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**Consumer Preferences for Non-Conventionally Grown Produce**

**by**
**Sheila E. Underhill**
**and**
**Enrique E. Figueroa**

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Department of Agricultural Economics
Cornell University Agricultural Experiment Station
New York State College of Agriculture and Life Sciences
A Statutory College of the State University
Cornell University, Ithaca, New York, 14853

# CONSUMER PREFERENCES FOR NON-CONVENTIONALLY GROWN PRODUCE[1]

Sheila. E. Underhill[2] and Enrique E. Figueroa[3]

## INTRODUCTION

Surveys indicate that food safety issues, particularly pesticide residues in or on food, are an important concern for consumers. While the numbers vary among surveys, in most cases, pesticide residues emerge near the top of the list of food safety concerns (van Ravenswaay 1988). Additionally, comparing surveys over a 20-year period reveals that the level of concern has risen dramatically. At the same time, confidence in the adequacy of government pesticide regulation has plummeted (Sachs et al 1984).

The hypothesis of this study is that produce grown without or with reduced synthetic chemical inputs may be preferred by consumers over conventionally grown produce. Alternatively, consumers may prefer residue testing as an assurance that the produce they are consuming is safe. Several labels have been used or have been proposed for use on produce which indicate some form of enhanced food and/or environmental safety benefits over those of conventional produce.[4] Four such labels were investigated in this study: Organic, Certified Organic, Certified Pesticide Residue-Free, and Grown with IPM.

Since the labels imply different levels of safety benefits, one important question is whether consumers are knowledgeable enough about the meanings of the labels to make purchasing decisions that reflect their preferences with regard to food and environmental safety. Additionally, if consumers are informed about the labels, which label is most preferred, and would they be willing to pay more for labeled produce than for conventional produce?

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[1]--Paper presented at the Valuing Food Safety and Nutrition Conference, Alexandria, Virginia, June 2-4, 1993.
[2]--Graduate Research Assistant, Department of Agricultural Economics, Cornell University, Ithaca, NY, May, 1993
[3]--Associate Professor, Department of Agricultural Economics, Cornell University, Ithaca, NY, May, 1993.
[4]--The authors assume the labels are clearly visible to produce shoppers.

**Objectives**

The primary goal of this study was to determine how consumers' preferences for purchasing and willingness to pay for produce with the labels are influenced by receiving information about them. Specific objectives were:

1) Determine consumers' level of familiarity and/or experience with the labels.

2) Determine consumers' preferences for purchasing and willingness to pay for produce with the labels under conditions of a) their existing state of knowledge and b) information about the labels provided.

3) Identify, for each label, a segment of the population, based on demographic characteristics, which would be most positively influenced by information to purchase and willingness to pay for produce with the label.

4) Add insights into developing an appropriate methodology for this type of research inquiry.

**DATA**

A survey instrument was mailed to 1500 randomly selected households in the Northeast (ME, NH, VT, MA, CT, RI, NY, NJ, and PA).[5] The mailing list was obtained from Survey Sampling, Inc. (Fairfield, CT) and was chosen from telephone directory listings which are updated quarterly. The sample was drawn proportionately according to the populations of the states in the study.

In order to test the information effect, information about the labels was provided to half of the sample (the "informed" group) so that their answers could be compared to the other half which did not receive information (the "uninformed" group). The sub-samples were chosen by sorting the mailing list by zip code so that they were geographically as similar as possible.

[5]--Considerable effort went into the design of the questionnaire to make it clear and easy to complete, minimize bias associated with wording of questions, and enhance the return rate. It was critiqued by a number of professionals familiar with survey work, including the director of the Survey Research Facility at the Cornell Institute for Social and Economic Research (CISER). An informal pretest was done, and the mailings were carried out following the technique of Dillman 1978, except that, due to insufficient funds, bulk mail rather than first class had to be used.

Five hundred and thirty-four (534) usable survey instruments were returned. The response rate was 42% after correcting for 225[6] non-deliverable instruments. The responses were almost equally divided between the informed and uninformed groups, with 263 informed and 271 uninformed responses.

The demographic characteristics of survey respondents were compared with 1990 Census data in order to determine if they were representative of the sampled population. The age profile of respondents was very similar to the Census data, but respondents were more highly educated, had a slightly higher median income ($40,000 per year versus $36,000), and minority groups were underrepresented. See Table 1. No attempts were made to correct for possible bias or for non-respondents.

## ANALYTICAL PROCEDURES

### Test for Bias Between the Informed and Uninformed Groups

Frequencies were calculated on answers to all of the questions separately for the informed and uninformed groups. These were subjected to chi-square analysis in order to detect responses that differed between the groups. The purpose of this was to determine if the two groups were similar with respect to beliefs about hazards of pesticides, familiarity and previous experience with the labels, demographics, and background variables such as gardening activity and whether they shop in health food stores.

### The Ordered Logit Model

The likelihood of purchase and willingness to pay questions were asked such that the respondents answered on a scale of 1 to 5 with answers ranging from very likely to very unlikely and would not purchase to would pay more than 20% more, respectively.

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[6]--Since bulk mail was used, the undeliverable questionnaires were not returned, so it was impossible to know exactly how many were not delivered. Survey Sampling, Inc. reports a fairly consistent deliverable rate of 85% for their mailing lists, so this was used to calculate the undeliverables. In fact, the 85% is based on first class mail, so the actual deliverable rate may have been even lower.

Two estimation procedures, Probit and Logit, can be used when the dependent variables are discrete. Both use Maximum Likelihood Estimation (MLE). The Logit procedure, however, is preferable when the dependent variable has more than two categories (Aldrich and Nelson 1984). Additionally, Logit can be used when it is desirable for the estimation procedure to take into account an inherent ordering of the categories of the dependent variable. This is termed the ordered Logit procedure and was used to address objectives 2 and 3.

The equations for likelihood of purchase are:

$$\text{BuyO} = ß_0 + ß_1\text{Age} + ß_2\text{Livenow} + ß_3\text{Sex} + ß_4\text{Info} \quad (1)$$
$$\text{BuyCO} = \_0 + \_1\text{Age} + \_2\text{Livenow} + \_3\text{Sex} + \_4\text{Info} \quad (2)$$
$$\text{BuyPF} = s_0 + s_1\text{Age} + s_2\text{Livenow} + s_3\text{Sex} + s_4\text{Info} \quad (3)$$
$$\text{BuyIPM} = f_0 + f_1\text{Age} + f_2\text{Livenow} + f_3\text{Sex} + f_4\text{Info} \quad (4)$$

and the equations for willingness to pay are:

$$\text{PayO} = l_0 + l_1\text{Age} + l_2\text{Livenow} + l_3\text{Income} + l_4\text{Info} \quad (5)$$
$$\text{PayCO} = d_0 + d_1\text{Age} + d_2\text{Livenow} + d_3\text{Income} + d_4\text{Info} \quad (6)$$
$$\text{PayPF} = q_0 + q_1\text{Age} + q_2\text{Livenow} + q_3\text{Income} + q_4\text{Info} \quad (7)$$
$$\text{PayIPM} = a_0 + a_1\text{Age} + a_2\text{Livenow} + a_3\text{Income} + a_4\text{Info}, \quad (8)$$

where:

Age = continuous variable constructed by taking the midpoints of the age categories,
Livenow = 1 if live in suburban/rural setting (suburban, village or hamlet, or rural); 0 otherwise (metropolitan or small city),
Sex = 1 if female; 0 otherwise,
Income = continuous variable constructed by taking the midpoints of the income categories,
Info = 1 if received information; 0 otherwise,

and the suffixes denote the following:

O = Organic label
CO = Certified Organic label
PF = Certified Pesticide Residue-Free label
IPM = Grown with IPM label.

The variables included in the equations were those shown to be significant by preliminary regression runs. The education variable was not found to have an effect on the outcomes of either likelihood of purchasing or paying more so was not included in the equations. Similarly, sex was not found to have an effect on willingness to pay and income did not affect purchase likelihood.

This study does not focus on the predictive ability of the equations, but on testing of the information effect and investigating the importance of demographics in purchase likelihood and willingness to pay. Byrne et al 1991 argue that inclusion of independent variables such as beliefs and behaviors may enhance the predictive ability of the equation at the expense of valid parameter estimates for the variables of interest. For this reason, only the variables of interest are included in the equations, i.e., the information and demographic variables.

Since the ordered Logit procedure does not allow for simultaneous solution of equations,[7] the equations were estimated singly, even though it is likely that preferences for the labels are related.

## METHODOLOGICAL CONSIDERATIONS

This paper contributes to the development of a methodology for evaluating consumer 'stated' preferences, i.e., willingness to purchase and/or pay. First, it is built upon the theory of two-stage utility maximization. In the first stage, consumers maximize utility with respect to all goods, while in the second stage, produce with a label is considered to be a product which is differentiated from unlabeled produce by virtue of the attributes implied by the label, and therefore

[7]--Prof. G. Jacobsen, School of Industrial and Labor Relations, Cornell University, personal communication.

is a substitute for unlabeled, or conventional, produce, i.e., lettuce with the Organic label is a different product than conventionally grown lettuce. Therefore, demand schedules can be obtained from the utility maximization process. The unavailability of price and quantity data for produce with the labels limit the ability of our model to produce demand schedules at the present time. However, as this data becomes available, the explanatory power of the model should increase.

The second aspect of our model which contributes to the body of literature on methodology is the use of a Logit estimator and the interpretation of "predicted probabilities" and "marginal effects" that result from the estimation. Though predicted probabilities do not necessarily translate to purchase behavior, they do serve to compare probable behavior across labels. Moreover, the marginal effects of the demographic variables across labels adds to the understanding of references between labels. We are confident that the model accurately measures the impact of information on consumer preferences and this measurement is most likely the better application of the model.

## RESULTS

### Chi-Square Analysis

No important source of bias was found between the informed and uninformed groups. There were only three questions found to be statistically different, and none of these were considered to be important enough to have an impact on conclusions of the study. Two of these were household situation (married, single, etc.) and presence of household members aged 13-19, at the .10 and .05 levels, respectively. Previous purchase experience of Certified Organic produce was also statistically different (.05), with more informed respondents stating they purchase it occasionally, and more uninformed respondents purchasing it regularly. When these two categories are combined, however, there is no statistical difference between the groups.

**Beliefs About the Hazards of Pesticides**

Three questions were asked in which respondents were asked to circle the statement they most agreed with regarding hazards posed by pesticides to consumers, the environment, and farm workers. Five statements were given for each question, ranging from very hazardous to not likely to pose a hazard.

For the question about hazards to consumers, 71% of those responding felt that pesticide residues in food pose a serious to moderate health hazard. This is consistent with previous surveys. Eleven percent (11%) felt that even though there may be residues in food, they did not present a hazard, and only 3% felt that it was not likely that any residues remained in food.

Seventy-four percent (74%) felt that pesticides pose a serious to moderate hazard to the environment, 6% felt that contamination of the environment from pesticides was not a problem, and 4% felt that pesticides were not likely to cause contamination of the environment.

Sixty-four percent (64%) felt that pesticides (even if used according to directions) present a serious to moderate hazard for farm workers, 16% felt that pesticides only presented a hazard if not used according to directions, and only 1% felt that there was no hazard to farm workers.

Chi-square analysis on responses to the belief questions revealed no significant difference in responses given by the informed versus the uninformed groups.

**Familiarity and Experience with the Labels**

Three questions were asked to assess respondents' familiarity with produce with the labels. The first asked if they had ever seen the labels on produce in a store where they shop, the second asked if they were familiar with what is meant by the labels, and the third asked about frequency of purchasing the labels. Table 2 summarizes the responses to these questions.

Overall, 62% had seen the Organic label, as opposed to only 13% who had seen the Certified Organic label. Only 4% reported seeing the CPRF label and 1.3% had seen Grown with IPM. Since the Grown with IPM label is not currently being used in stores, it is hypothesized that those reporting having seen the label have been exposed to it either at farmers' markets or at

roadside stands where individual farmers have chosen to promote their produce as grown with IPM.

Of those who had seen the Organic label, 53% reported purchasing produce labeled as Organic regularly or occasionally. This translates to 33% of all respondents.[8] Since only 17% reported shopping in health food stores, and since the availability of Organic produce at conventional grocery stores is limited, it may be that farmers' markets and other direct marketing efforts account for a significant portion of the Organic produce sold in the Northeast. Of those who had seen the Certified Organic label, 15% reported purchasing it regularly or occasionally, which translates to about 2% of respondents. Eight percent of those who had seen the CPRF label purchase it regularly or occasionally (0.3% of respondents), and 2% of those who had seen Grown with IPM purchase it (.03% of respondents).[9]

Overall, 78% of the respondents stated that they were familiar with what is meant by Organic, 44% were familiar with Certified Organic, 43% with Certified Pesticide Residue-Free, and only 13% with Grown with IPM. The implications for the information effect are that: 1) for Organic, since a majority of people are familiar with the concept, providing information may not have as much of an effect on likelihood of purchasing as it would for the other labels, 2) since less than half reported knowledge of Certified Organic and Certified Pesticide Residue-Free, a larger information effect would be expected, and 3) since so few respondents reported knowledge of Grown with IPM, there is a potential for a very significant information effect.

It should be noted, however, that since respondents were not asked for their definitions of what the labels mean, the accuracy of their knowledge about the labels is not known. Therefore, information can be expected to have an effect on some respondents who reported knowledge of the labels, since that knowledge may not have been accurate or may have been less than what was provided in the survey.

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[8]--Calculated by: 53% of those who had seen the label purchase it regularly or occasionally multiplied by 62% who had seen the label = 33% of all respondents.

[9]--The low percentage for purchasing the CPRF label may indicate that this produce is not available regularly enough for respondents to purchase it with any regularity or that it is not labeled at the retail level. As mentioned in the text, this is certainly the case for Grown with IPM.

Since the focus of the study was to ascertain the effect of informing consumers in general, rather than individuals, the level of knowledge of individual respondents was not used in the analysis of likelihood of purchase or willingness to pay. Since the assumption underlying this study is that the level knowledge of respondents is similar to that of the population being sampled, i.e., residents of the Northeast, results of the study can be extended to give an indication of how consumers would respond to information about the labels. Likewise, beliefs about hazards of pesticides were not entered into the analysis.[10]

Familiarity and experience with the Organic label was considerably higher than for the others, and this may have some implications for how accurately respondents were able to answer the likelihood of purchase and willingness to pay questions about the Organic versus the other labels.

Insight was gained about how respondents with and without previous experience with the Organic label perceive the quality and appearance of produce with the label as compared to conventional produce. Two questions were asked in which quality and appearance were rated as compared to conventional produce on a scale of 1 to 5, from much better to much worse. Chi-square tests were performed on the answers given by respondents who had seen or purchased the label versus those who had not. Interestingly, there was no significant difference at the .10 level.

This result is significant since respondent misperception[11] is considered to be an important source of bias in contingent valuation studies (Mitchell and Carson 1988). Assuming that perceived quality and appearance are important factors in the purchase decision, this result may indicate that respondents without previous experience with the labels are as able to answer accurately whether they would purchase and pay more for produce with the label as are those with experience.

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[10]--The authors recognize the bias in our sample and therefore accept the limitations of extending our findings to the general public.

[11]--Respondent misperception occurs when respondents do not correctly perceive some attribute(s) of the good being valued and is more likely to occur when they are not familiar with the good.

**The Information Effect**

The information provided to the "informed" group of respondents consisted of a short paragraph about each label which was intended to be an objective statement of what growing practices or testing procedures were used.[12] The statements were reviewed by several professionals familiar with growing practices in order to ensure their accuracy.[13] The statements are as follows:

> Organically grown fruits and vegetables are grown under a system of ecological soil management which relies on building fertility through crop rotations, recycling organic wastes, and balanced mineral additions. Pests may be controlled by applying naturally-occurring materials, but no man-made fertilizers or pesticides are used. No artificial preservatives, waxes, or gases are used after harvest.
>
> Certified organically grown fruits and vegetables have been certified as being organically grown by a third party such as an organic growers association or state agency. This provides added assurance that organic methods were used.
>
> Certified pesticide residue-free fruits and vegetables have been laboratory-tested and certified as having no pesticides remaining at the time of purchase, even though pesticides may have been used in their production.
>
> Grown with IPM (Integrated Pest Management) fruits and vegetables are grown under a system in which the numbers of pests are closely monitored. Naturally-occurring materials and/or man-made pesticides are used only when the numbers of pests become large enough to damage the quality of the fruits and vegetables. This method may result in less pesticide use than under conventional growing methods.

*Likelihood of Purchasing Produce with the Labels*

Results of the ordered Logit regressions for likelihood of purchase can be found in Tables 3-6. The information effect was found to be positive for all of the labels and was significant (at least at the .10 level) for all but the Certified Pesticide Residue-Free label, i.e., there is a greater likelihood of purchasing when information is provided. The magnitude of the shift in probability

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[12]--The authors make the assumption that the "informed" respondents read the information about the labels.

[13]--Prof. Christopher Wien, Department of Vegetable Crops, Carrie Koplinka-Loehr, New York State IPM Program, Judy Green, Farming Alternatives Program, Cornell University.

from less to more likely that is attributable to the information effect was, however, much greater for Grown with IPM (.2012) than for Organic (.0778) or Certified Organic (.0750). This is due, no doubt, to the fact that consumer knowledge about the Grown with IPM label was much lower than for the other labels before information was provided.

The calculated probabilities of being somewhat or very likely to purchase the labels imply a preference ranking for the labels and this is shown in Table 7.[14] The ranking for informed consumers is Organic, Certified Organic, Certified Pesticide Residue-Free, and Grown with IPM and for uninformed consumers it is similar, except that Certified Organic and Certified Pesticide Residue-Free are ranked about the same. Note that even though the information effect for Grown with IPM is much greater than for the other labels, it is still ranked lower for likelihood of purchasing.

The ranking of the labels can give an indication of the relative importance of food versus environmental safety to respondents. Since most individuals assume that organic produce is guaranteed to be free of residues by virtue of the fact that no pesticides were used (Ott et al 1991),[15] the food safety implications of the Organic and Certified Pesticide Residue-Free labels are probably very similar. However, respondents clearly prefer the Organic label, which may imply that the environmental safety aspects of organic production methods, as well as the food safety attributes, are important.

An important result of the label ranking is that Certified Organic is ranked lower than Organic. This indicates that consumers do not attach very much value to certification of organic produce, and implies that there is no advantage in the marketplace to producers for certifying. Two points must be mentioned: 1) in the near future, certification of organic produce will be mandated by federal law for farms with sales of over $5,000 per year, so this result will be irrelevant except for small or part-time farms and 2) a study of New Jersey retailers (Morgan and

[14]–This method of obtaining a ranking was chosen over asking a ranking question because respondents often misunderstand ranking questions and do not answer appropriately (J. Maestro-Scherer, CISER, personal communication).

[15]–In fact, residues can be found in organic produce if the land it was grown on was previously used for conventional production.

Barbour 1990) found that they do value certification as a means of ensuring that produce sold to their customers as organic is that.

Demographics. For both the informed and uninformed groups, respondents' place of residence (Livenow) was an important factor in the likelihood that they would purchase produce with the labels,[16] and was negative, indicating that those in rural or suburban settings are less likely to purchase than those in metropolitan areas. Age was also significant and negative, indicating that the likelihood of purchasing any of the labels decreases with age. Females have a somewhat higher probability of purchasing the Organic and Certified Organic labels.

Interactions Between Demographics and the Information Variable. In order to detect slope shifts, i.e., differing effects of information over the values of the demographic variables, interaction variables were introduced into the Logit regressions. The interaction effects can be found in Table 8. The value of interaction effects in this application is that segments of the population can be identified which would be more receptive to information about the labels, and therefore, informing the public can be carried out more efficiently by targeting those segments.

The most important interaction found in the study is between Livenow and Information for the Grown with IPM label. Livenow*Info is positive, indicating that information has a greater positive effect on rural/suburban consumers than on urban consumers. Since Livenow is negative, this implies a sign change of the slope with information. The implications are that not only are informed rural/suburban consumers more likely to purchase the label than when uninformed, but also that they are also more likely to purchase it than urban consumers who are also informed. This is sufficient evidence that informing rural/suburban consumers about the Grown with IPM label would significantly increase their likelihood of buying it.

Age*Info is negative for the Grown with IPM label, indicating that information has less of an effect on older consumers, who are already less likely to buy the Grown with IPM label, and conversely, has a greater effect on younger consumers, who already are more likely to buy. Since

[16]--The low partial-R statistic for Livenow in the Grown with IPM regression results from a cancelling out of the effects of the informed versus uninformed groups, as determined by subsequent regressions with interaction variables which are discussed below.

Age already has a negative slope, this indicates even more of a differential between likelihood of purchasing by younger vs. older consumers when they are informed

For the Certified Organic label, Sex has a positive interaction with information, indicating that information has a greater positive effect on females than on males. Females already have a greater likelihood of buying this label, so informing results in an even greater differential between males and females.

*Willingness to Pay More for Produce with the Labels than for Conventional Produce*

The information effect was found to be significant for only the Organic and Grown with IPM labels with respect to paying more than for conventional produce. See Tables 9-12. Again the magnitude of the shift in probability from less to more willingness to pay that is attributable to the information effect was greater for Grown with IPM (.1100) than for Organic (.0777). The ranking of the probabilities of paying more for both informed and uninformed consumers show that all of the labels are preferred over Grown with IPM, but among the others there are no apparent preferences. See Table 13.

The Willingness to Pay Question. Respondents were asked to state their willingness to pay (over the price of conventional produce) for each of the labels on a scale of 1 to 5. The categories were: would not purchase, 0, 10% more, 20% more, and more than 20% more. The first answer, "would not purchase", was actually not considered to be part of the scale and was not used in the Logit models.[17] It was included in order to present respondents with the broadest range of answers possible.

Since most respondents answered either 0 or 10% more, it is probable that the real value lies somewhere between 0 and 10%, but is not known because the categories were not small enough to capture it. Perhaps presenting respondents with a larger number of categories would have resulted in a more precise measure of willingness to pay. There is also the issue of whether

[17]--The numbers of respondents answering "would not purchase" were, for Organic: 9 out of a total of 483; Certified Organic: 11/450; Certified Pesticide Residue-Free: 21/454; and Grown with IPM: 49/434.

the choice of more than 20% as the highest category introduced some bias in respondents' valuations. For Organic, at least, premiums of as much as 100% can be found in the marketplace. For respondents who are not familiar with Organic produce, the use of more than 20% as the highest category might have suggested to them that 20% is a very high premium.

Demographics. Livenow is significant and negative for all of the labels, indicating that, not only are respondents from metropolitan areas more likely to purchase the labels, they are also willing to pay more than are rural or suburban respondents. Advancing age and lower income result in lower willingness to pay more for all of the labels.

Interactions Between Demographics and the Information Variable. Income has a negative interaction with information for both the Certified Pesticide Residue-Free and Grown with IPM labels, indicating that information has less of an effect on consumers with higher incomes for paying more for these labels. However, consumers with higher incomes already have a greater willingness to pay more for the labels whether informed or not. Information geared toward lower income consumers may convince them to be as likely as higher income consumers to pay more for the Certified Pesticide Residue-Free and Grown with IPM labels. However, demand for all produce may be elastic for low income consumers, so it is questionable if receiving information would translate to actual behavior changes with regard to willingness to pay in the marketplace.

## DISCUSSION

The results obtained in the willingness to pay portion of the study show that respondents' answers differed 1) - depending on whether or not they were informed and 2) - between labels, which indicates that the scale they were presented with was detailed enough to capture those effects. Still, there are the questions of whether presenting them with more categories would have produced even better results and whether, even though the range was open ended (more than 20%), the value of the highest category may have produced some bias as discussed earlier.

Strengths of this study are that the large sample size provides for attaching statistical significance to the results, data was collected over a broad geographical area, there was found to

be a statistical difference between the two treatments, i.e., informed and uninformed, and no evidence of bias was found between the groups receiving the treatments. Additionally, the use of the Logit models allowed for investigation of demographic effects on purchase likelihood and willingness to pay and the interactions between demographics and information.

In order to validate the results of this study, in-store experiments would have to be done in which consumers would be observed choosing between conventional and labeled produce under different pricing scenarios and under conditions of receiving or not receiving information. This study did not address the question of how to inform consumers. For example, would shoppers take time to read the statements at point of purchase or would some other vehicle be necessary, and how could it be verified that they had actually received the information?

Additionally, the question of appearance of the produce would have to be given close attention. In observational studies comparing organic versus conventional produce, appearance has not been controlled for, making it difficult to extend the results of those particular experiments to a general case. For example, in one study of lettuce, the conventional outsold the organic lettuce by a wide margin, but the head size of the organic lettuce was smaller (Cook 1991, personal communication), so there is no way to separate the effect of the Organic label from the effect of head size.

Results of this study can serve as guidelines to those in the produce industry as to whether it is worthwhile to tap into the non-conventional produce market. Since this was not a demand study, no estimates of potential revenues or returns on expenditures for offering produce with the labels, or for information/promotional efforts, can be given.

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*Table 1*. Demographic Characteristics of Survey Respondents Compared with 1990 Census Data for the Northeastern United States.

| | Survey Respondents %[2] | 1990 Census[1] %[2] |
|---|---|---|
| Age[3] | | |
| 25-44 | 46 | 49 |
| 45-64 | 30 | 30 |
| 65 + | 22 | 20 |
| Education | | |
| Bachelor's degree or higher | 49 | 25 |
| High school or technical school degree or some college | 46 | 55 |
| Less than high school degree | 6 | 20 |
| Ethnic Identity[3] | | |
| Caucasian | 94 | 72 |
| African American | 1.4 | 17 |
| Hispanic | 0.4 | 11 |
| Asian | 2.2 | 3.8 |
| Native American | 0.4 | 0.3 |
| Other | 1.4 | 5.5 |
| Median Household Income | $40,000 | $36,000 |

1 - Census data is expressed as % of the population over 25 in order to be comparable to survey data.

2 - Percentages may not sum to 100 due to rounding error.

3 - Census data for age and ethnic identity were from New York State, which makes up more than one-third of the population of the Northeast.

*Table 2*. Respondents' Familiarity and Experience with the Labels.

| Label | Familiar with Concept[1] % | Ever Seen Label[2] % | Purchase Regularly or Occasionally[3] % |
|---|---|---|---|
| Organic | 78 | 62 | 33 |
| Certified Organic | 44 | 13 | 2 |
| CPRF | 43 | 4 | 0.3 |
| Grown with IPM | 13 | 1.3 | 0.03 |

1 - Question Q-5 in survey

2 - Question Q-4 in survey

3 - Question Q-6 in survey

*Table 3.* Predicted Probabilities for Purchasing the Organic Label and Marginal Effects of the Exogenous Variables - Results of Logistic Regression.

| | $P_0$[1] Unlikely | $P_1$ Not Sure | $P_2$ Somewhat Likely | $P_3$ Very Likely |
|---|---|---|---|---|
| Overall Probabilities | | | | |
| Informed | .0537 | .1448 | .3270 | .4745 |
| Uninformed | .0722 | .1815 | .3496 | .3967 |
| Marginal Effects | | | | |
| Information[c] ($R^2$=.032) | -.0185 | -.0367 | -.0226 | .0778 |
| Age[a] (R=-.101) | .0012 | .0082 | -.0045 | -.0049 |
| Sex[b] (R=.045) | -.0219 | -.0426 | -.0247 | .0892 |
| Livenow[a] (R=-.089) | .0344 | .0707 | .0533 | -.1583 |

Model Likelihood Ratio=1041, R-like=.145, $\chi^2$=30.58, 4 d.f., p=.0000

1 - The categories Somewhat Unlikely and Very Unlikely were combined.

2 - R refers to the partial-R statistic, which measures the contribution of the variable to the explanatory power of the model.

a - significant at the .01 level

b - significant at the .05 level

c - significant at the .10 level

*Table 4.* Predicted Probabilities for Purchasing the Certified Organic Label and Marginal Effects of the Exogenous Variables - Results of Logistic Regression.

| | $P_0$ Unlikely | $P_1$ Not Sure | $P_2$ Somewhat Likely | $P_3$ Very Likely |
|---|---|---|---|---|
| Overall Probabilities | | | | |
| Informed | .0616 | .1741 | .3259 | .4384 |
| Uninformed | .0824 | .2143 | .3400 | .3634 |
| Marginal Effects | | | | |
| Information[c] (R=.030) | -.0208 | -.0402 | -.0141 | .0750 |
| Age[a] (R=-.096) | .0013 | .0080 | -.0045 | -.0048 |
| Sex[b] (R=.062) | -.0306 | -.0579 | -.0182 | .1068 |
| Livenow[a] (R=-.099) | .0427 | .0869 | .0425 | -.1721 |

Model Likelihood Ratio=1023, R-like=.154, $\chi^2$=33.10, 4 d.f., p=.0000

a - significant at the .01 level

b - significant at the .05 level

c - significant at the .10 level

*Table 5.* Predicted Probabilities for Purchasing the Certified Pesticide Residue-Free Label and Marginal Effects of the Exogenous Variables - Results of Logistic Regression.

| | $P_0$ Unlikely | $P_1$ Not Sure | $P_2$ Somewhat Likely | $P_3$ Very Likely |
|---|---|---|---|---|
| Overall Probabilities | | | | |
| Informed | .0779 | .1949 | .3154 | .4119 |
| Uninformed | .0863 | .2092 | .3195 | .3851 |
| Marginal Effects | | | | |
| Information (R=.000) | -.0084 | -.0143 | .0041 | .0268 |
| Age[a] (R=-.089) | .0014 | .0073 | -.0041 | -.0046 |
| Sex (R=-.000) | -.0059 | -.0101 | -.0028 | .0189 |
| Livenow[c] (R=-.027) | .0235 | .0413 | .0143 | -.0791 |

Likelihood Ratio=1044, R-like=.074, $\chi^2$=13.77, 4 d.f., p=.0018
a - significant at the .01 level
c - significant at the .10 level

*Table 6.* Predicted Probabilities for Purchasing the Grown with IPM Label and Marginal Effects of the Exogenous Variables - Results of Logistic Regression.

| | $P_0$ Unlikely | $P_1$ Not Sure | $P_2$ Somewhat Likely | $P_3$ Very Likely |
|---|---|---|---|---|
| Overall Probabilities | | | | |
| Informed | .1124 | .2869 | .2936 | .3071 |
| Uninformed | .2227 | .3779 | .2356 | .1639 |
| Marginal Effects | | | | |
| Information[a] (R=.127) | -.1103 | -.0910 | .0580 | .1432 |
| Age[c] (R=-.035) | .0015 | .0026 | -.0022 | -.0019 |
| Sex (R=.014) | -.0365 | -.0301 | -.0203 | .0463 |
| Livenow (R=.000) | .0234 | .0208 | -.0127 | -.0315 |

Model Likelihood Ratio=1108, R-like=.128, $\chi^2$=27.70, 4 d.f., p=.0000
a - significant at the .01 level
c - significant at the .10 level

*Table 7.* Ranking of Labels for Likelihood of Buying From Predicted Probabilities - Somewhat or Very Likely.

| | Probability (%) | Ranking |
|---|---|---|
| Informed | | |
| Organic | 80.2 | 1 |
| Certified Organic | 76.4 | 2 |
| Certified Pesticide Residue-Free | 72.7 | 3 |
| Grown with IPM | 60.1 | 4 |
| | | |
| Uninformed | | |
| Organic | 75.0 | 1 |
| Certified Organic | 70.3 | * |
| Certified Pesticide Residue-Free | 70.5 | * |
| Grown with IPM | 40.0 | 4 |

* These are ranked virtually the same.

*Table 8.* Interaction Effects of the Demographic Variables with the Information Variable .

| | BuyCO[c] | BuyIPM[b] | PayPF[c] | PayIPM[b] |
|---|---|---|---|---|
| Age*Info | | - | | |
| Sex*Info | + | | | |
| Livenow*Info | | + | | |
| Income*Info | | | - | - |

b - significant at the .05 level
c - significant at the .10 level

***Table 9***. Predicted Probabilities for Paying More for the Organic Label and Marginal Effects of the Exogenous Variables - Results of Logistic Regression.

| | $P_0$ Would Not Pay More | $P_1$ 10 % More | $P_2$[2] 20 % More or Greater |
|---|---|---|---|
| Overall Probabilities | | | |
| Informed | .4153 | .4475 | .1372 |
| Uninformed | .4930 | .4030 | .1041 |
| Marginal Effects | | | |
| Information[c] (R=.029) | -.0777 | .0445 | .0331 |
| Age[a] (R=-.077) | .0040 | -.0023 | -.0017 |
| Livenow[a] (R=-.112) | .1418 | -.0908 | -.0848 |
| Income[3b] (R=.072) | -.0265 | .0153 | .0112 |

Model Likelihood Ratio=788, R-like=.160, $\chi^2$=29.00, 4 d.f., p=.0000

2 - "20 % More" and "More Than 20 % More" were combined.

3 - In tens of thousands of dollars.

a - significant at the .01 level

b - significant at the .05 level

c - significant at the .10 level

***Table 10***. Predicted Probabilities for Paying More for the Certified Organic Label and Marginal Effects of the Exogenous Variables - Results of Logistic Regression.

| | $P_0$ Would Not Pay More | $P_1$ 10 % More | $P_2$ 20 % More or Greater |
|---|---|---|---|
| Overall Probabilities | | | |
| Informed | .4195 | .4256 | .1548 |
| Uninformed | .4966 | .3851 | .1183 |
| Marginal Effects | | | |
| Information (R=.025) | -.0771 | .0405 | .0365 |
| Age[a] (R=-.104) | .0052 | -.0027 | -.0025 |
| Livenow[a] (R=-.118) | .1851 | -.0857 | -.0993 |
| Income[c] (R=..031) | -.0181 | .0096 | .0085 |

Model Likelihood Ratio=747, R-like=.160, $\chi^2$=27.94, 4 d.f., p=.0000

a - significant at the .01 level

c - significant at the .10 level

*Table 11*. Predicted Probabilities for Paying More for the Certified Pesticide Residue-Free Label and Marginal Effects of the Exogenous Variables - Results of Logistic Regression.

| | $P_0$ Would Not Pay More | $P_1$ 10 % More | $P_2$ 20 % More or Greater |
|---|---|---|---|
| Overall Probabilities | | | |
| Informed | .4279 | .4233 | .1487 |
| Uninformed | .4897 | .3904 | .1199 |
| Marginal Effects | | | |
| Information (R=.000) | -.0618 | .0329 | .0288 |
| Age[b] (R=-.069) | .0037 | -.0020 | -.0017 |
| Livenow[a] (R=-.080) | .1372 | -.0671 | -.0701 |
| Income[b] (R=.068) | -.0258 | .0138 | .0120 |

Model Likelihood Ratio=736, R-like=.129, $\chi^2$=20.61, 4 d.f., p=.0000
a - significant at the .01 level
b - significant at the .05 level

*Table 12*. Predicted Probabilities for Paying More for the Grown with IPM Label and Marginal Effects of the Exogenous Variables - Results of Logistic Regression.

| | $P_0$ Would Not Pay More | $P_1$ 10 % More | $P_2$ 20 % More or Greater |
|---|---|---|---|
| Overall Probabilities | | | |
| Informed | .5131 | .3837 | .1032 |
| Uninformed | .6231 | .3086 | .0683 |
| Marginal Effects | | | |
| Information[b] (R=.060) | -.1100 | .0751 | .0349 |
| Age[c] (R=-.036) | .0029 | -.0020 | -.0009 |
| Livenow[a] (R=-.095) | .1603 | -.1047 | -.0555 |
| Income[c] (R=.040) | -.0211 | .0145 | .0066 |

Model Likelihood Ratio=592, R-like=.126, $\chi^2$=17.62, 4 d.f., p=.0000
a - significant at the .01 level
b - significant at the .05 level
c - significant at the .10 level

*Table 13*. Ranking of Labels for Likelihood of Paying More From Predicted Probabilities.

| | Probabilities (%) | Ranking |
|---|---|---|
| Informed | | |
| Organic | 58.5 | * |
| Certified Organic | 58.1 | * |
| Certified Pesticide Residue-Free | 57.2 | * |
| Grown with IPM | 48.7 | 4 |
| Uninformed | | |
| Organic | 50.7 | * |
| Certified Organic | 50.3 | * |
| Certified Pesticide Residue-Free | 51.0 | * |
| Grown with IPM | 37.7 | 4 |

* The only clear difference is between Grown with IPM and the other three labels.

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