown?*



N = 598

**Figure 16**

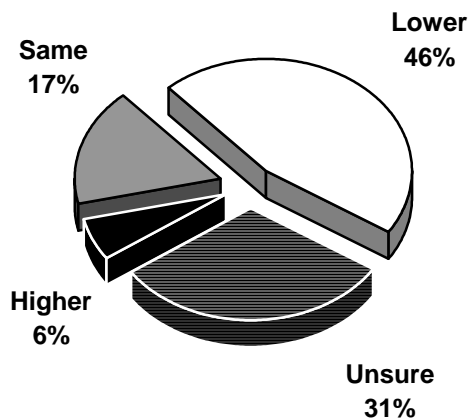
*How do you think organically grown produce compares to conventionally grown produce in supermarkets and other retail facilities, in terms of quality?*



N = 591

**Figure 17**

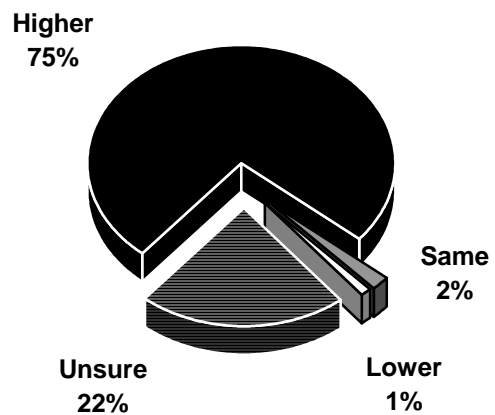
*How do you think organically grown produce compares to conventionally grown produce in supermarkets and other retail facilities, in terms of variety?*



N = 589

**Figure 18**

*How do you think organically grown produce compares to conventionally grown produce in supermarkets and other retail facilities, in terms of prices?*

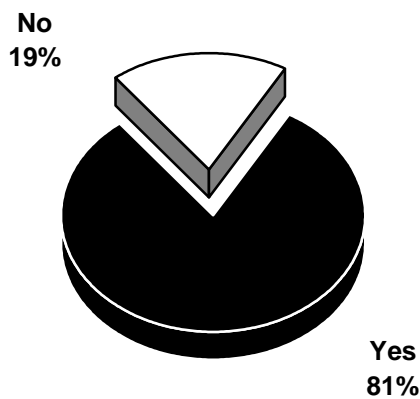


N = 589

Forty-six percent of respondents feel that organically grown produce has a smaller amount of variety than conventionally grown produce in supermarkets and other retail facilities (Figure 16). Seventeen percent feel that the two are the same in variety, while 31 percent are unsure about the amount of variety between organic and conventional produce. Six percent of respondents feel that organic produce offers a higher variety of choices than conventional produce.

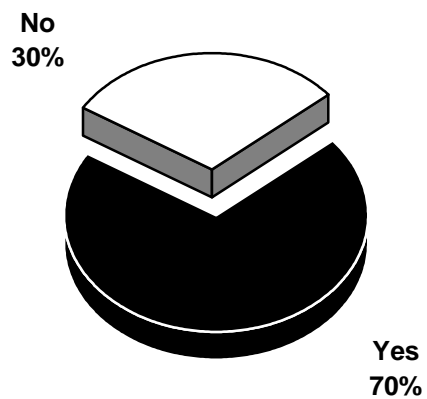
Three quarters of respondents feel that organic produce has higher prices than conventional produce (Figure 17). Organic produce is usually priced higher to cover the decreased yield for not using synthetic pesticides in their production. Almost another quarter of respondents were not sure how organic and conventional produce's prices compared to each other. Only three percent thought that organic produce was priced either the same or lower than conventional produce.

**Figure 19**  
*Does your family consciously eat healthy foods?*



N = 592

**Figure 20**  
*Do the availability and quality of fresh produce affect where you do most of your food shopping?*



N=591

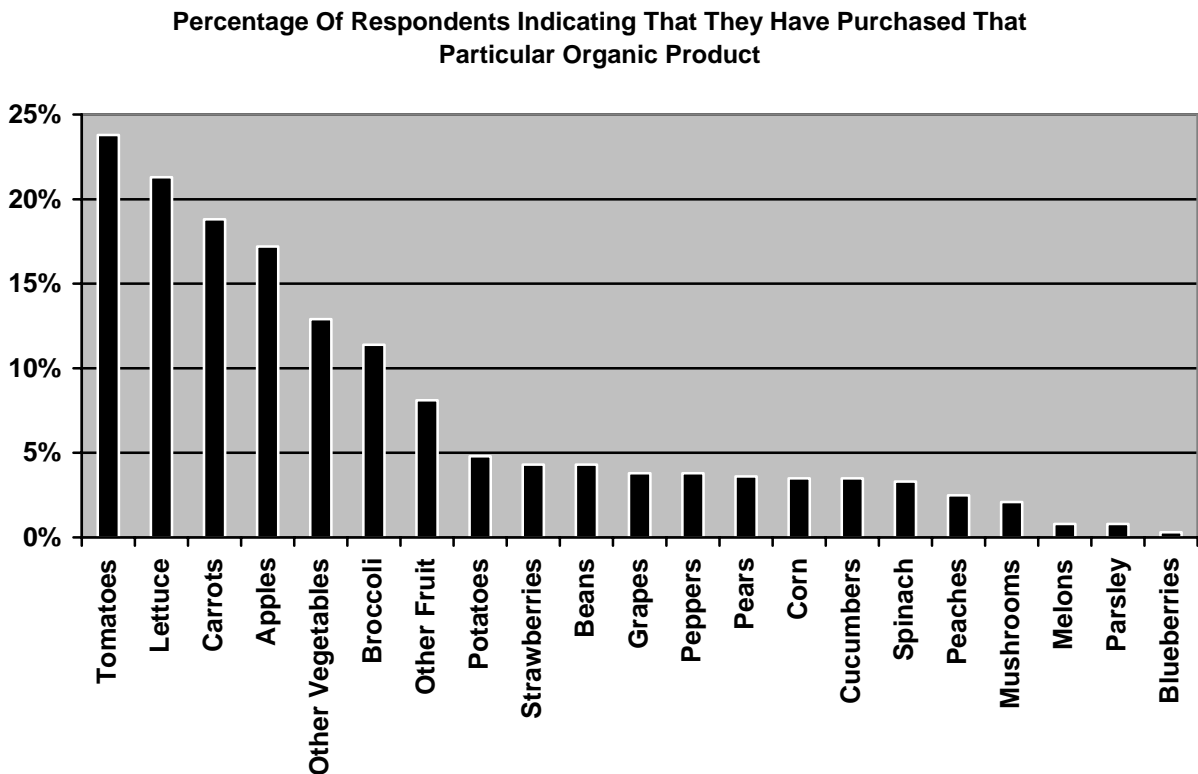


More than four fifths of respondents stated that their family consciously eats healthy foods (Figure 18). Slightly less than one fifth of respondents stated that their family does not consciously eats healthy foods. Therefore, the majority of respondents are interested in foods that they consider ‘healthy.’

Seven out of ten respondents feel that the availability and quality of fresh produce affect where they do most of their food shopping (Figure 20). The remaining 30 percent feel that the availability and quality of fresh produce does not affect where they do most of their food shopping. However, most consumers are interested in shopping at stores with a higher availability and quality of fresh produce.

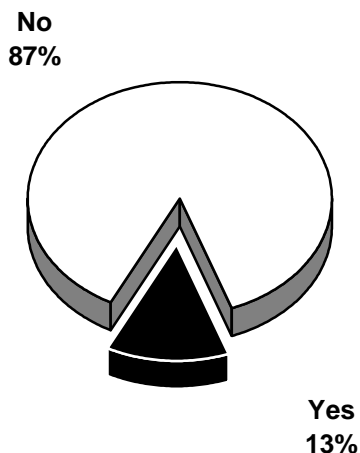
### **Figure 21**

***If you have purchased organically grown produce at least occasionally, what are the four organic fruits or vegetables you have purchased most often?***



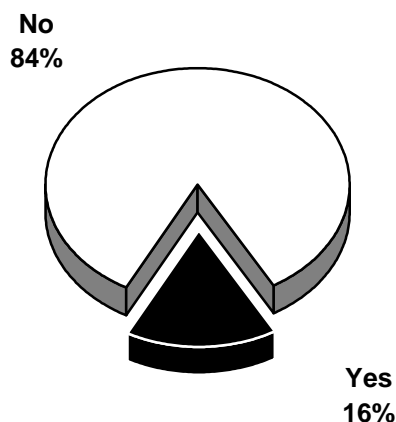
Tomatoes are the most popular organic product that respondents reported purchasing among vegetables (Figure 21). Almost a quarter of all respondents indicated purchasing organic tomatoes. Organic lettuce was purchased by more than a fifth of respondents. Organic carrots (18 percent), apples (17 percent), 'other vegetables' (13 percent), and broccoli (11 percent) were purchased by more than 10 percent of respondents. 'Other fruit' were purchased by eight percent of respondents. All other organic products were purchased by less than five percent of respondents, as shown in figure 21.

**Figure 22**  
*Do any members of your household have nutritional related health problems?*



N = 586

**Figure 23**  
*Have you heard or read any news reports about integrated pest management (IPM)?*



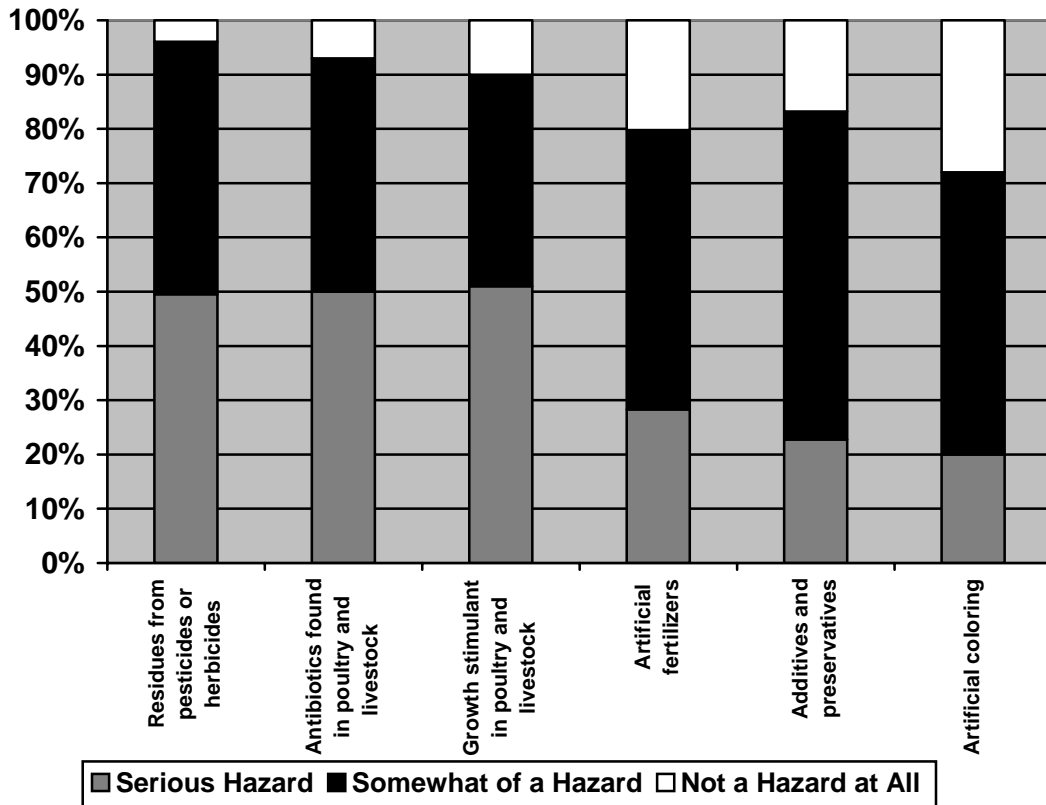
N = 586

Thirteen percent of respondents reported that members of their household have nutritional related health problems (Figure 22). Most, 87 percent, reported that there are no household members with any nutritional related health problems in their household.

Most respondents, 84 percent, stated that they have not heard or read any news reports about integrated pest management, or IPM (Figure 23). Sixteen percent stated that they had heard or read any news reports about integrated pest management. It may be

that consumers are either not informed about IPM or that they are not concerned with IPM.

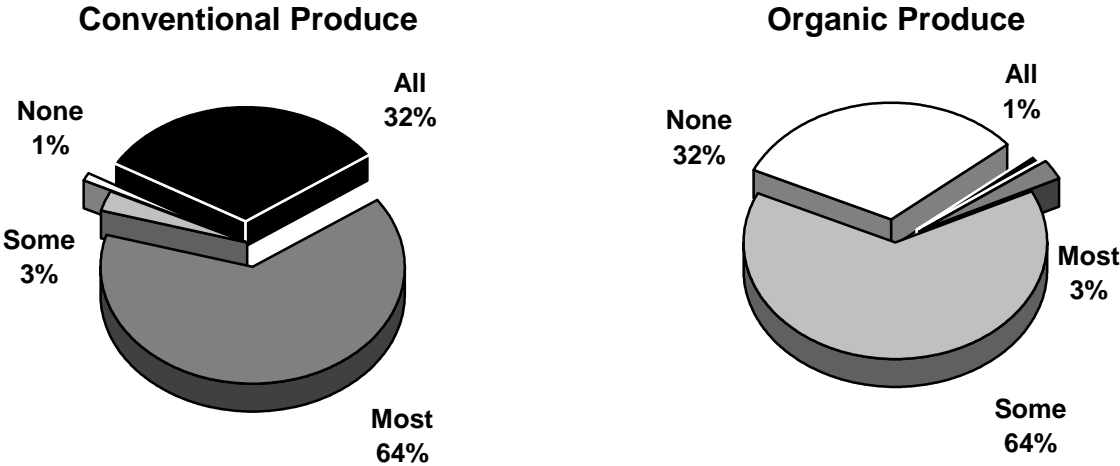
**Figure 24**  
*How do you feel about the following?*



About half of respondents feel that a serious hazard exists with (1) residues from pesticides or herbicides, (2) antibiotics found in poultry and livestock, and (3) growth stimulant in poultry and livestock (Figure 24). By the same token, only about a quarter of respondents feel that a serious hazard exists with (1) artificial fertilizers, (2) additives and preservatives, and (3) artificial coloring. Almost 30 percent feel that artificial coloring is not a hazard at all. Only less than five percent of respondents feel that residues from pesticides or herbicides are not a hazard at all. Less than 10 percent feel that antibiotics and growth stimulants found in poultry and livestock are not a hazard at all. The majority of consumers feel that artificial fertilizers, additives and preservatives, and artificial coloring are somewhat of a hazard.

**Figure 25**

*Please select the amount and types of produce you purchased in 1999:*



N = 594

N = 594

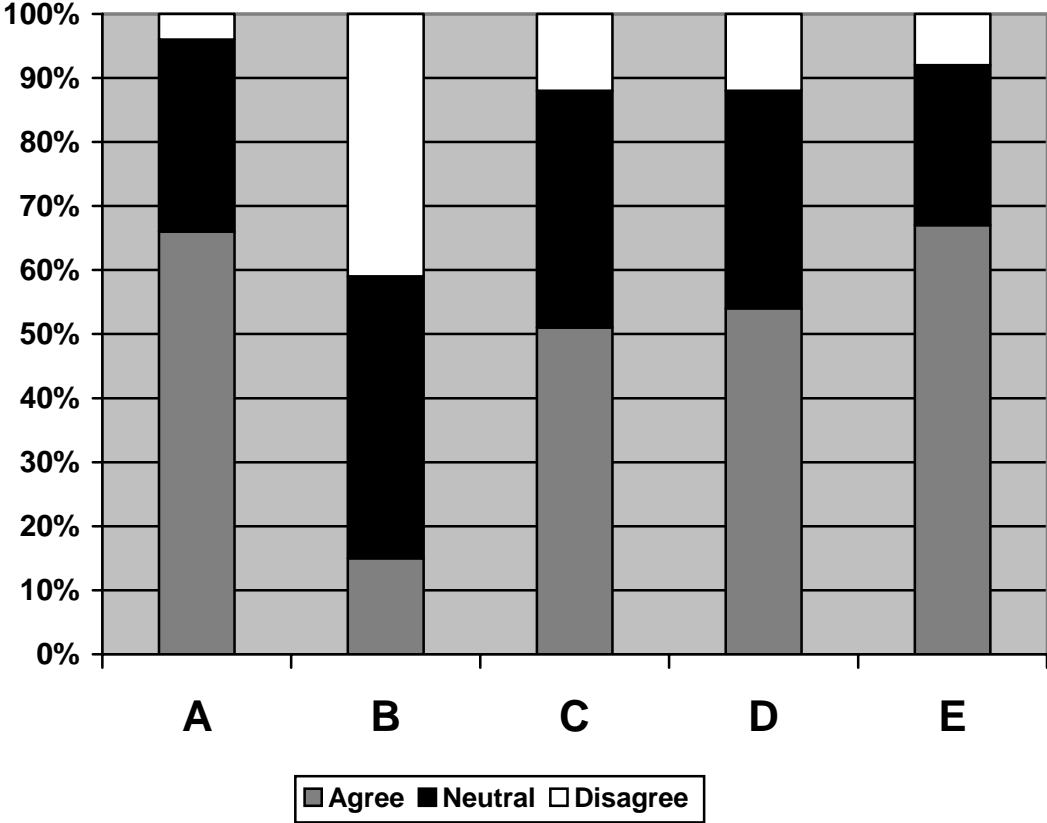
In 1999, 32 percent of respondents purchased only conventional produce and no organic produce at all (Figure 25). The majority of respondents, 64 percent, purchased mostly conventional produce and some organic produce. Three percent reported purchasing mostly organic produce and some conventional produce. Only one percent reported purchasing all organic produce and no conventional produce at all. Most respondents are occasional purchasers of organic produce.

Two thirds of respondents feel that conventional produce is generally safe to consume (Figure 26). Over 40 percent feel that there is a difference between the safety of conventional and organic produce. Over half of respondents feel that the use of synthetic chemicals in agriculture has a negative effect on the environment. Over half also feel that they would buy organic produce if it were more readily available, and about two thirds stated that they would buy organic produce if it were cheaper. The availability and price of organic produce have a foremost effect on the purchasing decisions of consumers when considering buying organic produce.

**Figure 26**

*How do you feel about the following statements?*

- A Conventional produce is generally safe to consume
- B There is basically no difference between the safety of conventional and organic produce
- C The use of synthetic chemicals in agriculture has a negative effect on the environment
- D I would buy organic produce if it were more readily available
- E I would buy organic produce if it were cheaper



## ***Methodology***

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Five binary qualitative choice models were estimated to analyze the effect of various organic consumer characteristics using the information drawn from the organic consumer surveys conducted in 2000. The logit framework was selected for this analysis because its asymptotic characteristic constrains the predicted probabilities to a range of zero to one. The logit model is also favored for its mathematical simplicity and is often used in a setting where the dependent variable is binary. As the survey utilized in this analysis provided individual rather than aggregate observations, the estimation method of choice was the maximum likelihood estimation (MLE) (Gujarati, 1992). Among the beneficial characteristics of MLE are that the parameter estimates are consistent and asymptotically efficient (Pindyck and Rubinfeld, 1991).

The model assumes that the probability of observing a specific outcome (i.e. an individual consumer was willing to pay more than 10 percent more for organic produce than conventional produce),  $P_i$ , is dependent on a vector of independent variables ( $X_{ij}$ ) associated with consumer  $i$  and variable  $j$ , and a vector of unknown parameters  $\beta$ . The likelihood of observing the outcome of the dependent variable was tested as a function of explanatory variables that included demographic characteristics of each consumer.

$$P_i = F(Z_i) = F(\alpha + \beta X_{ij}) = 1 / [1 + \exp(-Z_i)]$$

Where:

$P_i$  = the probability that a specific outcome is observed (i.e. an individual consumer was willing to pay more than 10 percent more for organic produce than conventional produce) given knowledge of the independent variables  $X_{ij}$ s

$F(Z_i)$  = represents the value of the standard logistic density function associated with each possible value of the underlying index  $Z_i$ .

$Z_i$  = the underlying index number or  $\alpha + \beta X_{ij}$

And  $\beta X_{ij}$  is a linear combination of independent variables so that:

$$Z_i = \log [P_i / (1 - P_i)] = \beta_{i0} + \beta_{i1}X_{i1} + \beta_{i2}X_{i2} + \dots + \beta_{in}X_{in} + \varepsilon_i$$

Where:

- $i$  = 1, 2, . . . , n are observations
- $Z_i$  = the unobserved index level or the log odds of choice for the  $i^{\text{th}}$  observation
- $X_{in}$  = the  $n^{\text{th}}$  explanatory variable for the  $i^{\text{th}}$  observation
- $\beta$  = the parameters to be estimated
- $\epsilon$  = the error or disturbance term

The dependent variable  $Z_i$  in the above equation is the logarithm of the probability that a particular choice will be made. The parameter estimates do not directly represent the effect of the independent variables. To obtain the estimators for continuous explanatory variables in the logit model, the changes in probability,  $P_i$  that  $Y_i = 1$  brought about by a change in the independent variable,  $X_{ij}$  is given by:

$$(\partial P_i / \partial X_{ij}) = [\beta_j \exp (-\beta X_{ij})] / [1 + \exp (-\beta X_{ij})]^2$$

For qualitative discrete variables, such as the explanatory variables used in this study,  $\partial P_i / \partial X_{ij}$  does not exist. Probability changes are then determined by:

$$(\Delta P_i / \Delta X_{ij}) = P_i(Y_i : X_{ij} = 1) - P_i(Y_i : X_{ij} = 0)$$

The change in probability for each explanatory variable was measured at the mean of all other independent variables. The actual specifications for each of the five models as well as a description of the explanatory variables, the maximum likelihood estimates, and the prediction success of each model are provided in tables through the text.

**Table 1: Explanatory Variables for Logistic Models**

<b>Variable</b> <i>(Variable names appear capitalized)</i>		<b>Frequency</b>	<b>Mean</b> <b>(Percent)</b>	<b>Std Dev.</b>
PUR_ORG	Has purchased organic produce	269	0.4439	0.4973
	Has not purchased organic produce*	337	0.5561	0.4973
FREQ_ORG	Purchases organic frequently	68	0.1122	0.3159
	Purchases organic infrequently*	538	0.8878	0.3159
HIGH_QUAL	Feels organic is of higher quality than conventional produce	190	0.3135	0.4643
	Does not feel organic is of higher quality than conventional*	416	0.6865	0.4643
PAY_10	Would pay 10% more for organic	140	0.2310	0.4218
	Would not pay 10% more for organic*	466	0.7690	0.4218
PAY_20	Would pay 20% more for organic	47	0.0776	0.2677
	Would not pay 20% more for organic*	559	0.9224	0.2677
PA	Lives in Pennsylvania	96	0.1584	0.3654
	Lives in New York or New Jersey*	510	0.8416	0.3654
GROW	Grows fruits/vegetables at home	201	0.3328	0.4716
	Does not grow at home*	403	0.6672	0.4716
FM5	Visits Farmer's Markets less than once a month	185	0.3053	0.4609
	Visits Farmer's Markets more than once a month*	421	0.6947	0.4609
PRICE12	Feels price is very important when choosing fresh produce	378	0.6238	0.4848
	Does not feel price is very important when choosing fresh produce*	228	0.3762	0.4848
SWITCH	Would switch supermarkets to buy organic produce	118	0.2024	0.4021
	Would not switch supermarkets to buy organic produce*	465	0.7976	0.4021
HIGHVARI	Feels organic produce has a higher variety than conventional produce	36	0.0594	0.2366
	Does not feel organic produce has a higher variety than conventional produce*	570	0.9406	0.2366



**Table 1: Explanatory Variables for Logistic Models (con't)**

<b>Variable</b> <i>(Variable names appear capitalized)</i>		<b>Frequency</b>	<b>Mean</b> <b>(Percent)</b>	<b>Std Dev.</b>
HIGHPRIC	Feels organic produce has a higher price than conventional produce	443	0.7310	0.4438
	Does not feel organic produce has a higher price than conventional produce*	163	0.2690	0.4438
APPLES	Purchased organic apples most often	104	0.1719	0.3776
	Does not purchase organic apples*	501	0.8281	0.3776
SPIN	Purchased organic spinach most often	20	0.0331	0.1789
	Does not purchase organic spinach*	585	0.9669	0.1789
CARROTS	Purchased organic carrots most often	114	0.1884	0.3914
	Does not purchase organic carrots*	491	0.8116	0.3914
FLRESPES1	Feels residues from pesticides or herbicides are a serious hazard	294	0.4851	0.5002
	Feels residues from pesticides or herbicides are not a serious hazard*	312	0.5149	0.5002
IPM	Has heard or read reports about IPM	96	0.1638	0.3704
	Has not heard or read reports about IPM*	490	0.8362	0.3704
FBUYAV1	Would buy organic if it were more available	316	0.5215	0.5000
	Would not buy organic if more available*	290	0.4785	0.5000
DOSHOP	Availability and quality of fresh produce effects where shopping is done	414	0.7005	0.4584
	Availability and quality of fresh produce does not effect where shopping is done*	177	0.2995	0.4584
LIVEMORE	Four or more people live in household	170	0.2805	0.4496
	Less than four people live in household*	436	0.7195	0.4496
HIGHKIDS	Three or more children live in household	31	0.0512	0.2205
	Less than three children live in household*	575	0.9488	0.2205

**Table 1: Explanatory Variables for Logistic Models (con't)**

<b>Variable</b> <i>(Variable names appear capitalized)</i>		<b>Frequency</b>	<b>Mean</b> <b>(Percent)</b>	<b>Std Dev.</b>
MONHIGH	Spends \$50 or more on produce monthly	311	0.5132	0.5002
	Spends less than \$50 on produce monthly*	295	0.4868	0.5002
SUBURB	Lives in a suburban area	456	0.7525	0.4319
	Lives in an urban or rural area*	150	0.2475	0.4319
GENDER	Female respondent	411	0.6884	0.4635
	Male respondent*	186	0.3116	0.4635
OLDER	Respondent is 51 years old or older	296	0.4884	0.5003
	Respondent is 50 years old or younger*	310	0.5116	0.5003
COLLS	Respondent attended some college	436	0.7195	0.4496
	Respondent did not attend any college*	170	0.2805	0.4496
INCOMEH	Respondent's annual household income is \$60,000 or more	295	0.4868	0.5002
	Respondent's annual household income is less than \$60,000*	311	0.5132	0.5002
MARRIED	Respondent is married	398	0.6568	0.4752
	Respondent is not married*	208	0.3432	0.4752

\* Refers to the category that was omitted in the logit analysis

**Model One: Consumers that have purchased certified organic produce at least once in the past**

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$$\begin{aligned} \text{PUR\_ORG} &= \beta_0 + \beta_1 \text{PA} + \beta_2 \text{GROW} + \beta_3 \text{FM5} + \beta_4 \text{PRICE12} \\ &+ \beta_5 \text{SWITCH} + \beta_6 \text{HIGHVARI} + \beta_7 \text{HIGHPRIC} + \beta_8 \text{APPLES} \\ &+ \beta_9 \text{SPIN} + \beta_{10} \text{CARROTS} + \beta_{11} \text{FLRESPES1} + \beta_{12} \text{IPM} \\ &+ \beta_{13} \text{FBUYAV1} + \beta_{14} \text{DOSHOP} + \beta_{15} \text{LIVEMORE} \\ &+ \beta_{16} \text{HIGHKIDS} + \beta_{17} \text{MONHIGH} + \beta_{18} \text{SUBURB} \\ &+ \beta_{19} \text{GENDER} + \beta_{20} \text{OLDER} + \beta_{21} \text{COLLS} + \beta_{22} \text{INCOMEH} \\ &+ \beta_{23} \text{MARRIED} \end{aligned}$$

**Model Two: Consumers who buy organic produce frequently**

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$$\begin{aligned} \text{FREQ\_ORG} &= \beta_0 + \beta_1 \text{PA} + \beta_2 \text{GROW} + \beta_3 \text{FM5} + \beta_4 \text{PRICE12} \\ &+ \beta_5 \text{SWITCH} + \beta_6 \text{HIGHVARI} + \beta_7 \text{HIGHPRIC} + \beta_8 \text{APPLES} \\ &+ \beta_9 \text{SPIN} + \beta_{10} \text{CARROTS} + \beta_{11} \text{FLRESPES1} + \beta_{12} \text{IPM} \\ &+ \beta_{13} \text{FBUYAV1} + \beta_{14} \text{DOSHOP} + \beta_{15} \text{LIVEMORE} \\ &+ \beta_{16} \text{HIGHKIDS} + \beta_{17} \text{MONHIGH} + \beta_{18} \text{SUBURB} \\ &+ \beta_{19} \text{GENDER} + \beta_{20} \text{OLDER} + \beta_{21} \text{COLLS} + \beta_{22} \text{INCOMEH} \\ &+ \beta_{23} \text{MARRIED} \end{aligned}$$

**Model Three: Consumers who think that organic produce is of a higher quality than conventional produce**

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$$\begin{aligned} \text{HIGH\_QUAL} &= \beta_0 + \beta_1 \text{PA} + \beta_2 \text{GROW} + \beta_3 \text{FM5} + \beta_4 \text{PRICE12} \\ &+ \beta_5 \text{SWITCH} + \beta_6 \text{HIGHVARI} + \beta_7 \text{HIGHPRIC} + \beta_8 \text{APPLES} \\ &+ \beta_9 \text{SPIN} + \beta_{10} \text{CARROTS} + \beta_{11} \text{FLRESPES1} + \beta_{12} \text{IPM} \\ &+ \beta_{13} \text{FBUYAV1} + \beta_{14} \text{DOSHOP} + \beta_{15} \text{LIVEMORE} \\ &+ \beta_{16} \text{HIGHKIDS} + \beta_{17} \text{MONHIGH} + \beta_{18} \text{SUBURB} \\ &+ \beta_{19} \text{GENDER} + \beta_{20} \text{OLDER} + \beta_{21} \text{COLLS} + \beta_{22} \text{INCOMEH} \\ &+ \beta_{23} \text{MARRIED} \end{aligned}$$

**Model Four: Consumers who are willing to pay 10 percent or more for organic produce than conventional produce**

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$$\begin{aligned} \text{PAY}_{10} &= \beta_0 + \beta_1 \text{PA} + \beta_2 \text{GROW} + \beta_3 \text{FM5} + \beta_4 \text{PRICE12} \\ &+ \beta_5 \text{SWITCH} + \beta_6 \text{HIGHVARI} + \beta_7 \text{HIGHPRIC} + \beta_8 \text{APPLES} \\ &+ \beta_9 \text{SPIN} + \beta_{10} \text{CARROTS} + \beta_{11} \text{FLRESPES1} + \beta_{12} \text{IPM} \\ &+ \beta_{13} \text{FBUYAV1} + \beta_{14} \text{DOSHOPI} + \beta_{15} \text{LIVEMORE} \\ &+ \beta_{16} \text{HIGHKIDS} + \beta_{17} \text{MONHIGH} + \beta_{18} \text{SUBURB} \\ &+ \beta_{19} \text{GENDER} + \beta_{20} \text{OLDER} + \beta_{21} \text{COLLS} + \beta_{22} \text{INCOMEH} \\ &+ \beta_{23} \text{MARRIED} \end{aligned}$$

**Model Five : Consumers who are willing to pay 20 percent or more for organic produce than conventional produce**

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$$\begin{aligned} \text{PAY}_{20} &= \beta_0 + \beta_1 \text{PA} + \beta_2 \text{GROW} + \beta_3 \text{FM5} + \beta_4 \text{PRICE12} \\ &+ \beta_5 \text{SWITCH} + \beta_6 \text{HIGHVARI} + \beta_7 \text{HIGHPRIC} + \beta_8 \text{APPLES} \\ &+ \beta_9 \text{SPIN} + \beta_{10} \text{CARROTS} + \beta_{11} \text{FLRESPES1} + \beta_{12} \text{IPM} \\ &+ \beta_{13} \text{FBUYAV1} + \beta_{14} \text{DOSHOPI} + \beta_{15} \text{LIVEMORE} \\ &+ \beta_{16} \text{HIGHKIDS} + \beta_{17} \text{MONHIGH} + \beta_{18} \text{SUBURB} \\ &+ \beta_{19} \text{GENDER} + \beta_{20} \text{OLDER} + \beta_{21} \text{COLLS} + \beta_{22} \text{INCOMEH} \\ &+ \beta_{23} \text{MARRIED} \end{aligned}$$

**Where:**

- PA = 1 if the respondent is from Pennsylvania and 0 otherwise.
- GROW = 1 if the respondent grows fruits or vegetables for consumption at their home and 0 otherwise.
- FM5 = 1 if the respondent visits farmer's markets approximately less than once a month in the months in which they are open and 0 otherwise.

PRICE12	= 1 if the respondent choose either '1' or '2' for how they ranked price as an important issue purchasing fresh produce, with 1 being 'very important' and 5 being 'very unimportant' and 0 otherwise.
SWITCH	= 1 if the respondent would switch supermarkets to be able to purchase fresh produce and 0 otherwise.
HIGHVARI	= 1 if the respondent thinks that organic produce has a higher variety than conventional produce is in supermarkets and other retail facilities and 0 otherwise.
HIGHPRIC	= 1 if the respondent thinks that organic produce has a higher price than conventional produce is in supermarkets and other retail facilities and 0 otherwise.
APPLES	= 1 if the respondent chose apples as one of the four organic fruits or vegetables that they have purchased most often and 0 otherwise.
SPIN	= 1 if the respondent chose spinach as one of the four organic fruits or vegetables that they have purchased most often and 0 otherwise.
CARROTS	= 1 if the respondent chose carrots as one of the four organic fruits or vegetables that they have purchased most often and 0 otherwise.
FLRESPES1	= 1 if the respondent feels that residues from pesticides or herbicides are a serious hazard and 0 otherwise.
IPM	= 1 if the respondent has heard or read any news reports about integrated pest management (IPM) and 0 otherwise.
FBUYAV1	= 1 if the respondent would buy organic produce if it were more readily available and 0 otherwise.
DOSHOP	= 1 if the availability and quality of fresh produce affects where the respondent does most of their food shopping and 0 otherwise.
LIVEMORE	= 1 if four or more people live in the respondent's household and 0 otherwise.
HIGHKIDS	= 1 if three or more people under the age of 17 live in the respondent's household and 0 otherwise.
MONHIGH	= 1 if the respondent 's household spends \$50 or more on produce each month and 0 otherwise.
SUBURB	= 1 if the respondent describes their neighborhood as suburban and 0 otherwise.
GENDER	= 1 if the respondent is a female and 0 if the respondent is a male.

OLDER	= 1 if the respondent is 51 years old or older and 0 otherwise.
COLLS	= 1 if the respondent attended at least some college education or further education and 0 otherwise.
INCOMEH	= 1 if the respondent's annual household income is \$60,000 or more and 0 otherwise.
MARRIED	= 1 if 'married' best describes the respondent's current marital status and 0 otherwise.

### ***Logit Analysis Of Consumer Data***

The five logit models were tested according to the specifications given above. A listing of the explanatory variables used in the regression models is given in Table 4. In order to increase the regression fit, explanatory variables were dropped or added based on how they impacted the overall performance of the models and on the effect on other explanatory variables. When selecting the final models, several measures of the goodness of fit were taken into account. The Chi-square statistic, which tests the null hypothesis that the coefficients of all the independent variables as a set are equal to zero, was one of the most important. In this study, the null hypothesis was rejected at a significance level of 0.0001 in each case. All five models include the same variables, so that comparisons can be made between independent variables across the models. The McFadden's  $R^2$  statistic is also reported for each model. Binary dependent variable models estimated with cross sectional data, like the ones constructed in this study, are not expected to yield high  $R^2$  values (Pindyck and Rubinfeld, 1991). For example, Hensher and Johnson consider McFadden's  $R^2$  values that range between 0.20 and 0.40 would indicate an extremely good fit (Bell, et al., 1994). The four models estimated produced  $R^2$  statistics in the 0.28 to 0.40 range, with an average of 0.33 between the five models. Because another potential use of logit models is to predict whether or not an event will occur given a set of explanatory variables, the percent of successful predictions within the given samples is also provided for each model as a measure of goodness of fit (Judge, et al., 1982). Based on a 50-50 classification scheme, individuals in the samples are classified as either opting for a choice or not (i.e., an individual consumer was willing to pay more than 10 percent more for organic produce than conventional produce) or having an attribute or lacking it (i.e., the respondent

chose spinach as one of the four organic fruits or vegetables that they have purchased most often) (Nayga, 1993). The five models were quite accurate in their percent of correct predictions, correctly predicting an average of 83 percent of the responses. model one correctly predicted 74.5 percent of the responses, model two 88.6 percent, model three 76.0 percent, model four 81.8 percent, and model five correctly predicted 92.8 percent of the responses.

***Model One: Consumers that have purchased certified organic produce at least once in the past***

Model one predicts the likelihood that a consumer has purchased organic produce at least once in the past. Of 554 observations that were used in this model, 249 (45 percent) of respondents had purchased organic produce at least once in the past, while 305 (55 percent) did not. Model one correctly predicted the state of the dependent variable in 74.5 percent of the observations. The chi-square statistic rejected the null hypothesis that the explanatory variables as a set were insignificant in explaining variation in the dependent variable at 0.0001 level and the McFadden's  $R^2$  was 0.29. The results for model one appear in Tables 2 and 3.

Respondents who stated that they would buy more organic produce if it were more readily available were 22 percent more likely to have bought organic produce at least once in the past. Respondents who said that they would switch supermarkets to be able to buy organic produce were also 22 percent more likely to have bought organic produce at least once in the past. Although it is intuitive in nature for one to believe the signs of these coefficients to be positive, the 22 percent number for both of these variables tells us that consumers who are willing to search for the availability of organic produce and even switch supermarkets for organic produce are 22 percent more likely to buy organic produce at least once, as compared to those consumers who have not yet purchased organic produce as of yet.

Respondents who believe that organic produce is priced higher than conventional produce are 20 percent more likely to have bought organic produce in the past. In this

sense, organic produce is seen as more of a 'luxury good,' where the higher price tag gives the purchaser a feeling of high product quality, social esteem from buying the expensive products, or could coincide with the fact that consumers are willing to pay a premium for organic produce due to the perceived notion of safety.

Respondents who stated that the availability of fresh produce affects where they do most of their shopping were 14 percent more likely to have purchased organic produce in the past. Hence, consumers who care about the availability of fresh produce in their supermarkets are more likely to be organic produce buyers. The freshness of the produce in each supermarket is a major concern for organic produce purchasers. Organic produce purchasers may feel that organic produce is fresher than conventional produce.

Residents of Pennsylvania were 14 percent more likely to be organic produce purchasers as compared to those who live in New York or New Jersey. Possible reason for this behavior is that Pennsylvanians may have a heightened awareness of agriculture because Pennsylvania has more land in agriculture than New York and New Jersey.

Households with four or more people were 17 percent less likely to purchase organic produce. Reasons for this behavior may be that households with more family members, especially those households with four or more people, will probably have less money to spend per person on fresh produce. Hence, these households may choose conventional produce over the higher priced organic produce.

Those respondents who are over 50 years of age were 17 percent less likely to purchase organic produce than their younger counterparts. This grouping includes those consumers that are retired, and hence may live from social security payments. Retired consumers may not have the 'extra' money to purchase the more expensive organic produce, and may be more reluctant to purchase a relatively new and more expensive form of organic products.



Married households were 12 percent more likely to purchase organic produce than single or other types of households. In a married household, it is the woman who may be more likely to do the food shopping, hence the fact that women are more likely to purchase organic produce than men. However, the other models indicate that married households are actually less likely to choose organic produce. This may be because more married households have children, and those households with a greater number of children cannot afford to pay a premium, as will be shown in the latter models.

Residents of the suburbs were 11 percent more likely to have purchased organic produce in the past, as compared to those in an urban or rural area. It is possible that the higher price tag on organic produce may attract the richer people of the suburbs before people that live in the cities or the country. Additionally, those with at least some college education are 13 percent more likely to have purchased organic produce. Again, those with some college experience will earn a higher income, which also goes along with the positive sign of the variable which separates the higher income consumers (\$60,000 per year) from the lower ones.

**Table 2: Consumers that have purchase certified organic produce at least once in the past (model one)**

<i>Variable</i>	<i>Estimate</i>	<i>Standard Error</i>	<i>Change in Probability</i>
Intercept***	-3.3942	0.5484	
PA*	0.5737	0.2992	0.1423
GROW	0.3745	0.2364	
FM5	0.0153	0.2364	
PRICE12	-0.2434	0.2333	
SWITCH***	0.9123	0.3249	0.2242
HIGHVARI	-0.3712	0.4949	
HIGHPRIC***	0.8346	0.2775	0.1956
APPLES***	0.8077	0.3102	0.1992
SPIN**	1.2837	0.6768	0.3027
CARROTS***	1.8931	0.3145	0.4316
FLRESPES1	-0.0686	0.2317	
IPM	0.2106	0.3009	
FBUYAV1***	0.9275	0.2367	0.2235
DOSHOP**	0.5930	0.2419	0.1420
LIVEMORE**	-0.7235	0.2951	-0.1713
HIGHKIDS	-0.7817	0.5794	
MONHIGH	0.2586	0.2309	
SUBURB*	0.4770	0.2592	0.1144
GENDER	0.2581	0.2377	
OLDER***	-0.7059	0.2606	-0.1715
COLLS**	0.5584	0.2779	0.1337
INCOMEH	0.1125	0.2552	
MARRIED*	0.4758	0.2652	0.1151

Significance of Chi-square Statistic: 0.0001

McFadden's R<sup>2</sup>: 0.29

Ratio of nonzero observations to the total number of observations: 0.45

\*: significant at the .10 level

\*\*: significant at the .05 level

\*\*\*: significant at the .01 level

**Table 3: Prediction Success For Model One**

		<i>Predicted</i>	
		0	1
<i>Actual</i>	0	248	57
	1	84	165

Number of correct predictions: 413

Percent of correct predictions: 74.5

### ***Model Two: Consumers who buy organic produce frequently***

Model two predicts the likelihood that a consumer purchased organic produce at least 'usually' or 'always,' which is defined as 'frequently.' Of 554 observations that were used in this model, 62 (11 percent) of respondents purchased organic produce frequently, while 492 (89 percent) did not. Model two correctly predicted the state of the dependent variable in 88.6 percent of the observations. The chi-square statistic rejected the null hypothesis that the explanatory variables as a set were insignificant in explaining variation in the dependent variable at 0.0001 level and the McFadden's  $R^2$  was 0.40. The results for model two appear in Tables 4 and 5.

Respondents who stated that they would buy more organic produce if it were more readily available were three percent more likely to buy organic produce more frequently. Respondents who said that they would switch supermarkets to be able to buy organic produce were 24 percent more likely to buy organic produce more frequently. Although it is again logical to believe the signs of these coefficients to be positive, this indicates that consumers who are willing to search for the availability of organic produce and even switch supermarkets for organic produce are more likely to be frequent buyers of organic produce.

A rather unexpected result was that those respondents who visit farmer's markets less frequently were three percent more likely to buy organic produce. Although this is a small percentage, this variable is significant at the 95% level. Reasons for this may be due to the fact that consumers who buy organic produce may prefer to purchase their produce at a supermarket rather than a farmer's market. In model one we found that the richer, more affluent and married people of the suburbs are major purchasers of organic produce. These people may prefer to purchase their groceries in a nice clean supermarket rather than an outside and open air farmer's market or may not have the time to make a special stop to buy fresh produce.

Respondents who believe that organic produce is priced higher than conventional produce are four percent less likely to buy organic produce more frequently. Although

the sign of this variable in model one was positive, consumers as a whole will purchase fewer of the higher priced items on a regular basis. The results also indicate that of the 11 percent of the respondents that chose organic produce more frequently, nine percent chose organic 'usually' while only two percent chose organic 'always' (Figure 15).

Organic apple and spinach consumers were more likely to purchase organic produce more frequently. Organic apple consumers were five percent more likely to purchase organic produce more frequently, while organic spinach consumers were 15 percent more likely to purchase organic produce more frequently. This indicates that organic apple and especially organic spinach consumers are repeat buyers of organic produce, most likely again buying the organic apples or spinach.

Respondents who have read or heard any news reports about Integrated Pest Management, or IPM, were six percent more likely to purchase organic produce more frequently. An interest in IPM stems from an interest in healthy produce, which would make a consumer buy organic produce more frequently. Although it is only six percent, the IPM variable was significant at the 99% level, making it a strong factor in influencing consumer purchase of organic produce on a frequent basis.

The results of models one and two were similar, reaffirming many of the results that were found in model one. Results of these models indicate that the richer residents of the suburbs that are more educated are the consumers that are purchasing organic produce. The two models indicate that people with larger households and households with more children buy less organic produce. They also indicate that consumers that are over 50 years of age buy organic produce less frequently than younger people.

**Table 4: Consumers who buy organic produce frequently (model two)**

<i>Variable</i>	<i>Estimate</i>	<i>Standard Error</i>	<i>Change in Probability</i>
Intercept***	-5.8118	0.9598	
PA	0.7510	0.4639	
GROW	-0.2020	0.3976	
FM5**	0.8922	0.4124	0.0346
PRICE12	-0.2015	0.3812	
SWITCH***	2.9224	0.4531	0.2431
HIGHVARI	-0.8819	0.6383	
HIGHPRIC**	-0.9854	0.4905	-0.0404
APPLES**	1.0023	0.4123	0.0450
SPIN***	1.9406	0.7167	0.1524
CARROTS	-0.2375	0.4358	
FLRESPES1	0.2824	0.3884	
IPM***	1.2148	0.3980	0.0594
FBUYAV1*	0.9928	0.5109	0.0324
DOSHOP	0.6593	0.4766	
LIVEMORE	-0.5107	0.4873	
HIGHKIDS	-0.0778	0.9071	
MONHIGH	0.1931	0.3939	
SUBURB	0.0512	0.4154	
GENDER**	1.0425	0.4416	0.0290
OLDER	0.3440	0.4111	
COLLS	0.0939	0.4613	
INCOMEH	0.6493	0.4370	
MARRIED	-0.5154	0.4111	

Significance of Chi-square Statistic: 0.0001

McFadden's R<sup>2</sup>: 0.40

Ratio of nonzero observations to the total number of observations: 0.11

\*: significant at the .10 level

\*\*: significant at the .05 level

\*\*\*: significant at the .01 level

**Table 5: Prediction Success For Model Two**

		<i>Predicted</i>	
		0	1
<i>Actual</i>	0	471	42
	1	21	20

Number of correct predictions: 491

Percent of correct predictions: 88.6

### ***Model Three: Consumers who think that organic produce is of a higher quality than conventional produce***

Model three predicts the likelihood that respondents feel that organic produce is of a higher quality than conventional produce. Of 554 observations that were used in this model, 172 (31 percent) of respondents feel that organic produce is of a higher quality than conventional produce, while 382 (69 percent) did not. Model three correctly predicted the state of the dependent variable in 76.0 percent of the observations. The chi-square statistic rejected the null hypothesis that the explanatory variables as a set were insignificant in explaining variation in the dependent variable at the 0.0001 level and the McFadden's  $R^2$  was 0.28. The results for model three appear in Tables 6 and 7.

Respondents who stated that they would buy more organic produce if it were more readily available were 22 percent more likely to feel that organic produce is of higher quality than conventional produce. Respondents who said that they would switch supermarkets to be able to buy organic produce were 18 percent more likely to feel that organic produce is of higher quality than conventional produce.

Respondents who believe that organic produce is priced higher than conventional produce are 23 percent more likely to feel that organic produce is of higher quality than conventional produce. Furthermore, respondents who believe that organic produce has a higher variety than conventional produce are 46 percent more likely to feel that organic produce is of higher quality than conventional produce. These greater percentages make sense because most consumers believe that higher price, better quality, and more variety all go hand-in-hand with each other. Although consumers may feel that organic produce is priced higher and has more variety than conventional produce, they feel that organic produce is of higher quality than conventional produce. Consumers may feel that they would 'get what they pay for' when it comes to purchasing organic produce.

The results indicate that respondents who visit farmer's markets less frequently were nine percent more likely to feel that organic produce is of higher quality than conventional produce. Although it is intuitive to think that those consumers who visit farmer's markets frequently would have a higher view of organic produce than those who visit farmer's markets less frequently, the findings indicate that this is not the case.

Organic carrot and spinach consumers were more likely to feel that organic produce is of higher quality than conventional produce. Organic carrot consumers were 12 percent more likely to feel that organic produce is of higher quality than conventional produce, while organic spinach consumers were 27 percent more likely to feel that organic produce is of higher quality than conventional produce. Organic carrot and in particular organic spinach consumers may feel that these organic products specifically are of higher quality than their conventional produce counterparts, and are most likely repeat buyers of organic carrots or spinach.

Residents of Pennsylvania were 11 percent more likely to feel that organic produce is of a higher quality than conventional produce, as compared to those who live in New York or New Jersey. Pennsylvania has more land in agriculture than New Jersey. Therefore, those consumers may have had more exposure to agriculture than consumers in other states.

Respondents who grow their own vegetables were eight percent more likely to feel that organic produce is of higher quality than conventional produce. People that grow their own vegetables will be able to better tell the high quality produce from the low quality produce. Hence, they are more likely to believe that organic produce is of higher quality than conventional produce.

Households with three or more children were 18 percent less likely to feel that organic produce is of higher quality than conventional produce. At the 95% significance level in model three, the results indicate that households with three or more children are 18 percent less likely to feel that organic produce is of higher quality than conventional

produce. As stated previously, households with a larger number of children may have less money to spend per child, and cannot afford the organic produce premium. For this reason, these consumers may not believe there is a difference in quality between organic and conventional produce, at least not as much as a difference that would cause them to spend the extra money on the more expensive organic produce.

Those respondents who are over 50 years of age are 14 percent less likely to feel that organic produce is of higher quality than conventional produce. Much alike consumers with a larger number of children, older people may not have the extra money to spend on organic produce. They therefore may not believe there is a difference in quality between organic and conventional produce. They may also be less worried about the dangers of consuming pesticide residues at their older age.

Married households were nine percent less likely to feel that organic produce is of higher quality than conventional produce. Although 12 percent more likely to have bought organic in the past, married consumers are less likely to buy organic on a frequent basis, as seen in models one and two. It may be that married households are on a tighter budget, especially those households with children, and may not feel that the larger price for organic is compensated by a large enough increase in quality.

Women were eight percent more likely to feel that organic produce is of higher quality than conventional produce when compared to men. Women may be more likely to be the primary food shopper in the household, and may therefore be the ones to assume that organic produce deserves the higher price due to the higher quality than conventional produce. Women are also often the parental unit responsible for the health of the household, and therefore they may be interested more in the quality of organic produce.



**Table 6: Consumers who think that organic produce is of a higher quality than conventional produce (model three)**

<i>Variable</i>	<i>Estimate</i>	<i>Standard Error</i>	<i>Change in Probability</i>
Intercept***	-3.4146	0.5995	
PA*	0.5436	0.3170	0.1069
GROW*	0.4106	0.2444	0.0764
FM5*	0.4863	0.2503	0.0916
PRICE12	0.0068	0.2469	
SWITCH***	0.9064	0.2960	0.1839
HIGHVARI***	2.0265	0.5532	0.4598
HIGHPRIC***	1.5914	0.3658	0.2326
APPLES	-0.1759	0.2952	
SPIN**	1.2148	0.5665	0.2707
CARROTS**	0.6297	0.2776	0.1243
FLRESPES1	-0.0709	0.2452	
IPM	0.1082	0.3028	
FBUYAV1***	1.2557	0.2605	0.2214
DOSHOP	0.2581	0.2592	
LIVEMORE	0.2267	0.3006	
HIGHKIDS**	-1.4700	0.6284	-0.1779
MONHIGH	0.0071	0.2482	
SUBURB	-0.0230	0.2709	
GENDER*	0.4699	0.2596	0.0804
OLDER***	-0.7566	0.2743	-0.1351
COLLS	0.0172	0.2977	
INCOMEH	-0.3731	0.2713	
MARRIED*	-0.4784	0.2707	-0.0893

Significance of Chi-square Statistic: 0.0001

McFadden's R<sup>2</sup>: 0.28

Ratio of nonzero observations to the total number of observations: 0.31

\*: significant at the .10 level

\*\*: significant at the .05 level

\*\*\*: significant at the .01 level

**Table 7: Prediction Success For Model Three**

		<i>Predicted</i>	
		0	1
<i>Actual</i>	0	331	82
	1	51	90

Number of correct predictions: 421

Percent of correct predictions: 76.0

***Model Four: Consumers who are willing to pay 10 percent or more for organic produce than conventional produce***

Model four predicts the likelihood that a consumer would be willing to pay 10 percent or more for organic produce than conventional produce. Of 554 observations that were used in this model, 129 (23 percent) of respondents were willing to pay 10 percent or more for organic produce than conventional produce, while 425 (77 percent) were not. Model four correctly predicted the state of the dependent variable in 81.8 percent of the observations. The chi-square statistic rejected the null hypothesis that the explanatory variables as a set were insignificant in explaining variation in the dependent variable at the 0.0001 level and the McFadden's  $R^2$  was 0.32. The results for model four appear in Tables 8 and 9.

Respondents who felt that residues from pesticides or herbicides are a serious hazard were 13 percent more likely to pay 10 percent or more for organic produce than conventional produce. This finding is rational, as one would expect these consumers who are risk averse toward pesticide or herbicide residues would be willing to pay more for organic produce.

Respondents who stated that they would buy more organic produce if it were more readily available were 15 percent more likely to pay 10 percent or more for organic than conventional produce. Respondents who said that they would switch supermarkets to be able to buy organic produce were 12 percent more likely to pay 10 percent or more for organic than conventional produce. Apparently, these consumers who seem to be very interested in organic produce are not turned away by the price premium over conventional produce.

Respondents who believe that organic produce is priced higher than conventional produce are seven percent more likely to pay 10 percent or more for organic than conventional produce. Just as in models one and three, organic produce may be regarded as more of a high-end good, and these respondents may believe that the

higher price goes along with higher quality. These consumers are willing to pay the extra price for organic produce.

A very surprising finding was that respondents who believe that organic produce has a higher variety than conventional produce are 11 percent less likely to pay 10 percent or more for organic than conventional produce. This variable was significant at the 99% level. One possible explanation for this is that those consumers who feel that organic produce has more variety than conventional produce may not be interested in a variety of produce.

Consumers who grow their own vegetables were six percent more likely to pay 10 percent or more for organic than conventional produce. As in model three, the results indicate that people that grow their own vegetables may believe that organic produce is of higher quality than conventional produce, and hence are more willing to pay the higher price.

Those respondents that felt that price is very important to them when purchasing fresh produce were 16 percent less likely to pay 10 percent or more for organic than conventional produce. Those consumers who consider price to be a major determinate of fresh produce purchasing are less likely to be willing to pay the premium for organic produce.

Respondents who stated that the availability of fresh produce affects where they do most of their shopping were nine percent more likely to pay 10 percent or more for organic than conventional produce. Consequently, consumers who care about the availability of fresh produce in their supermarkets are more likely to pay the premium for organic produce. Some organic produce purchasers may feel that organic produce is fresher than conventional produce and are therefore willing to pay more for the freshness.

Organic carrot consumers were 15 percent more likely to pay 10 percent or more for organic than conventional produce. These consumers may feel that organic carrots are of higher quality than conventionally grown carrots, and are willing to pay more for them. In model five, the results indicate that organic carrot consumers are also willing to pay the 20 percent premium for organic produce. It appears that organic carrot consumers will stick with their purchasing decisions even if the price is higher.

Households with three or more children were 10 percent less likely to pay 10 percent or more for organic than conventional produce. These households with a larger number of children will probably have less money to spend per child, and cannot afford the organic produce price premium. For this reason, these consumers may be less willing to pay more for organic produce.

Respondents who are over 50 years of age are 10 percent less likely to pay 10 percent or more for organic than conventional produce. Much like the findings from models one and three, the results indicate reluctance on the part of older consumers to buy organic produce. The higher price of organic may be the key barrier keeping older consumers from buying organic.

**Table 8: Consumers who are willing to pay 10 percent or more for organic produce than conventional produce (model four)**

<i>Variable</i>	<i>Estimate</i>	<i>Standard Error</i>	<i>Change in Probability</i>
Intercept***	-3.2086	0.6308	
PA	0.0419	0.3684	
GROW*	0.4635	0.2711	0.0591
FM5	0.3244	0.2838	
PRICE12***	-1.1996	0.2671	-0.1622
SWITCH***	0.8585	0.3169	0.1238
HIGHVARI***	-1.4457	0.5604	-0.1106
HIGHPRIC*	0.6208	0.3726	0.0677
APPLES	-0.1007	0.3233	
SPIN	0.9063	0.6178	
CARROTS***	1.0241	0.3083	0.1539
FLRESPES1***	1.0655	0.2787	0.1315
IPM	0.3646	0.3129	
FBUYAV1***	1.2139	0.3074	0.1460
DOSHOP***	0.7995	0.3066	0.0864
LIVEMORE	0.0739	0.3290	
HIGHKIDS**	-1.3170	0.6695	-0.1038
MONHIGH	0.2941	0.2758	
SUBURB	-0.1753	0.3012	
GENDER	-0.2818	0.2809	
OLDER***	-0.8187	0.3139	-0.0987
COLLS	-0.0408	0.3378	
INCOMEH	0.1887	0.3038	
MARRIED	-0.1143	0.3039	

Significance of Chi-square Statistic: 0.0001

McFadden's R<sup>2</sup>: 0.32

Ratio of nonzero observations to the total number of observations: 0.23

\*: significant at the .10 level

\*\*: significant at the .05 level

\*\*\*: significant at the .01 level

**Table 9: Prediction Success For Model Four**

		<i>Predicted</i>	
		0	1
<i>Actual</i>	0	393	69
	1	32	60

Number of correct predictions: 453

Percent of correct predictions: 81.8

***Model Five : Consumers who are willing to pay 20 percent or more for organic produce than conventional produce***

Model five predicts the likelihood that a consumer would be willing to pay 20 percent or more for organic produce than conventional produce. Of 554 observations that were used in this model, 45 (8 percent) of respondents would be willing to pay 20 percent or more for organic produce than conventional produce, while 509 (92 percent) would not. Model five correctly predicted the state of the dependent variable in 92.8 percent of the observations. The chi-square statistic rejected the null hypothesis that the explanatory variables as a set were insignificant in explaining variation in the dependent variable at the 0.0001 level and the McFadden's  $R^2$  was 0.38. The results for model five appear in Tables 10 and 11.

Respondents who stated that they would buy more organic produce if it were more readily available were five percent more likely to pay 20 percent or more for organic than conventional produce. Respondents who said that they would switch supermarkets to be able to buy organic produce were three percent more likely to pay 20 percent or more for organic than conventional produce. These two variables, of which both had positive coefficients in models four and five, were significant at the 99% level in both models.

Those respondents that felt that price is very important to them when purchasing fresh produce were two percent less likely to pay 20 percent or more for organic than conventional produce. Once more, the results indicate that consumers who consider price to be a major determinate of purchasing fresh produce are less likely to pay the price premium for organic produce, as in model four.

Organic carrot consumers were two percent more likely to pay 20 percent or more for organic than conventional produce. These consumers may feel that organic carrots are of higher quality than conventionally grown carrots, and are willing to pay more for them. These results are also supported by the findings in model four.

Respondents who stated that the availability of fresh produce affects where they do most of their shopping were one percent more likely to pay 20 percent or more for organic than conventional produce. Although this is a small percentage, it reinforces the findings in model four that consumers who care about the availability of fresh produce in their supermarkets are more likely to pay the premium for organic produce.

Respondents who are over 50 years of age are one percent less likely to pay 20 percent or more for organic than conventional produce. Although this is a small percentage, it strengthens the findings from the rest of the models that older consumers are less willing to buy organic produce.

**Table 10: Consumers who are willing to pay 20 percent or more for organic produce than conventional produce (model five)**

<i>Variable</i>	<i>Estimate</i>	<i>Standard Error</i>	<i>Change in Probability</i>
Intercept***	-5.2667	1.3100	
PA	0.5384	0.5325	
GROW	-0.1399	0.4336	
FM5	0.3663	0.4555	
PRICE12**	-1.0633	0.4214	-0.0167
SWITCH***	1.3326	0.4332	0.0276
HIGHVARI	-0.3416	0.7059	
HIGHPRIC	0.1750	0.6407	
APPLES	0.5640	0.4273	
SPIN	0.8108	0.7395	
CARROTS**	0.9003	0.4308	0.0161
FLRESPES1	0.7146	0.4462	
IPM	-0.0164	0.4405	
FBUYAV1***	2.9582	1.0493	0.0502
DOSHOP*	0.9658	0.5267	0.0110
LIVEMORE	-0.7345	0.5277	
HIGHKIDS	-0.7095	1.2122	
MONHIGH	0.2733	0.4212	
SUBURB	-0.4572	0.4549	
GENDER	-0.4811	0.4376	
OLDER*	-0.8433	0.4686	-0.0114
COLLS	-0.1839	0.5285	
INCOMEH	0.2855	0.4637	
MARRIED*	-0.8634	0.4496	-0.0134

Significance of Chi-square Statistic: 0.0001

McFadden's R<sup>2</sup>: 0.38

Ratio of nonzero observations to the total number of observations: 0.08

\*: significant at the .10 level

\*\*: significant at the .05 level

\*\*\*: significant at the .01 level

**Table 11: Prediction Success For Model Five**

		<i>Predicted</i>	
		0	1
<i>Actual</i>	0	501	32
	1	8	13

Number of correct predictions: 514

Percent of correct predictions: 92.8



## ***Summary of Explanatory Variables***

The results from all five models are summarized in Table 12. A negative sign indicates that the variable was estimated to have a negative coefficient, and hence has a negative impact on the dependent variable. A positive sign indicates that the variable was estimated to have a positive coefficient, and hence has a positive impact on the dependent variable. The star symbol represents the significance level of the variable, which is interpreted at the bottom of the Table 12.

Since all five models contain the same variables, meaningful comparisons can be made between each of the independent variables across the five models. In view of the fact that each of the five dependent variables is binary and contains a positive aspect of the consumption of organic produce as one and hence a negative aspect of the consumption of organic produce as zero, independent variables that have positive symbols in Table 12 can be said to be positively affecting the consumption of organic produce, and vice versa for those with negative signs.

Some of the variables had positive symbols for 2 or 3 of the models, and hence negative symbols on the remaining models. Since these variables have both a positive and a negative relationship with different aspects of the consumption of organic produce, their strengths in the overall explanation of the consumption of organic produce is not as strong as those variables will all five or four of the same signs.

Residents of Pennsylvania, less frequent visitors of farmer's markets, those consumers who are willing to switch supermarkets in order to buy organic produce, organic spinach consumers, those who would buy more organic produce if it were more readily available, those whose shopping market decisions are affected by the availability of fresh produce, and those who spend more than \$50 a month on produce had positive effects on all five models. These consumers are currently the true demographic consumer markets that are purchasing organic produce.

Those consumers who feel that organic produce is priced higher than conventional produce, organic carrot consumers, those who have heard about IPM, and those with an income of over \$60,000 per year had positive effects on four of the five models. These consumers are currently purchasing organic produce, but may have not be as loyal as the groupings in the previous paragraph.

Those consumers with three or more children had negative effects on all five models. These consumers are currently the demographic consumer market that is not purchasing organic produce. Those consumers who feel that price is very important during produce purchasing decisions, those consumers who feel that organic produce has a higher variety than conventional produce, consumers over 50 years of age, and married consumers had negative effects on four of the five models. These groupings may not be purchasing organic produce presently, but may be interested in certain aspects of organic produce so that they may be targeted in the future.

**Table 12: Model Comparison:**

Variable	Model 1	Model 2	Model 3	Model 4	Model 5
PA	+	+	+	+	+
GROW	+	-	+	+	-
FM5	+	+	+	+	+
PRICE12	-	-	+	-	-
SWITCH	+	+	+	+	+
HIGHVARI	-	-	+	-	-
HIGHPRIC	+	-	+	+	+
APPLES	+	+	-	-	+
SPIN	+	+	+	+	+
CARROTS	+	-	+	+	+
FLRESPES1	-	+	-	+	+
IPM	+	+	+	+	-
FBUYAV1	+	+	+	+	+
DOSHOP	+	+	+	+	+
LIVEMORE	-	-	+	+	-
HIGHKIDS	-	-	-	-	-
MONHIGH	+	+	+	+	+
SUBURB	+	+	-	-	-
GENDER	+	+	+	-	-
OLDER	-	+	-	-	-
COLLS	+	+	+	-	-
INCOMEH	+	+	-	+	+
MARRIED	+	-	-	-	-

\*: significant at the .10 level  
 \*\*: significant at the .05 level  
 \*\*\*: significant at the .01 level

## ***Summary and Conclusions***

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Almost half of the respondents have purchased organic produce at least once in the past. These respondents are most likely to be consumers that:

- are willing to switch supermarkets to buy organic,
- are ready to buy additional organic if it were more readily available,
- purchase organic apples, organic carrots or organic spinach,
- feel organic is priced higher than conventional produce,
- live in Pennsylvania,
- live in the suburbs,
- have attended at least some college,
- shop according to the availability of fresh produce,
- are married,
- are under 50 years of age, and
- have fewer than four people living in their household.

About ten percent of the respondents purchased organic produce on a frequent basis.

These respondents are most likely to be consumers that:

- are willing to switch supermarkets to buy organic,
- are ready to buy additional organic if it were more readily available,
- purchase organic apples or organic spinach,
- feel organic is not priced higher than conventional produce,
- have heard or read news reports about IPM,
- visit Farmer's Markets less frequently, and
- are female.

Almost one-third of the respondents feel that organic produce is of a higher quality than conventional produce. These respondents are most likely to be consumers that:

- are willing to switch supermarkets to buy organic,
- are ready to buy additional organic if it were more readily available,
- purchase organic carrots or organic spinach,
- feel organic is priced higher than conventional produce,
- feel organic has more variety than conventional produce,
- live in Pennsylvania,
- grow their own fruits or vegetables,
- visit Farmer's Markets less frequently,
- have fewer than three children,
- are under 50 years of age, and
- not be married, and
- are female.

Almost one-quarter of the respondents stated that they would pay 10 percent or more for organic produce than conventional produce. These respondents are most likely to be consumers that:

- grow their own fruits or vegetables,
- are willing to switch supermarkets to buy organic,
- are ready to buy additional organic if it were more readily available,
- purchase organic carrots,
- feel organic is priced higher than conventional produce,
- feel organic does not have more variety than conventional produce,
- are not greatly effected by price when purchasing fresh produce,
- feel residues from pesticides and herbicides are a serious hazard,
- shop according to the availability of fresh produce,
- have fewer than three children, and
- are under 50 years of age.

Almost ten percent of the respondents stated that they would pay 20 percent or more for organic produce than conventional produce. These respondents are most likely to be consumers that:

- are willing to switch supermarkets to buy organic,
- are ready to buy additional organic if it were more readily available,
- purchase organic carrots,
- are not greatly effected by price when purchasing fresh produce,
- shop according to the availability of fresh produce,
- are not married, and
- are under 50 years of age.

In summary, the results indicate that most of our findings support earlier work while a few of the results shed new light on the market for organic produce. The results indicate that organic produce is purchased by people under the age of 50 much more than those over 50. Older people, most likely not as affluent as middle-aged people, may not want to spend 'extra' money on fruit or vegetables that they have bought inexpensively over the years. Females buy organic produce more often than males do. This may also be supported by the fact that women usually do more of the shopping in a married household, so this may be the reason that they buy organic produce more often than men.

The results also reinforce the theory that consumers who feel residues from pesticides and herbicides are a serious health hazard would be willing to purchase organic produce more frequently. According to the findings, these consumers are 13 percent more likely to pay 10 percent more for organic produce than conventional. Those who have read about IPM were also more likely to purchase organic produce.

As supported by past literature, consumers who are not greatly effected by price when purchasing fresh produce will buy organic produce more often than those consumers to whom price is a major factor in their fresh produce purchasing decisions. Freshness was also found to be highly influential in produce purchasing decisions.

Some new findings include that households with a larger number of children will purchase organic produce less than those households with a smaller number of children. Additionally, those households having a larger number of people will purchase organic produce less than those households with a smaller number of people. The larger the household, the less likely that household will purchase organic produce. Organic produce is bought by smaller, possibly single households which can more easily allow for a premium price payment.

The results indicate that organic tomatoes are the organic product that consumers reported purchasing the most, as almost a quarter of all respondents indicated purchasing organic tomatoes. Organic lettuce was purchased by more than a fifth of consumers. Organic carrots, apples, and broccoli were purchased by more than 10 percent of consumers. Furthermore, the results indicate that consumers appear to be more loyal to organic spinach and carrots than other organic products. Consumers feel that both of these organic products are of a higher quality than their corresponding conventional produce products. Not surprisingly, consumers of organic spinach and organic carrots are most likely repeat buyers of organic produce.

A rather startling finding was that consumers who visit farmer's markets less frequently were more apt to purchase organic produce than those consumers who visited farmer's markets more frequently. The sign of this coefficient was positive in all five models. A rationalization for this seemingly peculiar finding goes hand-in-hand with another finding, that consumers who feel organic produce is priced higher than conventional produce are more likely to have bought organic produce at least once in the past. These consumers also believe that organic produce is of higher quality than conventional produce. In this instance, consumers may regard the higher priced organic produce as a luxury good, one that is of higher quality, more expensive and having special social status. These consumers may be less likely to buy any produce at all at a farmer's market. They may be more affluent and prefer to purchase their produce in a clean supermarket.

The results indicate that consumers in the suburbs were 11 percent more likely to have bought organic produce in the past than those who live in urban or rural areas. Residents of the suburbs are also likely to purchase organic produce more frequently. It is quite clear that the wealthier people of the suburbs are buying organic produce. They see organic produce as a high-end item, and rather than buy it at farmer's markets, they prefer to purchase their special produce indoors in a supermarket.

The results also indicate that consumers who grow their own vegetables or fruits for consumption in their home are more likely to have purchased organic produce in the past. These consumers are willing to pay a 10 percent or more premium for organic produce. They also are more likely to believe that organic produce is of a higher quality than conventional produce. Growers are probably more aware of the benefits of organic production, and therefore are more likely to spend the extra money on the quality produce.

Regarding the residents within the three states of New Jersey, New York, and Pennsylvania, Pennsylvanians are more willing to purchase organic produce than those in New Jersey or New York. The sign of this coefficient was positive in all five models. It could be that residents of Pennsylvania are more concerned about their produce, consistent with the theory that Pennsylvanians are more concerned with agriculture than their counterparts in New Jersey and New York.

The results also indicate that the richer, more educated consumers who spend more than \$50 on produce on a monthly basis were more willing to buy organic produce. This supports the past findings about the marketability of organic produce and sheds light on some new results. Ultimately, organic produce marketers must realize that the wealthier, more educated segment of the population living in the suburbs with smaller households purchases organic produce. These consumers may regard organic produce as a quality product, one that they are willing to spend the extra money on.



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## Appendix I

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THE STATE UNIVERSITY OF NEW JERSEY

# RUTGERS

Department of Agricultural, Food and  
Resource Economics  
Rutgers, The State University of New Jersey  
55 Dudley Road  
New Brunswick, New Jersey 08901

## *Survey of Consumers of Fresh Produce*

1. How frequently do you check the ingredient label on the food you purchase?

- |                                       |                                  |
|---------------------------------------|----------------------------------|
| <input type="checkbox"/> never        | <input type="checkbox"/> usually |
| <input type="checkbox"/> occasionally | <input type="checkbox"/> always  |

2. How often do food advertisements in the newspapers help you decide which food items to purchase?

- |                                       |                                  |
|---------------------------------------|----------------------------------|
| <input type="checkbox"/> never        | <input type="checkbox"/> usually |
| <input type="checkbox"/> occasionally | <input type="checkbox"/> always  |

3. How often do newspaper articles/television/radio reports on food safety issues help you decide which food items to purchase?

- |                                       |                                  |
|---------------------------------------|----------------------------------|
| <input type="checkbox"/> never        | <input type="checkbox"/> usually |
| <input type="checkbox"/> occasionally | <input type="checkbox"/> always  |

4. Have you ever purchased certified organic produce?

- |                              |                             |
|------------------------------|-----------------------------|
| <input type="checkbox"/> yes | <input type="checkbox"/> no |
|------------------------------|-----------------------------|

5. Do you regularly shop at more than one food store in order to purchase advertised specials?

- |                              |                                       |                             |
|------------------------------|---------------------------------------|-----------------------------|
| <input type="checkbox"/> yes | <input type="checkbox"/> occasionally | <input type="checkbox"/> no |
|------------------------------|---------------------------------------|-----------------------------|

6. Do you grow fruits or vegetables for consumption at your home?

- |                              |                             |
|------------------------------|-----------------------------|
| <input type="checkbox"/> yes | <input type="checkbox"/> no |
|------------------------------|-----------------------------|

7. Have you visited a Farmers' Market in the past year?

- |                              |                             |
|------------------------------|-----------------------------|
| <input type="checkbox"/> yes | <input type="checkbox"/> no |
|------------------------------|-----------------------------|

8. Approximately how often do you visit Farmers' Markets during months in which they are open?

- More than once a week
- About once a week
- About twice a month
- About once a month
- Less than once a month

9. Have you visited a roadside produce stand in the past year?

- yes
- no

10. Have you visited a pick-your-own farm in the past year?

- yes
- no

11. Is organic produce available from the store from which you most often purchase groceries?

- yes
- no
- unsure

***How important are the following to you when purchasing fresh produce?***

	Very Important		Somewhat Important		Not Important
12. Ripeness	1	2	3	4	5
13. Freshness	1	2	3	4	5
14. Country where produce is grown	1	2	3	4	5
15. Absence of pesticide residues	1	2	3	4	5
16. Price	1	2	3	4	5

17. Organically produced food uses **no** synthetic pesticides and are normally labeled as such in the super-market. How frequently do you choose fresh food and vegetables that are organically grown?

- never
- occasionally
- usually
- always

18. Would you switch supermarkets to be able to purchase organic produce?

- yes
- no

19. Suppose your favorite fresh vegetable that you purchase regularly costs \$1 per pound. Would you pay slightly more for organic certified produce?

- no
- yes, I would pay between 1 cent and 5 five cents more for organic produce
- yes, I would pay between 6 cents and 10 cents more for organic produce
- yes, I would pay between 11 cents and 15 cents more for organic produce
- yes, I would pay between 16 cents and 20 cents more for organic produce
- yes, I would pay over 21 cents more for organic produce

**How do you think organically grown produce compares to conventionally grown produce in supermarkets and other retail facilities?**

20. In terms of **quality**

- Better
- Worse
- Same
- Unsure

21. In terms of **variety**

- Higher
- Lower
- Same
- Unsure

22. In terms of **prices**

- Higher
- Lower
- Same
- Unsure

23. Does your family consciously eat healthy foods?

- yes
- no

24. If you have purchased organically grown produce at least occasionally, what are the four organic fruits or vegetables you have purchased most often:

- 1. \_\_\_\_\_
- 2. \_\_\_\_\_
- 3. \_\_\_\_\_
- 4. \_\_\_\_\_

25. Do any members of your household have nutritional related health problems?

- yes
- no

How do you feel about the following?	Serious hazard	Somewhat of a hazard	Not a hazard at all
26.Residues from pesticides or herbicides	1	2	3
27.Antibiotics found in poultry and livestock	1	2	3
28.Growth stimulant in poultry and livestock	1	2	3
29.Artificial fertilizers	1	2	3
30.Additives and preservatives	1	2	3
31.Artificial coloring	1	2	3

32.Have you heard or read any news reports about integrated pest management (IPM)?  
 yes                       no

**How do you feel about the following statements?**                      **Agree    Neutral    Disagree**

33. Conventional produce is generally safe to consume	1	2	3
34. There is basically no difference between the safety of conventional and organic produce	1	2	3
35. The use of synthetic chemicals in agriculture has a negative effect on the environment	1	2	3
36. I would buy organic produce if it were more readily available	1	2	3
37. I would buy organic produce if it were cheaper	1	2	3

**Please select the amount and types of produce you purchased in 1999:**

38. Conventional Produce     all     most     some     none  
39. Organic Produce             all     most     some     none

40. Do the availability and quality of fresh produce affect where you do most of your food shopping?  
 yes                       no

Your answers to the following questions are strictly kept confidential and will help us interpret the results of this survey.

41. How many persons, including yourself live in your household?

\_\_\_\_\_

42. How many persons in your household are below the age of 17?

\_\_\_\_\_

43. Approximately how much does your household spend on *produce* each month (produce only)?

\$\_\_\_\_\_

44. Are you the primary shopper for food in your household?

yes       no

45. How would you describe your neighborhood?

urban       suburban       rural

46. Please indicate your gender.

female       male

47. In what range does your age (in years) fall? (Please circle one)

**1**                      **2**                      **3**                      **4**                      **5**  
less than 20      21 - 35      36 - 50      51 - 65      over 65

48. Please select the highest level of education you have completed. (Please circle one)

**1**                      **2**                      **3**                      **4**                      **5**                      **6**                      **7**                      **8**  
Some      Some      High      Some      College      Some      Masters      Doctoral  
Grade      High      School      College      Graduate      Graduate      Degree      Degree  
School      School      Graduate      College      Graduate      School  
School      School      Graduate

49. In what range does your annual household income fall? (Please circle one)

**1**                      **2**                      **3**                      **4**                      **5**                      **6**  
Less      \$20,000      \$40,000      \$60,000      \$80,000      More  
than      to      to      to      to      than  
\$20,000      \$39,999      \$59,999      \$79,999      \$99,999      \$100,000



50. Which of the following **best** describes your current marital status. (Please circle one)

- ①                      ②                      ③                      ④                      ⑤                      ⑥  
Single                Married                Separated             Divorced             Widower(d)           Other

51. How would you classify yourself in terms of trying a newly introduced food product in the supermarket?

- among the first to try
- among the last to try
- between the first and last to try
- never try

## ***Appendix II***

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The following was taken from the USDA website on January 17, 2001. It can be found at: <http://www.ams.usda.gov/nop/facts/index.htm>. It is provided here to supply the reader with the additional considerations that were made after the survey was completed. Reports done in the future will include variables that take into effect the labeling of organic products as “Organic” and “100% Organic.” While this report predates these changes by the USDA, this appendix is useful because it provides the reader with the additional considerations that must be made in future organic consumer-driven modeling.

### **National Organic Program Overview**

The Organic Foods Production Act (OFPA) of 1990, adopted as part of the 1990 Farm Bill, requires USDA to develop national standards for organically produced agricultural products to assure consumers that agricultural products marketed as organic meet consistent, uniform standards. The OFPA and the National Organic Program (NOP) require that agricultural products labeled as organic originate from farms or handling operations certified by a State or private agency that has been accredited by the U.S. Department of Agriculture (USDA).

The NOP is a marketing program housed within the USDA Agricultural Marketing Service, the agency that sets marketing standards. Neither the OFPA nor these final regulations address food safety or nutrition.

#### How the National Organic Program was developed

The OFPA requires USDA to develop national organic standards and establish an organic certification program based on recommendations of a 15-member National Organic Standards Board (NOSB).

In addition to NOSB recommendations, USDA reviewed State, private and foreign organic certification programs to help formulate these regulations. The final regulations are similar to most of the standards organic producers and handlers currently use, and are intended to be flexible enough to accommodate the wide range of operations and products grown and raised in every region of the United States.

In December 1997, USDA published a proposed rule and received 275,603 public comments, explaining why and how the rule should be rewritten. A revised proposal was published in March 2000. An additional 40,774 comments were received, many of which were incorporated into the final rule.

#### What's in the final rule?

The final regulation prohibits the use of genetic engineering (included in excluded methods), ionizing radiation, and sewage sludge. The rule includes the following:

Production and handling requirements, which address organic crop production, wild crop harvesting, organic livestock management, and processing and handling of organic agricultural products. The National List of Allowed Synthetic and Prohibited Non-Synthetic Substances is also included. Labeling requirements for organic products, along with compliance, testing, fee, and State program approval requirements.

### Certification and record-keeping requirements.

Accreditation requirements for receiving and maintaining accreditation, as well as requirements for foreign accreditation. Other administrative functions of the NOP, which include evaluation of foreign organic certification programs.

### What's changed in the final regulation?

We increased the minimum percentage of organic ingredients in products labeled "Made with Organic Ingredients" from 50 percent to 70 percent.

We adopted 5 percent of the Environmental Protection Agency's pesticide residue tolerance as the pesticide residue compliance threshold.

We allowed wine containing sulfites to be labeled "Made with Organic Grapes."

We adjusted the organic feed requirements for dairy herds when a producer converts the entire herd to organic production as a single, one-time event.

We minimized the burden on small farmers through a change in the composting standards.

We redesigned the USDA Organic Seal to minimize consumer confusion.

We made clear that use of ionizing radiation, sewage sludge, and excluded methods are prohibited throughout organic production and handling. The rule does allow one potential exception for use of animal vaccines produced using excluded methods, but only if they are first specifically recommended by the NOSB and approved by the Secretary, subject to notice and comment rulemaking.

We established a peer review process which will annually evaluate the NOP's accreditation decisions and adherence to accreditation procedures.

We added commercial availability provisions that require handlers to use organic ingredients in "organic" products whenever possible.

We established new requirements for the labeling of organic livestock feed products.

We allowed handlers to designate on the principal display panel the exact percentage of organic content of their product.

This final rule becomes effective 60 days after its publication in the Federal Register and will be fully implemented 18 months after its effective date. Eighteen months after the effective date, all agricultural products that are sold, labeled, or represented as organic must be in compliance with these regulations. The USDA Seal may not be affixed to any "100 percent organic," or "organic," product until 18 months after the final rule's effective date. Farms and handling operations that sell less than \$5,000 annually of organic agricultural products are exempt from certification. These producers and handlers, while exempt from certification and the preparation of an organic plan, must comply with all other national standards for organic products and may label their products as organic.

## **Certifying Agent Accreditation and Equivalency of Imported Products**

The Organic Foods Production Act of 1990 (OFPA) directs the U.S. Department of Agriculture (USDA) to accredit certifying agents so they can certify that producers and handlers representing their products as organic have complied with USDA regulations.

USDA's accreditation program establishes requirements an applicant must meet in order to become an accredited organic certifying agent, and procedures and requirements to maintain accreditation. The program is designed to ensure that all organic certifying agents act consistently and impartially. There are nearly 50 private and State organic certification programs in the United States, some of which have existed for 20 years or more. Most are expected to apply for USDA accreditation.

Applicants for accreditation must:

Employ personnel, including inspectors, who have sufficient experience and training in organic production and handling to carry out certification activities.

Demonstrate their ability to certify organic producers and/or handlers; maintain proper records; adequately communicate with producers, handlers, and the public; and communicate with USDA about decisions made.

Prevent conflicts of interest and maintain strict confidentiality.

Applicants granted accreditation must conduct annual performance appraisals of their inspectors and other personnel involved in the certification process, and have an annual program evaluation of their certification activities.

Accreditation process

Certifying agents will apply for accreditation to the Administrator of the Agricultural Marketing Service. Applicants will sign and return a statement of agreement prepared by the Administrator. USDA will evaluate the application to ensure that the certifying agent can comply with the NOP requirements, including a site evaluation at the applicant's place of business. The site evaluator's report will be reviewed by USDA staff. A peer review panel will annually evaluate the NOP's accreditation decisions and adherence to accreditation procedures. Accreditation will be for 5 years. Applications for renewal of accreditation are due 6 months prior to expiration of the accreditation. Certifying agents will submit to USDA annual updates on their certification activities. USDA will conduct one or more site evaluations during the period of accreditation to determine compliance with the OFPA and NOP regulations.

Equivalency of imported products

The OFPA requires USDA to review the certification programs under which imported organic products are produced to ensure that they meet the requirements of the National Organic Program (NOP). Certifying agents operating in foreign countries may apply for USDA accreditation. Foreign applicants will be evaluated based on the same criteria as domestic certifying agents.

In lieu of USDA accreditation, a foreign certifying agent may:

Receive recognition when USDA has determined, upon the request of a foreign government, that the foreign certifying agent's government authority is able to assess and accredit certifying agents as meeting the requirements of the NOP; or

Receive recognition as meeting requirements equivalent to the requirements of the NOP under an equivalency agreement negotiated between the United States and the foreign government.

Once accreditation or recognition is granted, organic product produced under the oversight of the certifying agent or foreign government will be eligible to be imported into this country and labeled as organic.

## State Organic Programs

The Organic Foods Production Act of 1990 (OFPA) authorizes the Secretary of Agriculture to approve State organic programs that are consistent with the national organic standards and regulations established under the OFPA. Under USDA's National Organic Program (NOP), a State government may request the Secretary to approve its State organic program. Once a State's requested organic requirements are approved by the Secretary, those requirements become the NOP requirements for organic producers, handlers, and certifying agents operating in the State.

### What criteria must a State organic program meet to be approved by the Secretary?

Under the NOP final rule, a State's organic requirements cannot be less restrictive than NOP requirements. State organic programs can have more restrictive requirements than the NOP. These more restrictive organic requirements will be approved by the Secretary only if those requirements are found to be necessary in light of a particular environmental condition or unique production or handling practice in the State or a particular area of the State. For instance, a State may request approval of additional restrictions to protect a sensitive watershed. A State's more restrictive standards cannot be applied to production and handling activities outside its jurisdiction. Finally, a State's more restrictive requirements cannot be used to discriminate against organic products produced in other States.

### Must a State assume responsibilities for administration of its State organic program?

Yes. The governing State official of a State organic program must agree to administer the NOP program, including any approved more restrictive State requirements. The State's organic program will oversee certified organic producers and handlers in the State to assure that they are operating in compliance with the NOP. Working with certifying agents, the State organic program will administer enforcement and appeal procedures to make sure all certified organic operations are in compliance with NOP and State requirements. However, only the NOP will exercise compliance authority over accredited certifying agents operating in the State.

States may also administer other organic programs outside the jurisdiction of the OFPA, such as research and promotion programs, tax incentives, or transition assistance for organic producers within the State. Such projects will not be subject to the Secretary's approval, provided they do not conflict with the general requirements of the Act.

### What happens if a State doesn't have a State organic program?

In States with no approved State organic program, USDA will administer and enforce the requirements of the NOP. USDA will monitor any State, private, and foreign certifying agents operating within the State to assure compliance with the national program.

### What steps are followed to implement a State organic program?

States with established organic programs and States that intend to establish a new organic program must submit an application to the Secretary for the approval of their State organic program. The request for approval must describe the State organic program and provide justification statements on any more restrictive requirements requested by the State. Once approved, the State organic program, including any additional requirements, becomes the NOP for that State. The State also must agree to administer the State's additional requirements and NOP requirements in the State. Existing and new State organic programs should be approved and operating when the NOP is implemented, 18 months after the final rule becomes effective. The Secretary will review requests to amend an approved State program, and will review the State organic program at least once every 5 years.

## Organic Production and Handling Standards

The National Organic Program (NOP) final rule contains regulations that will ensure that organically labeled products meet consistent national standards.

What agricultural operations are affected by the standards?

Any farm, wild crop harvesting, or handling operation that wants to sell an agricultural product as organically produced must adhere to the national organic standards. Handling operations include processors, manufacturers, and repackers of organic products. These requirements include operating under an organic system plan approved by an accredited certifying agent and using materials in accordance with the National List of Allowed Synthetic and Prohibited Non-Synthetic Substances. Operations that sell less than \$5,000 a year in organic agricultural products are exempted from certification and preparing an organic system plan, but they must operate in compliance with these regulations and may label products as organic. Retail food establishments that sell organically produced agricultural products but do not process them are also exempt from certification.

### Standards apply to production process

The national organic standards address the methods, practices, and substances used in producing and handling crops, livestock, and processed agricultural products. The requirements apply to the way the product is created, not to measurable properties of the product itself. Although specific practices and materials used by organic operations may vary, the standards require every aspect of organic production and handling to comply with the provisions of the Organic Foods Production Act (OFPA). Organically produced food cannot be produced using excluded methods, sewage sludge, or ionizing radiation.

### Crop standards

Land will have no prohibited substances applied to it for at least 3 years before the harvest of an organic crop. The use of genetic engineering (included in excluded methods), ionizing radiation and sewage sludge is prohibited. Soil fertility and crop nutrients will be managed through tillage and cultivation practices, crop rotations, and cover crops, supplemented with animal and crop waste materials and allowed synthetic materials.

Preference will be given to the use of organic seeds and other planting stock, but a farmer may use non-organic seeds and planting stock under specified conditions. Crop pests, weeds, and diseases will be controlled primarily through management practices including physical, mechanical, and biological controls. When these practices are not sufficient, a biological, botanical, or synthetic substance approved for use on the National List may be used.

### Livestock standards

These standards apply to animals used for meat, milk, eggs, and other animal products represented as organically produced.

Animals for slaughter must be raised under organic management from the last third of gestation, or no later than the second day of life for poultry. Producers are required to feed livestock agricultural feed products that are 100 percent organic, but may also provide allowed vitamin and mineral supplements. Producers may convert an entire, distinct dairy herd to organic production by providing 80 percent organically produced feed for 9 months, followed by 3 months of 100 percent organically produced feed. Organically raised animals may not be given hormones to promote growth, or antibiotics for any reason. Preventive management practices, including the use of vaccines, will be used to keep animals healthy. Producers are prohibited from withholding treatment from a sick or injured animal; however, animals treated with a prohibited medication may not be sold as organic. All organically raised animals must have

access to the outdoors, including access to pasture for ruminants. They may be temporarily confined only for reasons of health, safety, the animal's stage of production, or to protect soil or water quality.

#### Handling standards

All non-agricultural ingredients, whether synthetic or non-synthetic, must be included on the National List of Allowed Synthetic and Prohibited Non-Synthetic Substances. Handlers must prevent the commingling of organic with non-organic products and protect organic products from contact with prohibited substances. In a processed product labeled as "organic," all agricultural ingredients must be organically produced, unless the ingredient(s) is not commercially available in organic form.

#### Labeling and Marketing Information

The Organic Foods Production Act and the National Organic Program (NOP) are intended to assure consumers that the organic foods they purchase are produced, processed, and certified to consistent national organic standards. The labeling requirements of the new program apply to raw, fresh products and processed foods that contain organic ingredients. Foods that are sold, labeled, or represented as organic will have to be produced and processed in accordance with the NOP standards.

Except for operations whose gross agricultural income from organic sales totals \$5,000 or less, farm and processing operations that grow and process organic foods must be certified by USDA-accredited certifying agents. A certified operation may label its products or ingredients as organic and may use the "USDA Organic" seal.

#### Labeling requirements are based on the percentage of organic ingredients in a product.

Foods labeled "100 percent organic" and "organic"

Products labeled as "100 percent organic" must contain (excluding water and salt) only organically produced ingredients.

Products labeled "organic" must consist of at least 95 percent organically produced ingredients (excluding water and salt). Any remaining product ingredients must consist of nonagricultural substances approved on the National List or non-organically produced agricultural products that are not commercially available in organic form.

Products meeting the requirements for "100 percent organic" and "organic" may display these terms and the percentage of organic content on their principal display panel.

The USDA seal and the seal or mark of involved certifying agents may appear on product packages and in advertisements.

Foods labeled "100 percent organic" and "organic" cannot be produced using excluded methods, sewage sludge, or ionizing radiation.

Processed products labeled "made with organic ingredients"

Processed products that contain at least 70 percent organic ingredients can use the phrase "made with organic ingredients" and list up to three of the organic ingredients or food groups on the principal display panel. For example, soup made with at least 70 percent organic ingredients and only organic vegetables may be labeled either "soup made with organic peas, potatoes, and carrots," or "soup made with organic vegetables."

Processed products labeled "made with organic ingredients" cannot be produced using excluded methods, sewage sludge, or ionizing radiation.

The percentage of organic content and the certifying agent seal or mark may be used on the principal display panel. However, the USDA seal cannot be used anywhere on the package.

Processed products that contain less than 70 percent organic ingredients

These products cannot use the term organic anywhere on the principal display panel. However, they may identify the specific ingredients that are organically produced on the ingredients statement on the information panel.

#### Other labeling provisions

Any product labeled as organic must identify each organically produced ingredient in the ingredient statement on the information panel.

The name and address of the certifying agent of the final product must be displayed on the information panel.

There are no restrictions in this final rule on use of other truthful labeling claims such as "no drugs or growth hormones used," "free range," or "sustainably harvested."

#### Penalties for misuse of labels

A civil penalty of up to \$10,000 can be levied on any person who knowingly sells or labels as organic a product that is not produced and handled in accordance with the National Organic Program's regulations.

When the new regulations become effective, organic farmers and handlers will have 18 months to adjust their growing and processing operations and revise their product labels to conform to the new standards.

## **Certification**

The U.S. Department of Agriculture (USDA) will accredit State, private, and foreign organizations or persons to become "certifying agents." Certifying agents will certify that production and handling practices meet the national standards.

#### Who needs to be certified?

Operations or portions of operations that produce or handle agricultural products that are intended to be sold, labeled, or represented as "100 percent organic," "organic," or "made with organic ingredients" or food group(s).

#### Who does NOT need to be certified?

Farms and handling operations that sell less than \$5,000 a year in organic agricultural products. Although exempt from certification, these producers and handlers must abide by the national standards for organic products and may label their products as organic. Handlers, including final retailers, that do not process or repackage products. Handlers that only handle products with less than 70 percent organic ingredients. A handling operation or portion of an operation that is a retail food establishment that processes or prepares, on the premises of the establishment, raw and ready-to-eat food labeled organic. A handling operation that chooses to use the word organic only on the information panel. A handling operation that handles products that are packaged or otherwise enclosed in a container prior to being received by the operation and remain in the same package.



### How will farmers and handlers become certified?

An applicant will submit specific information to an accredited certifying agent. Information will include:

Type of operation. History of substances applied to land for the previous 3 years. Organic products being grown, raised, or processed. Applicant's organic plan, which includes practices and substances used in production. The organic plan also must describe the monitoring practices to be performed to verify that the plan is effectively implemented, the record-keeping system, and the practices to prevent commingling of organic and non-organic products and to prevent contact of products with prohibited substances.

Applicants for certification will have to keep accurate post-certification records for 5 years concerning the production, harvesting, and handling of agricultural products that are to be sold as organic.

These records should document that the operation is in compliance with the regulations and verify the information provided to the certifying agent. Access to these records must be provided to authorized representatives of USDA, including the certifying agent.

### Inspection and certification process

Certifying agents will review applications for certification eligibility. A qualified inspector will conduct an on-site inspection of the applicant's operation. Inspections will be scheduled when the inspector can observe the practices used to produce or handle organic products and talk to someone knowledgeable about the operation.

The certifying agent will review the information submitted by the applicant and the inspector's report. If this information shows that the applicant is complying with the relevant standards and requirements, the certifying agent will grant certification and issue a certificate. Certification will remain in effect until terminated, either voluntarily or through the enforcement process.

Annual inspections will be conducted of each certified operation, and updates of information will be provided annually to the certifying agent in advance of conducting these inspections. Certifying agents must be notified by a producer immediately of any changes affecting an operation's compliance with the regulations, such as application of a prohibited pesticide to a field.

### Compliance review and enforcement measures

The rule will permit USDA or the certifying agent to conduct unannounced inspections at any time to adequately enforce the regulations. The Organic Foods Production Act also requires that residue tests be performed to help in enforcement of the regulations. Certifying agents and USDA will conduct residue tests of organically produced products when there is reason to believe that they have been contaminated with prohibited substances. If any detectable residues are present an investigation will be conducted to determine their source.