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# Consumer Response and Perceptions of Integrated Pest Management Produce

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With escalations in consumer food safety concerns, integrated pest management (IPM) and organic methods of agriculture have received increasing attention. Consumer response to organic produce has been extensively studied in both real and hypothetical scenarios over the past 15 years. Yet, nearly all of the relevant research which has focused on IPM produce has been supply or production oriented. To date, very few studies have analyzed the marketability or consumer response to IPM.

The purpose of this bulletin is to present an empirical evaluation of consumer preferences and response to IPM grown produce. A consumer survey was administered in 1997 to collect the opinions and perceptions of consumers of fresh produce. The respondents indicated strong support for IPM through both a high willingness-to-purchase and willingness-to-pay a premium for IPM grown produce. On average, the sample was more willing to pay a premium for and more willing to switch supermarkets to obtain IPM rather than organic produce.

Respondents also ranked pesticide residues as their top food safety concern relative to five other common sources of food risk. Over two-thirds of the participants indicated that they presently purchase at least some organic produce, however the majority still predominantly consume conventionally grown produce. High retail prices seemed to be a major obstacle to purchasing organic produce. Approximately 67 percent of the participants indicated that they would purchase organic produce if it were cheaper.

Overall, the results of this survey give insight into the likely consumer response to produce that is labeled as “IPM Grown.” However, before the average consumer exhibits the same level of interest in IPM as the sample in this study, some mechanism must be developed to educate the public about IPM.

# *Introduction*

Synthetic chemical pesticides were first marketed in the United States in the late 1940's and have since facilitated a dramatic increase in the productivity of agricultural labor. However, pesticide usage by fruit and vegetable growers has been nearly seven times greater than other agricultural sectors (Fernandez-Cornejo et al., 1994) and also poses the problem of human consumption of chemical residues. Numerous studies have placed pesticide residue exposure as the top concern for consumers relative to other food safety issues (Byrne et al., 1991; NFO Research, 1989; Misra, Huang and Ott, 1991). Regardless of whether these fears are legitimate or exaggerated, public perceptions of the risk posed by pesticides can translate into very real effects in the marketplace (Dunlap and Beus, 1992). For instance, within days of a *60 Minutes* program reporting the risks of Alar, a pesticide that was used in the production of apples, farmers, agribusinesses, and the Washington State apple industry experienced the devastating effects of public "anti-apple" sentiment. A similar incident involving Chilean grapes was also highly publicized. As a result of widespread fears of pesticide residues in recent years, a renewed interest in low-input agriculture has been occurring. Accordingly, organic produce is now commonly found in most major supermarkets and Integrated Pest Management has received increasing public and research attention. Even so, the majority of growers still rely heavily on pesticides as their primary defense against insect damage.

The concern of grocery shoppers over the expanding application of pesticides has not been limited to their personal health. In an altruistic sense, significant concerns about the pesticide-induced external damage to farm workers, groundwater, wildlife and the environment have also been documented (Weaver et al., 1992). With the banning of DDT, which had provided an economical and efficient defense against many pests, growers were forced to turn to a new variety of more expensive insecticides. In many instances the new generation of pest control did not achieve the degree of control attained with DDT (Prostak, 1993). Additionally, insecticide resistance has already

begun to have a serious impact on some agricultural commodities such as European orchard crops (Burn, Coaker, Jepson, 1987).

Integrated Pest Management (IPM) is a system of agricultural pest control which has been developed to reduce the reliance on a purely chemical approach to protecting agricultural crops from pest damage. Specifically in fruits and vegetables, the use of non-synthetic pest controls may reduce the amount of inorganic pesticide residues directly consumed by humans. Conceptually, IPM falls between conventional and organic agriculture. Conventional growers typically rely on a fixed number of chemical pesticide applications per year based on the calendar which do not take into account fluctuations in pest populations. In New Jersey, rising costs and increased application caused conventional growers to increase expenditure on chemical pesticides over 28% between 1985 and 1990 (Robson et al., 1995). Yet, the high proximity of agricultural land to areas of high population density in the state also necessitates a cautious approach to chemical pesticide use. Whereas the expanding application of pesticides has been a source of concern for consumers, the rising costs of conventional produce production is a concern for producers. Conversely, organic growers use no synthetic pesticides or fertilizers. In addition to being highly labor intensive, without the benefits of chemical pesticides, organic agriculture may result in fluctuating yield and aesthetic quality. Rather than eliminating synthetic pesticides as in organic agriculture, IPM production techniques minimize their use to lower and possibly safer levels. The reduction in pesticide inputs is intended to be cost saving for the agricultural industry, safer for the consumer and farm worker, and more sustainable for the environment. IPM focuses on determining an economic threshold at which the benefits of pesticide usage outweigh both the immediate and long term costs. In this way, IPM is more efficient than organic methods as less produce is lost due to disease or insect infestation. Further, IPM is significantly less labor intensive than organic farming and is often possible when organic methods are not feasible. IPM guidelines generally limit the application of artificial pesticides to instances when pest populations exceed an economically damaging level. The level at which it becomes necessary to control pests

is highly dependent on crop prices, pesticide costs, the types of pests, and the pest population densities. The introduction of IPM presents a feasible and cost effective alternative to both conventional and organic agriculture.

IPM is a system of pest control which evolved amidst concerns of entomologists and other scientists that certain pests were building immunity to synthetic pesticides (Greene, 1991). Even with decades of entomology and production research, IPM is still considered to be in its infancy (Burn, Coaker, Jepson, 1987) and the pressure for growers to adopt IPM is expected to increase. IPM programs have been endorsed by the U.S. Department of Agriculture, the Food and Drug Administration, and the Environmental Protection Agency. The Federal government has set an ambitious national goal of bringing 75% of U.S. agricultural land under IPM techniques by the year 2000 (Cate and Hinkle, 1994). While research in this field was initially supported through funding from the Federal government, supplemental funding has recently come from state and private investment. Today, IPM has gained newfound interest amongst concerns of pesticide residues on food and in municipal or groundwater supplies as well as fears concerning the prolonged use of pesticides.

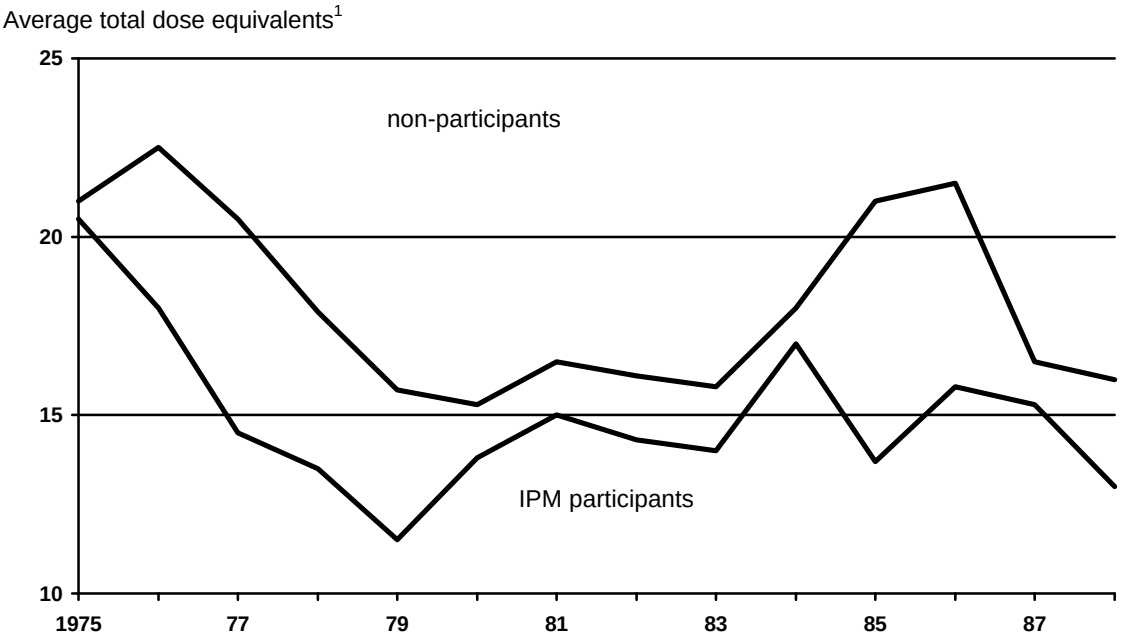
Research in IPM combines both efficiency and substitutive approaches. Together these approaches have resulted in significantly less intensive pesticide applications and have lead to the development of alternative and natural methods of pest control. Both approaches can be seen as increasing efficiency in an economic sense in that they both lead to lower levels of input used to generate a comparable quantity and quality of output. Relying on artificial pesticides only as a last resort and making better use of them is a goal of the efficiency approach, while developing non-chemical and biological methods as a partial replacement for synthetic pesticides is the focus of the substitutive approach. Illustratively, one substitutive IPM practice is the release and establishment of “pest predators” which prey upon species that threaten crops. Parasitic wasps have been successfully released to control leaf beetles and leaf-miners. However, this process of importing and releasing beneficial organisms is

complex since many precautions must be taken to prevent unwanted long term or adverse effects (Ohio Pest Management Survey Program website, 1993).

### *The Success of Integrated Pest Management*

The entomology literature cites numerous references to the production benefits enjoyed by participating growers. IPM is an encouraging system that can often save time, increase profits by lowering costs and result in reducing artificial inputs to production without adversely affecting the yield and quality of agricultural products. Additionally, IPM reduces the hazard to agricultural workers, wildlife, and to non-target organisms. For example, prior to the implementation of New Jersey's IPM program in eggplant, growers made expenditures averaging $500 to $1500 per acre for pest control. The IPM program has reduced these costs to an average of $300 to $400 per acre (Hamilton and Lashomb, 1994 as reported by Robson et al., 1995).

### *Figure 1 - IPM Permits Growers To Use Fewer Pesticides*




[1] Is a measure of pesticide use calculated by dividing the actual rate of product applied per acre by the Cornell University recommended rate. Source: Food Review, 1991. Data - NY State IPM Program, 1989 Annual Report, Cornell University.

A 1985 survey reported that IPM use by Florida vegetable growers resulted in an 80% decrease in pesticide application and a 31% decrease in fungicide application (Greene, 1991). In 1995, the USDA reported that a New York study found fungicide use was reduced in onions by 30% with IPM techniques and pest management costs in onions were reduced by $75 per acre. A national evaluation team estimated that the total annual cost saving benefit to farmers in 15 states using IPM during the 1980's exceeded $500 million (Greene, 1991). When trained scouts monitor an IPM field, reductions in the number of pesticide applications and the conservation of energy can be considerable. In Massachusetts, the local IPM program has reduced the use of pesticides in strawberries, cranberries, corn, apples and potatoes by as much as 40 to 60% (Hollingsworth et al., 1993).

The growing concern over residues in fresh produce which has renewed interest in IPM could manifest itself as changes in consumer behavior in two ways: (1) an increased demand for low-input agriculture with reduced synthetic pesticide residues or (2) decreased demand for fresh produce. For reduced pesticide produce to be marketed successfully, it is necessary to determine whether consumer concern for pesticide residues has resulted in fundamental changes in consumer attitudes and behavior (Weaver et al., 1992). This study begins to address these issues by quantifying aggregate levels of a) prior knowledge of IPM, b) willingness-to-purchase IPM produce, and c) willingness-to-pay for IPM produce. As there existed no readily available data set dealing with consumer perceptions of IPM produce, it was necessary to conduct a new survey for this project.

IPM methods of production offer benefits to both producers and consumers. These benefits have fueled government and more recently, significant private investment in the development of low-input production techniques. While much empirical and econometric analysis has illustrated consumer preference for organic produce, less than 1% of all produce grown in this country can currently be considered organic. Conversely, growers who have adopted IPM make up a fast growing share of the

agricultural sector with significant success in lowering pesticides at reduced costs. Seventy-four percent of fruit and vegetable growers preferred an emphasis on IPM research, while only 13% preferred an emphasis on organic research. Even 64% of growers who use at least some organic production methods favored an emphasis on IPM over organic research (Anderson, 1993).

A recent New England survey showed that small fruit and vegetable farmers would prefer not to use synthetic pesticides if viable and profitable alternatives existed (Anderson, 1993). Yet, many farmers have been hesitant to adopt IPM for a variety of reasons. These include fear regarding the salability of IPM crops, lack of faith in the pest control methods, and lack of knowledge of the program (Robson et al., 1995). Fernandez-Conejo et al. found that growers who adopted IPM early were more likely to be risk-takers than non-adopters. In many states, larger farm sizes and IPM adoption were positively correlated, and the degree of adoption was found to be different for different regions of the country. Sufficient scientific and cost benefit data exist to justify the use of IPM. However, marketing research which demonstrates consumer support and demand for IPM produce may effectively persuade more producers to attempt IPM techniques thereby lowering the aggregate pesticide usage. Moreover, if additional local growers were to adopt IPM techniques it may be useful as a means to advance New Jersey agriculture. Even if sold at the price of conventional produce, many IPM growers could essentially receive a premium in the form of cost savings that is not realized by conventional growers.

Currently there exists no educational device in place to inform consumers of the benefits of IPM. Consequently, few consumers have had exposure to or knowledge of IPM. Government and private organizations have been hesitant to adopt a certified “IPM Grown” labeling system. Many feel that a certification program would be confusing to consumers and too costly to enforce. Much of the difficulty in implementing a universal IPM certification is that IPM is an additive as opposed to a discrete process. The question in comparing individual growers is not whether they

practice IPM or not, but rather whether they practice “more” or “less” IPM than one another. Thus, concisely defining what produce should be certifiably IPM grown continues to be a challenge and is still in debate among government, private, and academic researchers. Empirical results which evidence a positive public response toward IPM may provide incentives to developing IPM labeling. Other beneficial implications of IPM would be the derived demand for low-input produce used in manufacturing processed and prepared foods in which the level of harmful pesticide residues are a concern. For instance, baby foods and processed goods which are typically marketed as “health conscious” are selectively targeted at specific market segments. Analyzing pesticide risk perceptions and their impact upon consumer choice will be beneficial to the success of these products.

In contrast to the marketing research for organic agriculture, there has been relatively little research on the marketability of IPM produce. If IPM produce is to be successfully marketed side by side conventional and organic produce, it will be necessary to identify consumer characteristics which increase the likelihood of purchasing IPM grown produce. With its focus on IPM rather than organic, this study is a first step toward that goal and should be a beneficial addition to the existing literature.

The objective of this bulletin is to present a descriptive analysis of consumer preferences and perceptions of IPM grown produce. Additionally, some perceptions of organic produce were collected as a reference for comparison. Information regarding the shopping habits, risk perceptions, and the demographic background helped to construct a profile of the participants.

## *Review of Literature*

Among the earliest studies of consumer response to synthetic pesticide risk was the pioneering work of Bealer and Willits in 1965 which indicated a general public acceptance of pesticide use. Only one half of the Pennsylvania residents surveyed at that time indicated that they believed chemical pesticides were harmful to wildlife.

Furthermore, residues consumed by humans were found to have an even lower level of concern. Only 6% of respondents indicated they were very concerned about pesticide use and approximately one half responded they were not at all concerned (Kidwell 1994, Bealer and Willits, 1968). When compared to Bealer and Willits' original findings, consumer perceptions have shifted dramatically over the past thirty years.

In 1984, a follow-up to the Bealer and Willitis study was undertaken by Sachs, Blair, and Richter. Again, the survey was administered in Pennsylvania and included many of the same questions as the 1965 questionnaire. Many of the demographic characteristics of the two samples were also similar. The results indicated that consumer concern about pesticide usage had risen and knowledge of pest control practices had also greatly increased. Concern was also escalated for pesticide damage to wildlife and agricultural workers. Regression analysis indicated that none of the differences between 1965 and 1984 could be explained by socio-demographic factors. The most likely cause for this change in attitudes was the extensive environmental awareness and increased media coverage of environmental issues in the 1960's and 1970's.

Since the mid 1980's, a number of other research initiatives have reported pesticide residue fears to be a top food safety concern. Consumer polls have indicated that at least 70-85% of the national population exhibits a medium to high degree of concern toward pesticide residues and pesticide usage. A survey of four U.S. cities found that 83% of respondents were risk averse to pesticide usage (Zellner and Degner, 1989), and another study found that 86% of respondents expressing concern for pesticide usage (Zind, 1990). In a survey conducted by Cornell University, 46% of the respondents indicated they were very concerned about the use of chemical pesticides in growing food for consumption, while 50% were somewhat concerned and only 4% were unconcerned (Burgess et al., 1989). Ongoing nationwide research by the Food Marketing Institute, which began in 1984, has found that consumers consistently rank pesticides as the most serious food hazard. With a low of 73% ranking pesticides as

their top food safety fear in 1985, concern has generally increased each year since (Dunlap and Beus, 1992). While studies have found only modest variation in pesticide concern across different segments of the public, most have found that women are more likely than men to place pesticide residues as a top concern. Additionally, younger adults tend to show more concern over pesticide usage than older adults (Dunlap and Beus, 1992).

Ostiguy et al. (1990) reported that respondents to a 1989 survey conducted by Cornell University felt that the lack of absolute evidence, lack of simple precise documents addressing pesticide concerns, and conflicting information from experts all contributed to the complexity and level of public pesticide fears. Participants saw the pesticide dilemma as a long term problem due to the vested interests of chemical manufacturers and the necessity of pest control which conflicted with public health and environmental fears.

A study at the University of California illustrated the benefit of additional information and educational programs (in this case bilingual) about the use of pesticides. The presentation of IPM farming practices was documented to have a positive impact on consumer attitudes reducing food safety concerns. Specific concerns that the sample voiced included the effects of chemicals on family health, possible increases in the incidence of cancer, and the ability to produce healthy children in the future as a result of pesticide residue accumulation in the body (Diaz-Knauf et al., 1995).

In a similar study of consumer response to information about IPM, Bruhn et al. (1992) found that younger people and those with lower levels of education were both more likely to express uncertainty about the safety of food grown in the U.S. Approximately 40% of the respondents noted that they had avoided some produce items due to safety concerns. Participants were questioned before and after viewing two brief videos about IPM practices in a controlled group setting. Many of the participant's attitudes shifted dramatically after watching the video presentations. The goal of this study was not to

predict acceptance of IPM or demand for IPM produce, but to determine the effect of information regarding IPM in consumers' perception of food safety. Many of the respondents indicated the video increased their confidence in food safety. Even after the video was viewed, however, one quarter of the participants still maintained that pesticides should never be used to control insect pest populations.

A telephone survey of Idaho residents by Dunlap and Beus (1992) examined public attitudes toward pesticides and investigated if these attitudes could be predicted by demographic characteristics. While men and women exhibited approximately the same amount of trust in the food system, women were significantly more concerned about the safety of pesticide usage. Younger adults and those with higher levels of education were found to be somewhat more reticent to pesticide usage than their counterparts. Individuals with higher levels of education were also more likely to see pesticide usage as necessary. Higher income individuals were found to have lower levels of concern over pesticide usage, a finding which has been supported by other studies. Overall, the sample demonstrated that pesticide usage in agriculture is seen as a serious risk that elicits a high level of public concern. Yet, despite this perceived risk, the results indicate that many consumers still see a role for pesticides in modern agriculture. Similarly, other studies have indicated that the general public sees a positive relationship between the use of pesticides and both the size of the food supply and aesthetic appearance of produce.

Possible reasons for public concern may be explained by the uncertainty inherent to agrichemical use. For instance, it is almost impossible for an individual to determine how much pesticide residue he or she is exposed to without explicit product labeling (Horowitz, 1994). Debates within the scientific community about the safety of insecticides and herbicides as well as specific incidents such as the Alar controversy have been widely publicized in the media. This uncertainty may therefore contribute to a higher level of concern with respect to other food safety risks. Despite uncertainty in the academic and government communities regarding the safety and long term effects

of pesticide usage, public sentiment has continued to become more cautious (Sachs, Blair, and Richer 1987; Dunlap and Beus, 1992).

Byrne et al. (1991) detected significant differences between pesticide and herbicide residue concern and the other areas of concern regarding food consumption. The accompanying table shows the relative levels of consumer concern found by their study of the Delaware region.

***Table 1: Ranking of Food Safety Hazards***

| *Variable* | *Mean* | *St. Dev* | *Variable* | *Mean* | *St. Dev* |
|---|---|---|---|---|---|
| Pesticide Residue | 6.098 | 1.364 | Fiber | 5.439 | 1.528 |
| Herbicide Residue | 6.045 | 1.409 | Sugar in Food | 5.414 | 1.523 |
| Fat | 5.874 | 1.378 | Preservatives | 5.380 | 1.660 |
| Cholesterol | 5.818 | 1.391 | Calories | 5.318 | 1.667 |
| Radiation by Products | 5.759 | 1.783 | Growth Regulators | 5.114 | 1.832 |
| Fertilizer Residue | 5.755 | 1.549 | Artificial Colors | 5.107 | 1.779 |
| Salt in Food | 5.591 | 1.512 | | | |

*From University of Delaware 1989 Survey; Source: Byrne, Gempesaw, and Toensmeyer*

While significant research has been undertaken to analyze consumer pesticide risk aversions and demand for organic produce, very little research directly related to consumer response to IPM produce has been published. In one of the few marketing studies of IPM, Hollingsworth et al. (1993) indicated that the majority of the 549 respondents (63%) agreed or agreed strongly that IPM grown produce is safer than non-IPM produce and 78% agreed that IPM techniques helped to protect the environment. Most respondents (61%) indicated they had not heard of IPM before receiving the survey. Hollingsworth et al. surveyed consumers, farmstand owners, and food industry representatives to assess the potential for certification and labeling of produce grown using IPM. Their results suggest widespread support for both produce certification and labeling. Potential barriers to marketing IPM produce were also revealed. Their survey showed the need for education to inform the public about pest

management in agriculture and to build confidence in the safety of our food supply. If certification was implemented, consumers have indicated that they preferred to have independent laboratory certification rather than certification by farmer's cooperatives and associations (Ott, 1990).

Burgess, et al. (1992) found that few respondents (27%) to a 1989 survey in New York had heard of IPM but when the concept was explained to them, 92% were receptive to the point of being willing to purchase IPM grown produce. Similarly, they found that many were willing to spend 10% to 25% more for produce grown using IPM techniques and Anderson et al. (1996) found that 74% would prefer IPM-certified produce to conventionally grown produce. Many respondents indicated that they would even be willing to switch supermarkets to obtain IPM produce. Hollingsworth et al., (1993) reported that, most respondents (75%) agreed they would buy IPM-labeled produce over non-labeled produce if it cost the same and 40% were willing to purchase IPM labeled produce if it cost slightly more than non-labeled produce.

Underhill and Figueroa (1996) attempted to explain cross sectional differences in willingness-to-pay for IPM produce by variations in socio-demographic characteristics. However, the explanatory variables in that study were limited to age, income, regional setting (i.e. suburban, urban) and a variable which captured the effect of having previous information of IPM. Underhill and Figueroa reported that younger individuals, higher earning individuals, and those who live in urban settings were the most likely to pay more for certified IPM produce.

While the majority of consumers have revealed a relatively high degree of personal concern over pesticide residues, most have not significantly altered their purchasing behavior by buying low-input produce rather than conventional produce (Kidwell, 1994). One of the biggest obstacles to low-input agriculture is undoubtedly its retail price. The success of IPM will largely depend on what premium consumers are asked to pay above the retail price of conventionally grown produce. While the majority of

participants indicated they would be willing to pay more than conventional prices to obtain IPM produce, the high prices often found in organic produce would surely limit the attractiveness of IPM to most consumers.

## *Methodology and Data Source*

The major focus of this study was to present a descriptive analysis of consumer preferences and perceptions of IPM and organically grown produce. The survey instrument that was used is reprinted at the end of this bulletin (see Appendix).

### *The Consumer Survey*

In the Fall of 1996, a short consumer survey which had been developed earlier that year was begun. Topics in the survey questionnaire were based on an amalgamation of several surveys developed for assessing the demand for organic produce. In addition to attitudes and preferences, the questionnaire included items relating to demographic information such as age, gender, income, occupation, education, and household size. Questions related to consumer risk perceptions and the premium price that consumers would be willing to pay for IPM produce were also collected. In administering the survey, the major food purchaser for the household was encouraged to be the study participant. The survey was pre-tested by 16 individuals prior to its administration. As a result of the pre-testing procedure, the questionnaire was shortened in length and refinements were made in the survey design and question wording. The pre-tested responses were not included in the analysis.

A variety of avenues were used in order to acquire the 291 responses to this survey. Approximately one third of the responses (96) were gathered at retail establishments throughout central New Jersey. Copies of the survey were distributed and completed by respondents at grocery and produce markets in Franklin Township, Middlesex, Middletown, Princeton, and Mercer County. Prospective respondents were asked if they would be willing to participate in a short survey which was being sponsored by

Rutgers University and the New Jersey Agricultural Experiment Station. Those who inquired about the purpose or topic of the survey were told they would be participating in a survey of consumers of fresh vegetables. In an effort to reduce bias, no mention of pesticides, organics, or IPM were given prior to accepting to partake in the study. All respondents were assured of complete confidentiality and no means of any kind were used to identify participants once their survey had been completed.

Individuals who were unable to complete the survey at these locations were given a self-addressed stamped envelope with which to return their responses. This group of participants accounted for another third (92) of the total sample. Approximately 140 surveys were distributed in this manner with 92 being returned completed for a response rate of 66 percent. Again, no mention of pesticides was made prior to distributing the survey, however, with this group of respondents, non-response bias was a concern. Upon returning home, individuals had the opportunity to thoroughly examine the survey and, given that they were anonymous, had no incentive to return the survey if it was not of interest to them. The return rate, however, was generally acceptable for this type of scenario and the responses from this segment were not significantly different in any way from those completed at the supermarkets.

By October of 1996, 189 usable responses had been collected through the two methods mentioned above. In early 1997, it was decided that more responses were necessary to bolster the statistical power of the study. Approximately 200 survey packets were sent to households which were randomly selected from New Jersey phone books. Each mail packet included the same survey that had been distributed earlier as well as a postage paid return envelope. A cover letter for the questionnaire packet introduced the survey, explained the importance of participating in the study, and how the results would help to improve the types of produce available at local grocery stores. The letter also assured the confidentiality of the respondents, and emphasized that completing the questionnaire would take only a brief amount of their time.

In an attempt to reduce non-response bias, an incentive of one dollar was also enclosed with each mail survey. An effort was made to include areas of the state that were not represented by earlier responses. Thus, the majority of surveys were sent to northern and southern New Jersey as well as the Jersey shore region. Of the 200 mailed, 28 were returned because the postal addresses had expired. Of the 172 delivered surveys, 104 were returned of which 2 were discarded because they were incomplete. The 102 completed surveys gave a response rate of 62 percent for the mail portion of the survey. Although a return date was given as March 15, 1997, two survey were received in May of 1997 after data analysis was begun and were therefore not included in the analysis. Overall, 408 surveys were physically distributed to respondents yielding a sample of 291 responses and a response rate of 71 percent.

While IPM can be used in virtually all types of agriculture, the choice was made to limit the survey to vegetables. Focusing on this one area, it was hoped, would provide a consistent frame of reference and eliminate differences in perceptions consumers might have about fruits and vegetables. The definition of Integrated Pest Management was adopted from a 1989 survey conducted by the New York State IPM Program. For the purpose of introducing IPM to unfamiliar consumers and also for serving as a base of reference for those who had prior knowledge, IPM was defined as:

> ***a crop production program in which a combination of pest control techniques are used. The farmer does not rely completely on the regular scheduled use of chemical pesticides. Other methods are used such as resistant plants, natural enemies and destruction of places where pests breed. Only when those other methods fail to control pests does the farmer use chemical pesticides as a last resort. With IPM, farmers typically reduce their usage of chemical pesticides by one-third or more.***

The survey consisted of four single sided pages. Pages one through three dealt with consumption habits and personal beliefs about agriculture. Respondents were asked to comment on their responsiveness to newly introduced food products, their use of ingredient labels and food advertisements, their shopping habits and also to comment

on their perception of the risk inherent to the use of several inputs to agricultural production. These inputs included antibiotics in poultry and livestock, artificial coloring, and residues from pesticide usage.

On pages two and three, respondents were asked if they had ever heard of IPM. After reading the short definition of IPM, participants were asked if they would buy IPM produce and approximately how often they presently purchased organic produce. They were also asked to place a value on both IPM and organic produce. A contingent valuation question explained that a given type of conventional produce cost $1 per pound and then inquired if they would be willing to pay slightly more for IPM or organic produce. The possible answers ranged from “not willing” to “willing to pay over 20% more” for low-input agriculture. Questions were also included to see if consumers would be willing to switch supermarkets to purchase either IPM or organic produce.

The fourth page of the survey contained questions about the demographic characteristics of the participants. Respondents were asked about their household size, gender, age, education, annual household income, marital status and whether there were any children living in the household. A special note which insured the confidentiality of all respondents was included at the top of this page.

The contingent valuation (CV) method was used in this survey to gather willingness-to-pay information from respondents. Data collected through the contingent valuation method is increasingly more prevalent in analyzing food safety issues through mail surveys, personal interviews, and telephone interviews. While simply asking consumers their preferences through CV is direct and straightforward, there is always the uncertainty that consumer behavior revealed through hypothetical questionnaires may not be representative of actual behavior. Even with the danger of biases, contingent valuation has been the selected survey method used in the majority of related studies. It has also been shown that these biases can be kept acceptably small with a well designed survey instrument.

## *Profile of the Respondents*

A demographic characteristic breakdown of the 291 completed responses is given in Table 2. Females comprised 66 percent of the participants while males accounted for 34 percent. The average household size was 2.64 individuals with an average of 0.58 persons under the age of 17 living in each home. Households with children made up 33.4 percent of the sample.

The two youngest respondents were each less than 20 years of age while the oldest 51 participants (17.5%) were over 65 years of age. The largest representative age group was 36-50 year olds which comprised 35.4% of the sample. Following were the 51-65 year old age group (23.7%) and the 20-35 year old age group (22.7%). Almost half (45.4%) of the participating households had an annual income of at least $70,000 while only 13.2% had annual incomes of less than $30,000. The majority of the respondents indicated that they were married (68.6%) while 14.1% were single, 8.6% were widowed, 6.2% were divorced, and 1.4% were currently separated. While 33.4% of the respondents had not received a college degree, the highest level of education received by 29% of the sample was a college diploma and 37.7% percent indicated they had completed at least some graduate school. Suburban households made up 78.7% percent of the sample while rural and urban households accounted for 13.4% and 7.9% respectively.

## *Table 2:*
### *Socio Demographic Breakdown of Sample Respondents*

| | | |
|---|---|---|
| ***Gender (N = 291)*** | | |
| Female | 100 | 65.6% |
| Male | 191 | 34.5% |
| ***Age (N = 291)*** | | |
| Less than 20 years of age | 2 | 0.7% |
| 21 - 35 years of age | 66 | 22.7% |
| 36 - 50 years of age | 103 | 35.4% |
| 51 - 65 years of age | 69 | 23.7% |
| Over 65 years of age | 51 | 17.5% |
| ***Education (N = 290)*** | | |
| Some Grade School | 1 | 0.3% |
| Some High School | 3 | 1.0% |
| High School Graduate | 38 | 13.1% |
| Some College | 55 | 19.0% |
| College Graduate | 84 | 29.0% |
| Some Graduate School | 30 | 10.3% |
| Masters Degree | 60 | 20.7% |
| Doctoral Degree | 19 | 6.6% |
| ***Income (N = 280)*** | | |
| Less than $9,999 | 4 | 1.4% |
| $10,000 - $19,999 | 17 | 6.1% |
| $20,000 - $29,999 | 16 | 5.7% |
| $30,000 - $39,999 | 25 | 8.9% |
| $40,000 - $49,999 | 33 | 11.8% |
| $50,000 - $59,999 | 26 | 9.3% |
| $60,000 - $69,999 | 32 | 11.4% |
| More than $70,000 | 127 | 45.4% |
| ***Marital Status (N = 290)*** | | |
| Single | 41 | 14.1% |
| Married | 199 | 68.6% |
| Separated | 4 | 1.4% |
| Divorced | 18 | 6.2% |
| Widowed | 25 | 8.6% |
| Other | 3 | 1.0% |
| ***Area (N = 291)*** | | |
| Urban | 23 | 7.9% |
| Suburban | 299 | 78.7% |
| Rural | 39 | 13.4% |

When compared to actual 1990 census data, the survey sample is highly over representative of women. The average age, education, and income levels also appear higher than the New Jersey mean values maintained by the U.S. Census Bureau. Three factors provide a likely explanation for most of these variations. Firstly, the majority of responses were gathered in the central New Jersey region which generally has higher educational and income levels as well as property values than the urbanized northern and rural southern regions of the state. Secondly, the major food purchaser was encouraged to be the survey participant for the household which excluded nearly all individuals under 20 years of age and most males. Lastly, educational levels and nominal incomes are slightly higher than they were nearly a decade ago when the 1990 census was completed. Overall, the sample paints a reasonable picture of the average household and primary household shopper in central New Jersey.

## *Shopping Habits*

In a series of questions aimed at providing insight to the shopping habits of the sample, participants gave information on how readily they tried newly introduced food products and how frequently they made use of ingredient labels, product advertising, and media reports in their shopping. These questions were primarily included for use in an econometric analysis to statistically predict which consumers would purchase IPM produce, however they offer much information about the background and attitudes of grocery shoppers. Many of the survey results are presented graphically. For each bar chart figure, the x-axis represents the responses made by the participants and the y-axis represents the number of participants who made each response.

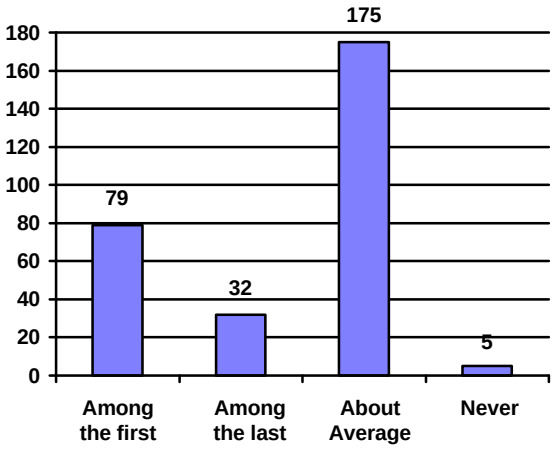
The majority of consumers (60.1%) indicated that they felt they were about average in their willingness-to-purchase a new food product while 27 percent were among the first to try and 17 percent were among the last or never try new food products (Figure 2). Over 97 percent of the respondents reported that they checked the ingredient label on

the foods they purchased at least occasionally. The largest group (40.3%) selected "usually" as their frequency for making use of food labeling (Figure 3).

## *Figure 2*

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

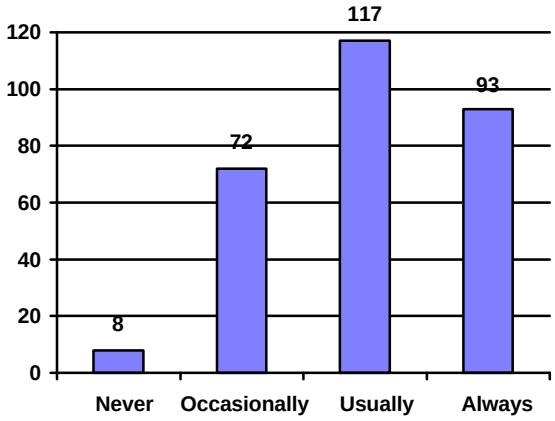
Responses: 291
Std. Dev.: 0.900




## *Figure 3*

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

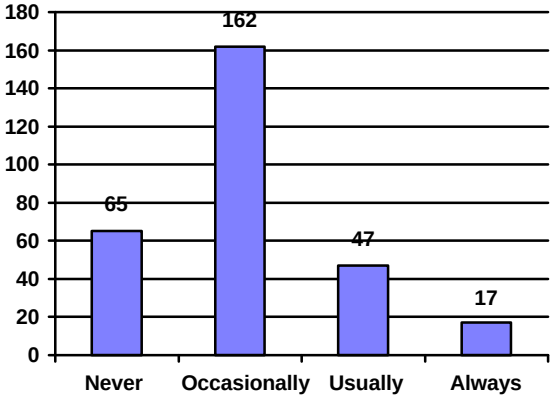
Responses: 290 Mean: 3.017
Std. Dev.: 0.825




## *Figure 4*

How often do food advertisements in the newspaper help you to decide which food items to purchase?

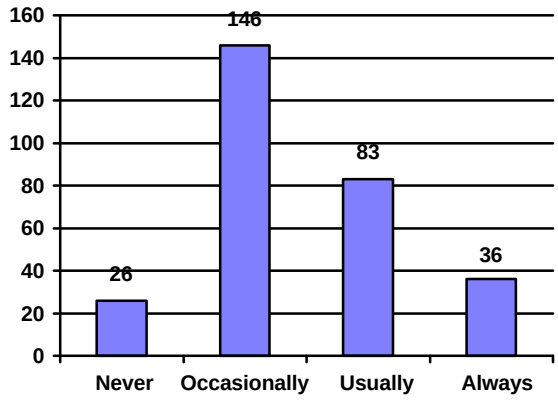
Responses: 291 Mean: 2.054
Std. Dev.: 0.786




## *Figure 5*

How often do newspaper articles or TV and radio reports on food safety issues help you to decide which food items to purchase?

Responses: 291 Mean: 2.443
Std. Dev.: 0.822

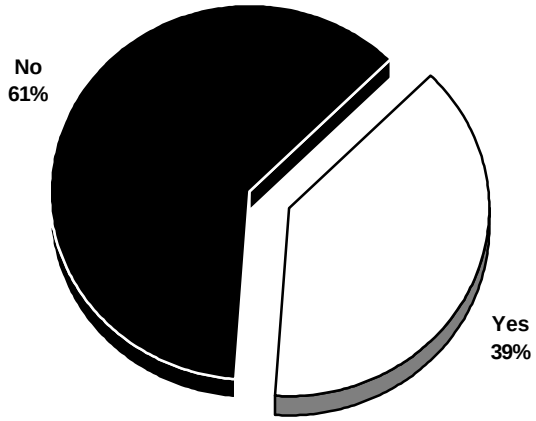


Only 22 percent of the survey participants indicated that they “usually” or “always” made use of food advertisements in newspapers while the majority (55.7%) said they occasionally made use of these advertisements (Figure 4). The majority of respondents indicated that they made use of media reports on food safety in helping them decide which food items to purchase (Figure 5), however very few classified themselves in the extreme categories (i.e. “always” or “never”). The results of a subsequent econometric analysis suggested that those who frequently made use of food advertisements were highly sensitive to changes in price. If a large price differential existed between IPM and conventional produce, many of the respondents who fell into this category would be expected to select the least expensive of the two. Conversely, those who often took food safety reports from the media into consideration were found to be highly risk averse when compared to others. This group seemed to be more willing to purchase low-input agriculture because of its lower pesticide content.

## *Figure 6*

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

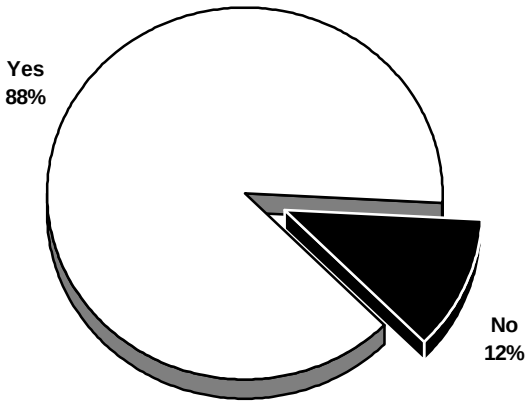
Responses: 290 Mean: 1.614
Std. Dev.: 0.488




## *Figure 7*

Have you visited a Farmers’ Market in the past five years?

Responses: 291 Mean: 1.117
Std. Dev.: 0.322




Approximately 39 percent of the sample indicated that they regularly shopped at more than one food store to purchase advertised specials (Figure 6). As with those who

frequently used food advertisements, this group was also relatively frugal and sensitive to price and performed very similarly in statistical models. Only 12 percent of the respondents had not visited a farmers' market in the past five years (Figure 7). This is indicative of the rising popularity and increasing number of direct agricultural markets in New Jersey. Because of their popularity, farmers' markets may also be a feasible way to educate the public about the nature and benefits of IPM.

## *Food Safety Risks*

When posed with six food safety issues, residues from pesticides and herbicides were perceived to be the most hazardous. Pesticide residues (Figure 8) also had the lowest standard deviation among the six topics indicating a higher level of consensus relative to other food safety issues. This was the first question which specifically mentioned pesticides in the survey and was placed before other pesticide questions to prevent bias from respondents when ranking food risks who had realized they were involved in a "pesticide" study. Antibiotics and growth stimulants used in livestock were ranked as the second and third most hazardous of the food safety issues in the set (Figures 9 and 10) followed by artificial fertilizers, additives and preservatives, and artificial coloring which ranked fourth, fifth and sixth respectively (Figures 11, 12, and 13).

### *Pesticide Residues*

Responses: 287 Mean: 1.436
Std. Dev.: 0.556

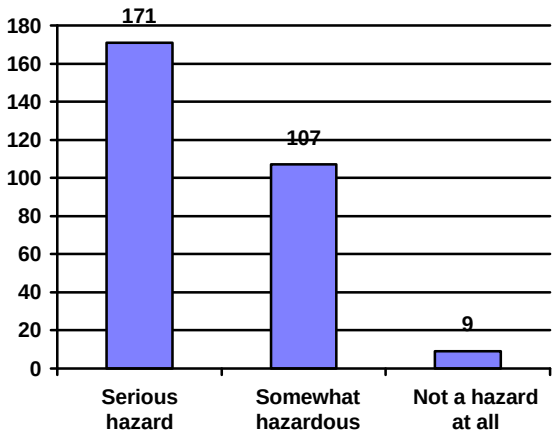



*Figure 8*

### *Antibiotics in Poultry*

Responses: 287 Mean: 1.512
Std. Dev.: 0.596

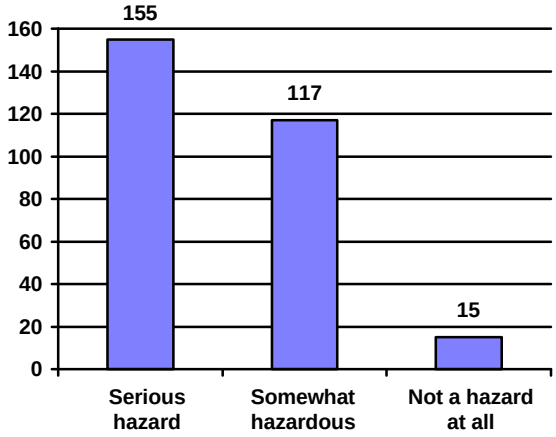



*Figure 9*

Among the food risk questions, responses about growth stimulants and artificial fertilizers exhibited the highest number of omissions of the set possibly indicating a higher lack of public familiarity with these topics. For this series of questions, a higher mean response indicated lower levels of concern about a particular food safety issue. Both the mean response and the standard deviation of responses generally increased together indicating a higher degree of consensus about the issues that were ranked as most hazardous and a greater dispersion of responses for issues ranked as less hazardous.

## *Growth Stimulants*

Responses: 285 Mean: 1.568
Std. Dev.: 0.661

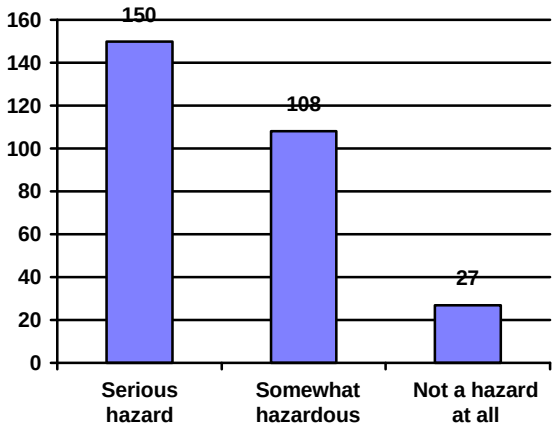



*Figure 10*

## *Artificial Fertilizers*

Responses: 285 Mean: 1.832
Std. Dev.: 0.671

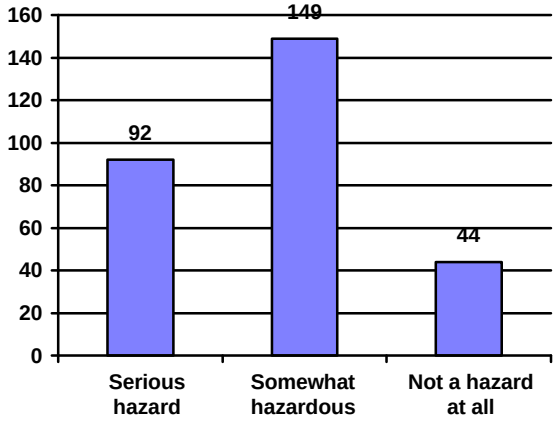



*Figure 11*

## *Additives and Preservatives*

Responses: 288 Mean: 1.892
Std. Dev.: 0.646

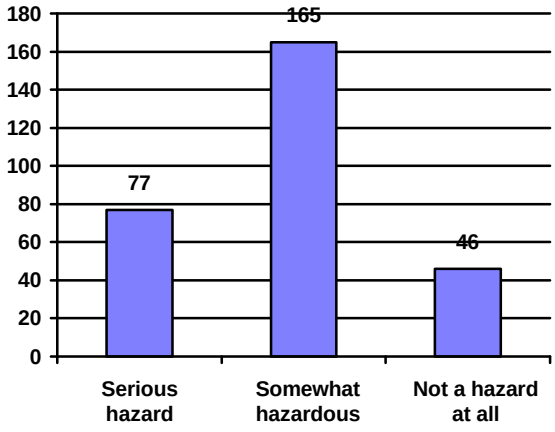



*Figure 12*

## *Artificial Coloring*

Responses: 288 Mean: 2.017
Std. Dev.: 0.686

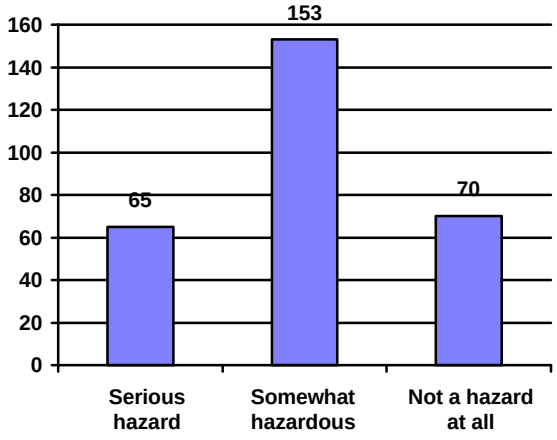



*Figure 13*

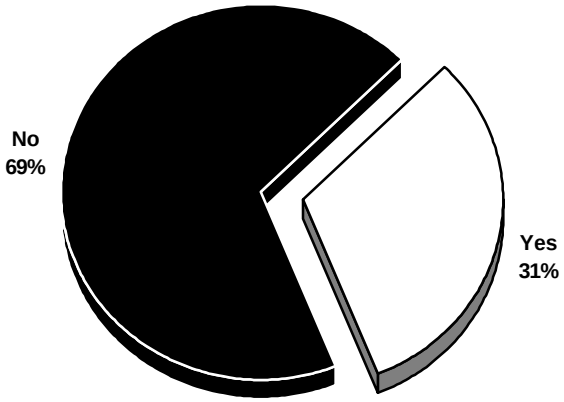
## *Consumer Response to IPM and Organic Produce*

Survey questions also dealt with whether or not individuals would be willing to purchase IPM or organic produce and how much they would be willing to pay for them. Figure 14 illustrates how many individuals had heard of IPM prior to taking this survey. As with other studies, less than one third of the respondents (31.4%) had prior knowledge of IPM. When cross-tabulated with socio-demographic characteristics (Table 3), knowledge of IPM was relatively consistent among each group except education. Individuals with lower educational levels clearly had less knowledge and those with high levels of education, especially those who had completed at least some graduate school, generally had more knowledge of IPM.

### *Figure 14*

Have you heard or read any news reports about integrated pest management?

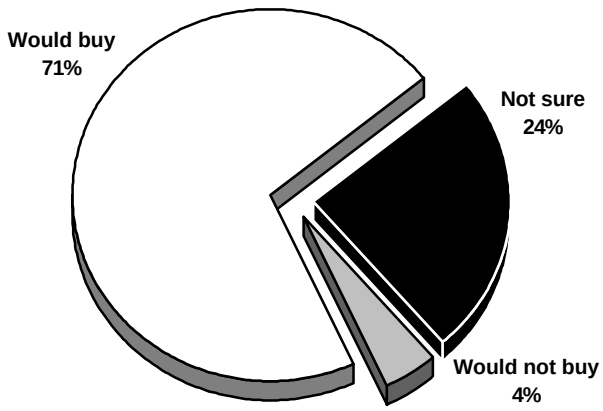
Responses: 287 Mean: 1.686
Std. Dev.: 0.465




### *Figure 15*

If IPM produce was labeled as such in your supermarket do you think that you:

Responses: 291 Mean: 1.533
Std. Dev.: 0.860




When asked if they would be willing to purchase IPM produce (Figure 15) given the information they had been presented about it, the majority of participants (71.1%) said they would purchase it, while 24 percent indicated they did not have enough information or were not sure and only 4 percent reported they would not purchase it. A cross-tabulation against demographic characteristics appears in Table 4. Responses were extremely consistent along the gender breakdown, however there was a clear and

## *Table 3: Have you heard or read any news reports about integrated pest management?*

| | | |
|---|---|---|
| Yes | 90 | 31.4% |
| No | 197 | 68.6% |

| *Cross-tabulated Responses* | *Yes* | | *No* | |
|---|---|---|---|---|
| ***Gender*** | | | | |
| Female | 65 | 34.8% | 122 | 65.2% |
| Male | 25 | 25.0% | 75 | 75.0% |
| ***Age*** | | | | |
| Less than 20 years of age | 0 | 0.0% | 2 | 100.0% |
| 21 - 35 years of age | 21 | 31.8% | 45 | 68.2% |
| 36 - 50 years of age | 33 | 32.0% | 70 | 68.0% |
| 51 - 65 years of age | 23 | 34.3% | 44 | 65.7% |
| Over 65 years of age | 13 | 26.5% | 36 | 73.5% |
| ***Education*** | | | | |
| Some Grade School | 0 | 0.0% | 1 | 100.0% |
| Some High School | 0 | 0.0% | 3 | 100.0% |
| High School Graduate | 6 | 16.2% | 31 | 83.8% |
| Some College | 9 | 16.7% | 44 | 83.0% |
| College Graduate | 23 | 27.7% | 60 | 72.3% |
| Some Graduate School | 16 | 53.3% | 14 | 46.7% |
| Masters Degree | 26 | 43.3% | 34 | 56.7% |
| Doctoral Degree | 9 | 47.4% | 10 | 52.6% |
| ***Income*** | | | | |
| Less than $9,999 | 0 | 0.0% | 4 | 100.0% |
| $10,000 - $19,999 | 6 | 37.5% | 10 | 62.5% |
| $20,000 - $29,999 | 1 | 6.3% | 15 | 93.8% |
| $30,000 - $39,999 | 9 | 37.5% | 15 | 62.5% |
| $40,000 - $49,999 | 10 | 31.3% | 22 | 68.8% |
| $50,000 - $59,999 | 7 | 26.9% | 19 | 73.1% |
| $60,000 - $69,999 | 7 | 21.9% | 25 | 78.1% |
| More than $70,000 | 48 | 37.8% | 79 | 62.2% |
| ***Marital Status*** | | | | |
| Single | 13 | 31.7% | 28 | 68.3% |
| Married | 64 | 32.2% | 135 | 67.8% |
| Separated | 1 | 25.0% | 3 | 75.0% |
| Divorced | 4 | 25.0% | 12 | 75.0% |
| Widowed | 6 | 26.1% | 17 | 73.9% |
| Other | 1 | 33.3% | 2 | 66.7% |

## *Table 4: If IPM produce was labeled as such in your supermarket, do you think that you would purchase it?*

| | | |
|---|---|---|
| Would purchase | 207 | 71.1% |
| Would not purchase | 13 | 4.5% |
| Not sure | 71 | 24.4% |

| ***Cross-tabulated Responses*** | ***Would Buy*** | | ***Would Not Buy*** | | ***Not Sure*** | |
|---|---|---|---|---|---|---|
| ***Gender*** | | | | | | |
| Female | 137 | 71.7% | 9 | 4.7% | 45 | 23.6% |
| Male | 70 | 70.0% | 4 | 4.0% | 26 | 26.0% |
| ***Age*** | | | | | | |
| Less than 20 years of age | 0 | 0.0% | 0 | 0.0% | 2 | 100.0% |
| 21 - 35 years of age | 50 | 75.8% | 3 | 4.6% | 13 | 19.7% |
| 36 - 50 years of age | 80 | 77.7% | 2 | 1.9% | 21 | 20.4% |
| 51 - 65 years of age | 51 | 73.9% | 2 | 2.9% | 16 | 23.2% |
| Over 65 years of age | 26 | 51.0% | 6 | 11.8% | 19 | 37.3% |
| ***Education*** | | | | | | |
| Some Grade School | 0 | 0.0% | 0 | 0.0% | 1 | 100.0% |
| Some High School | 1 | 33.3% | 0 | 0.0% | 2 | 66.7% |
| High School Graduate | 25 | 65.8% | 3 | 7.9% | 10 | 26.3% |
| Some College | 35 | 63.6% | 3 | 5.5% | 17 | 30.9% |
| College Graduate | 65 | 77.4% | 3 | 3.6% | 16 | 19.1% |
| Some Graduate School | 25 | 83.3% | 1 | 3.3% | 4 | 13.3% |
| Masters Degree | 41 | 68.3% | 2 | 3.3% | 17 | 28.3% |
| Doctoral Degree | 15 | 78.9% | 0 | 0.0% | 4 | 21.1% |
| ***Income*** | | | | | | |
| Less than $9,999 | 1 | 25.0% | 0 | 0.0% | 3 | 75.0% |
| $10,000 - $19,999 | 9 | 52.3% | 0 | 0.0% | 8 | 47.1% |
| $20,000 - $29,999 | 9 | 56.3% | 3 | 18.6% | 4 | 25.0% |
| $30,000 - $39,999 | 15 | 60.0% | 2 | 8.0% | 8 | 32.0% |
| $40,000 - $49,999 | 23 | 69.7% | 3 | 9.1% | 7 | 21.2% |
| $50,000 - $59,999 | 18 | 69.2% | 0 | 0.0% | 8 | 30.8% |
| $60,000 - $69,999 | 24 | 75.0% | 1 | 3.1% | 7 | 21.9% |
| More than $70,000 | 103 | 81.1% | 2 | 1.6% | 22 | 17.3% |
| ***Marital Status*** | | | | | | |
| Single | 29 | 70.7% | 2 | 4.9% | 10 | 24.4% |
| Married | 144 | 72.4% | 7 | 3.5% | 48 | 24.1% |
| Separated | 3 | 75.0% | 0 | 0.0% | 1 | 25.0% |
| Divorced | 15 | 83.3% | 1 | 5.6% | 2 | 11.1% |
| Widowed | 15 | 60.0% | 1 | 4.0% | 9 | 36.0% |
| Other | 1 | 33.3% | 1 | 33.3% | 1 | 33.3% |

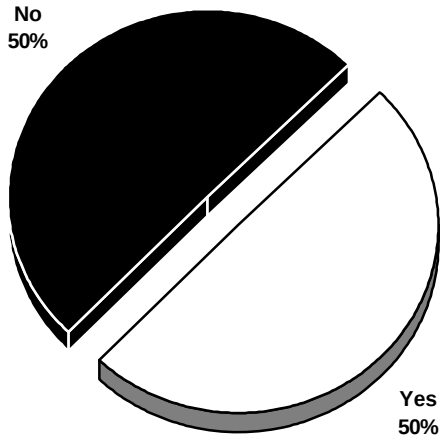
direct relationship between income and willingness-to-purchase IPM produce. Individuals with high annual household incomes were generally more willing to purchase IPM produce. Of particular interest were households with annual incomes over $70,000. With 127 members (45% of the entire sample) this was both the largest group and the segment which showed the highest level of interest in IPM with over 81 percent of participants indicating they would purchase IPM produce.

Similarly, those with higher levels of education were also more willing to purchase IPM produce, especially those who were at least college graduates. When compared to other age groups, those over 65 years of age seemed to be the most hesitant to purchase IPM produce with only 51 percent indicating they would buy it while 37 percent were unsure. Among the marital status breakdown, widowed individuals were the least willing to purchase IPM, however these individuals were highly correlated with those over 65 years of age.

## *Figure 16*

Would you switch supermarkets to be able to purchase IPM produce?

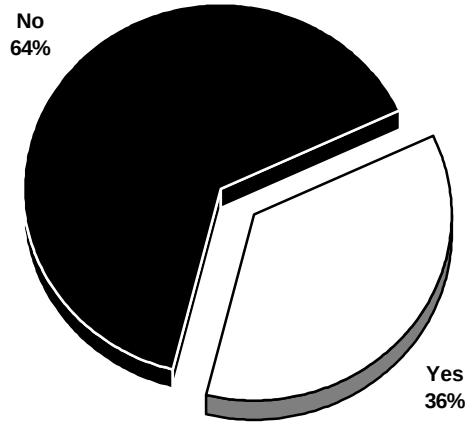
Responses: 280 Mean: 1.521
Std. Dev.: 0.535




## *Figure 17*

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

Responses: 285 Mean: 1.670
Std. Dev.: 0.527



Figures 16 and 17 present the first direct comparison of organic and IPM produce of the study. When asked if they would consider switching supermarkets to be able to purchase organic or IPM produce, 49.6% said they would switch supermarkets to be able to purchase IPM produce while only 35.8% indicated they would switch for organic. Roughly two-thirds of those who indicated that they would be interested in purchasing IPM produce also said that they would switch supermarkets to do so. Cross-tabulated results are presented in Tables 5 and 6. At least 17 respondents omitted these two questions or wrote "Don't know" on the survey paper. These responses were not included in the cross-tabulation tables and consequently summing across many subcategories will not add up to 100 percent. In general, IPM is often ranked higher by consumers than organic as seen in this and other (Anderson 1993, for example) surveys. One possible difference is the fact that for most respondents, the only information they have about IPM is that which is given in the survey itself whereas most had prior knowledge and opinions of organic produce.

For both organic and IPM produce, women were more likely to switch supermarkets than men. One dramatic difference was that participants with annual household incomes over $50,000 were far more likely to switch supermarkets to obtain IPM produce than they were for organic produce. In general, marital status and age were the demographic breakdowns which explained the least. The responses broken down by age were extremely consistent across all groups. Some sub-categories, however, such as the marital status "Separated," were unusually far from the overall question means due to the small number of members.

In questions 17 and 21, respondents were asked if they would be willing to pay a premium to purchase IPM and organic produce. Just as they were more willing to switch supermarkets for IPM, collectively the survey participants were more willing to pay a premium for IPM produce than for organic produce. This is an interesting finding since the survey explicitly explained that IPM produce contains some pesticide residues while organic produce contained no residues.

## *Table 5: Would you switch supermarkets to be able to purchase organic produce?*

| | | |
|---|---|---|
| Yes | 102 | 35.8% |
| No | 175 | 61.4% |

| *Cross-tabulated Responses* | *Yes* | | *No* | |
|---|---|---|---|---|
| ***Gender*** | | | | |
| Female | 68 | 36.7% | 111 | 60.0% |
| Male | 34 | 34.0% | 64 | 64.0% |
| ***Age*** | | | | |
| Less than 20 years of age | 0 | 0.0% | 2 | 100.0% |
| 21 - 35 years of age | 25 | 38.5% | 39 | 60.0% |
| 36 - 50 years of age | 35 | 34.3% | 62 | 60.8% |
| 51 - 65 years of age | 25 | 36.7% | 41 | 60.3% |
| Over 65 years of age | 17 | 35.4% | 31 | 64.6% |
| ***Education*** | | | | |
| Some Grade School | 0 | 0.0% | 0 | 0.0% |
| Some High School | 2 | 66.7% | 1 | 33.3% |
| High School Graduate | 15 | 41.7% | 21 | 58.3% |
| Some College | 17 | 31.5% | 36 | 66.7% |
| College Graduate | 26 | 31.3% | 56 | 67.5% |
| Some Graduate School | 13 | 43.3% | 17 | 56.7% |
| Masters Degree | 20 | 33.3% | 36 | 60.0% |
| Doctoral Degree | 8 | 44.4% | 8 | 44.4% |
| ***Income*** | | | | |
| Less than $9,999 | 2 | 50.0% | 2 | 50.0% |
| $10,000 - $19,999 | 9 | 56.3% | 7 | 43.8% |
| $20,000 - $29,999 | 8 | 53.3% | 7 | 46.7% |
| $30,000 - $39,999 | 11 | 44.0% | 14 | 56.0% |
| $40,000 - $49,999 | 9 | 29.0% | 22 | 71.0% |
| $50,000 - $59,999 | 7 | 26.9% | 18 | 69.2% |
| $60,000 - $69,999 | 14 | 43.8% | 18 | 56.3% |
| More than $70,000 | 38 | 30.2% | 82 | 65.1% |
| ***Marital Status*** | | | | |
| Single | 17 | 41.5% | 23 | 56.1% |
| Married | 64 | 32.7% | 125 | 63.8% |
| Separated | 3 | 75.0% | 1 | 25.0% |
| Divorced | 6 | 35.3% | 11 | 64.7% |
| Widowed | 9 | 39.1% | 14 | 60.9% |
| Other | 2 | 66.7% | 1 | 33.3% |

## *Table 6: Would you switch supermarkets to be able to purchase IPM produce?*

| | | |
|---|---|---|
| Yes | 139 | 49.6% |
| No | 136 | 48.6% |

| *Cross-tabulated Responses* | *Yes* | | *No* | |
|---|---|---|---|---|
| ***Gender*** | | | | |
| Female | 95 | 51.9% | 83 | 45.4% |
| Male | 44 | 45.4% | 53 | 54.6% |
| ***Age*** | | | | |
| Less than 20 years of age | 0 | 0.0% | 2 | 100.0% |
| 21 - 35 years of age | 35 | 53.0% | 30 | 45.5% |
| 36 - 50 years of age | 50 | 50.0% | 48 | 48.0% |
| 51 - 65 years of age | 30 | 45.5% | 34 | 51.5% |
| Over 65 years of age | 24 | 52.2% | 22 | 47.8% |
| ***Education*** | | | | |
| Some Grade School | 0 | 0.0% | 0 | 0.0% |
| Some High School | 2 | 66.7% | 1 | 33.3% |
| High School Graduate | 23 | 62.2% | 14 | 37.8% |
| Some College | 25 | 48.1% | 26 | 50.0% |
| College Graduate | 38 | 46.9% | 43 | 53.1% |
| Some Graduate School | 18 | 62.1% | 11 | 37.9% |
| Masters Degree | 26 | 44.8% | 29 | 50.0% |
| Doctoral Degree | 7 | 36.8% | 11 | 57.9% |
| ***Income*** | | | | |
| Less than $9,999 | 2 | 50.0% | 2 | 50.0% |
| $10,000 - $19,999 | 9 | 60.0% | 6 | 40.0% |
| $20,000 - $29,999 | 8 | 53.3% | 7 | 46.7% |
| $30,000 - $39,999 | 12 | 48.0% | 13 | 52.0% |
| $40,000 - $49,999 | 12 | 36.4% | 21 | 63.6% |
| $50,000 - $59,999 | 13 | 50.0% | 11 | 42.3% |
| $60,000 - $69,999 | 17 | 53.1% | 15 | 46.8% |
| More than $70,000 | 63 | 52.5% | 54 | 45.0% |
| ***Marital Status*** | | | | |
| Single | 21 | 51.2% | 20 | 48.8% |
| Married | 97 | 50.8% | 91 | 47.6% |
| Separated | 3 | 75.0% | 1 | 25.0% |
| Divorced | 7 | 41.2% | 8 | 47.1% |
| Widowed | 9 | 39.1% | 14 | 60.9% |
| Other | 2 | 66.7% | 1 | 33.3% |

Following a typical contingent valuation format, 6 possible choices were provided ranging from “no premium” to a premium of “over 20 percent.” Of the 283 respondents who replied to the willingness-to-pay questions, over 19 percent were not willing to pay any premium for organic while only 12 percent were unwilling to pay a premium for IPM produce. As can be seen in Figures 18 and 19, a higher number of participants were willing to pay for IPM produce at each level of premium than organic produce. The standard deviation among IPM responses was also lower than among organic responses suggesting more consensus among the IPM responses.

***Premium for IPM***

Responses: 283 Mean: 3.34
Std. Dev.: 1.63

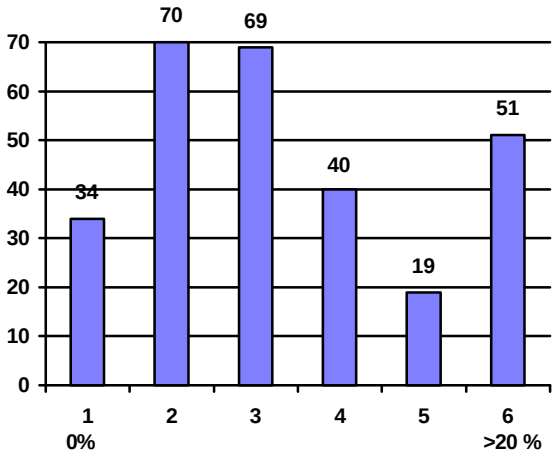



***Figure 18****

***Premium for Organic***

Responses: 283 Mean: 3.113
Std. Dev.: 1.71

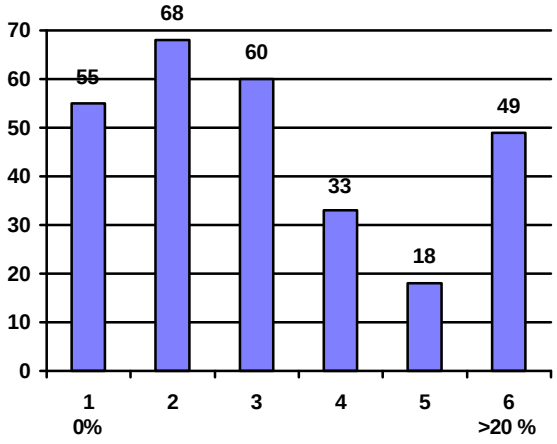



***Figure 19****

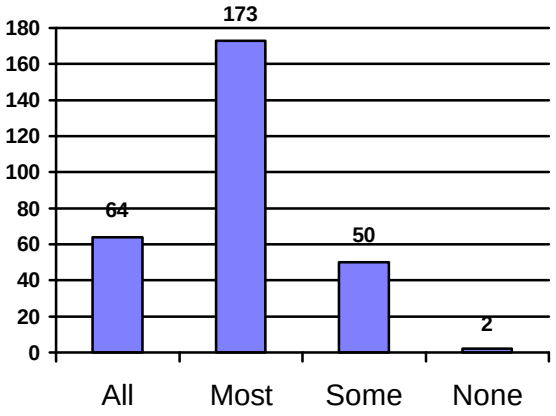
* Where 1 denotes a respondent who is not willing to pay a premium, 2 indicates a 1-5% premium, 3 indicates a 6-10% premium, 4 indicates a 10-15% premium, 5 indicates a 15-20% premium, and 6 indicates a greater than 20% premium.

Questions 22 and 23 required participants to indicate approximately how much of the produce they purchase was conventionally grown and how much was organic. As expected, only 5 individuals indicated that they purchased organic produce exclusively (Figure 21), while 64 individuals reported that they purchased conventional produce exclusively (Figure 20). The majority of individuals reported that they purchased “some” organic produce, but that “most” of the produce they purchased was conventionally grown. Some individuals (19.9%) indicated that they purchased no organic produce in the past year.

## *Figure 20*

Approximately how much of the produce you purchased last year was conventionally produced?

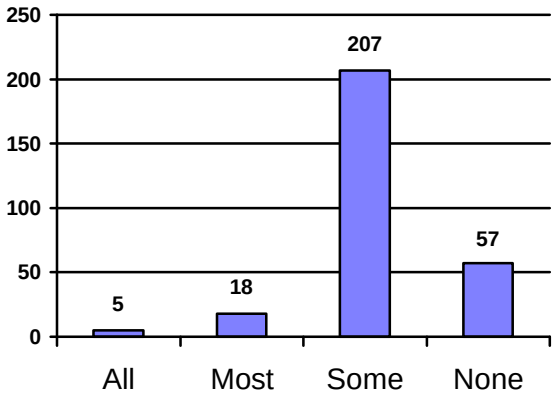
Responses: 289 Mean: 1.965
Std. Dev.: 0.649




## *Figure 21*

Approximately how much of the produce you purchased last year was organically produced?

Responses: 287 Mean: 3.097
Std. Dev.: 0.583

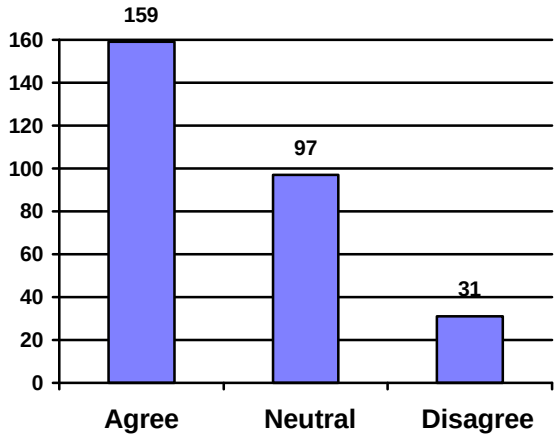



Near the end of the survey, a series of six questions was included to further test pesticide attitudes and willingness-to-pay for low-input agriculture. Of the 287 participants that responded, only half (55.4%) believed that conventional produce was generally safe to consume (Figure 22). Of the remaining 45 percent, 11 percent disagreed that conventional produce was safe and one third (33.8%) were unsure.

## *Figure 22*

Conventional produce is generally safe to consume.

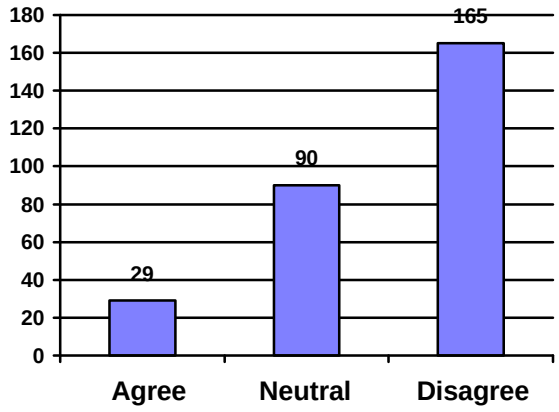
Responses: 287 Mean: 1.554
Std. Dev.: 0.682




## *Figure 23*

There is basically no difference between the safety of conventional, IPM and organic produce.

Responses: 284 Mean: 2.479
Std. Dev.: 0.675

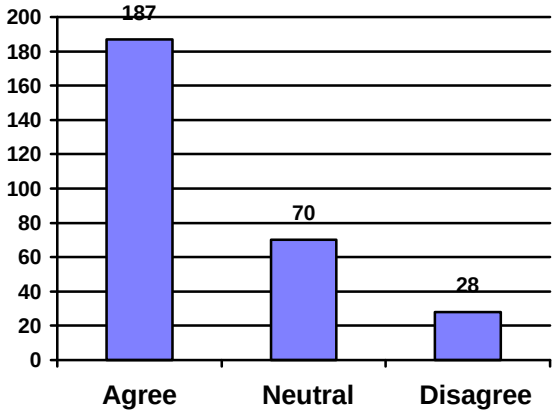


While a large portion of the sample believed that conventional produce was safe to consume, the majority (58.1%) of the respondents believed a significant difference existed in the safety of consuming conventional and low-input agriculture (Figure 23). Only 10 percent believed that there was no difference in the safety of conventional and low-input agriculture while 32 percent were unsure. The majority of respondents exhibited a concern about the effects of synthetic pesticide toward the environment. Of the 285 participants who responded, 66 percent indicated that they believed the use of synthetic pesticides had a negative effect on the environment while 24 percent were unsure and only 10 percent disagreed (Figure 24).

## *Figure 24*

The use of synthetic chemicals in agriculture has a negative effect on the environment.

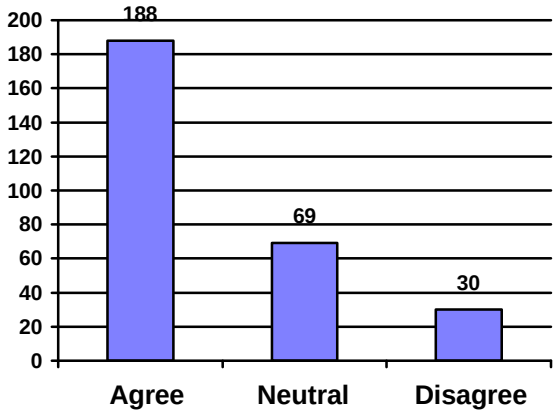
Responses: 285 Mean: 1.442
Std. Dev.: 0.667




## *Figure 25*

I would buy organic produce if it were more readily available.

Responses: 287 Mean: 1.449
Std. Dev.: 0.677

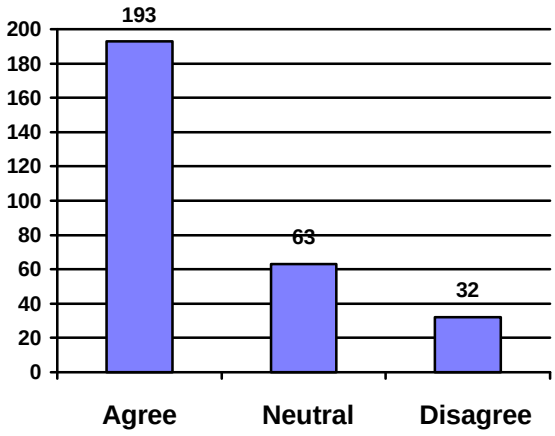



When asked again about their willingness-to-purchase organic and IPM produce, 68 percent of the respondents indicated that they would buy IPM produce if it were more readily available while 66 indicated that they would buy organic produce if it were more available (Figures 25 and 27). Of the 287 responding, 11 percent said they would not purchase organic produce while only 6 percent said that they would not purchase IPM produce if it were more readily available. When asked about the current prices of organic produce, 67 percent of the respondents indicated that they would purchase organic produce if it were cheaper (Figure 26).

## *Figure 26*

I would buy organic produce if it were cheaper.

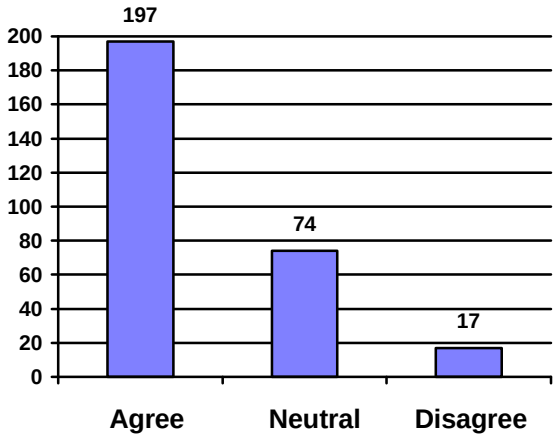
Responses: 288 Mean: 1.441
Std. Dev.: 0.686




## *Figure 27*

I would buy IPM produce if it were more readily available.

Responses: 288 Mean: 1.375
Std. Dev.: 0.595



# *Conclusion*

To date, very few studies have analyzed the marketability or consumer response to IPM. The focus of this study was to empirically evaluate consumer preferences and response to IPM produce. A consumer survey was administered and completed in early 1997 to collect the opinions and preferences of consumers of fresh produce. The respondents indicated strong support for IPM through both a high willingness to buy and willingness to pay a premium for IPM grown produce. In all cases, respondents were, on average, more willing to pay for and more willing to switch supermarkets for IPM rather than organic produce. Prior to participating in this survey, very few respondents had any knowledge of IPM.

Respondents also ranked pesticide residues as their top food safety concern relative to five other common food risk issues. Over two-thirds of the participants indicated that they presently purchase at least some organic produce, however the overwhelming majority still predominantly consume conventional produce.

The results of this survey should provide valuable information for those developing marketing strategies for low-input agriculture. However, before the average consumer exhibits the same level of interest in IPM as the sample in this study, some mechanism must be developed to educate the public about IPM. Consumer recognition also necessitates a labeling system which, to date, has been difficult to establish. While IPM does reduce pesticide residues, because integrated pest control is need based, the theoretical potential for IPM produce to contain more residues than conventional produce does exist. Such a scenario is most likely during seasons in which substitutive and natural pest control techniques are not sufficient to contain pest damage. This possibility as well as the variety and magnitude of IPM practices in use has further complicated the development of an IPM labeling system. In contrast, organic produce is more concretely defined and more easily certifiable.

While the majority of consumers have revealed a relatively high degree of personal concern over pesticide residues, most have not significantly altered their purchasing behavior by buying low-input produce rather than conventional produce (Kidwell, 1994). One of the biggest obstacles to low-input agriculture is undoubtedly price. Approximately 67 percent of the participants indicated that they would purchase organic produce if it were cheaper. The success of IPM will depend on the retail price at which it is ultimately available to consumers.

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# Survey of Consumers of Fresh Vegetables

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

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

- ❑ never
- ❑ occasionally
- ❑ usually
- ❑ always

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

- ❑ never
- ❑ occasionally
- ❑ usually
- ❑ always

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

- ❑ never
- ❑ occasionally
- ❑ usually
- ❑ always

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

❑ yes ❑ no

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

❑ yes ❑ no

Have you visited a Farmers' Market in the past five years?

❑ yes ❑ no

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

| | Serious hazard | Somewhat of a hazard | Not a hazard at all |
|---|---|---|---|
| Residues from pesticides or herbicides | 1 | 2 | 3 |
| Antibiotics found in poultry and livestock | 1 | 2 | 3 |
| Growth stimulant in poultry and livestock | 1 | 2 | 3 |
| Artificial fertilizers | 1 | 2 | 3 |
| Additives and preservatives | 1 | 2 | 3 |
| Artificial coloring | 1 | 2 | 3 |

Have you heard or read any news report about integrated pest management (IPM)?

❑ yes ❑ no

# *Please read before proceeding*

Integrated pest management (IPM) is a crop production program in which a combination of pest control techniques are used. The farmer does not rely completely on the regular scheduled use of chemical pesticides. Other methods are used such as resistant plants, natural enemies and destruction of places where pests breed. Only when those other methods fail to control pests does the farmer use chemical pesticides as a last resort. With IPM, farmers typically reduce their usage of chemical pesticides by one-third or more.

If IPM produce was labeled as such in your supermarket do you think that you . .

❑ would buy
❑ would not buy
❑ do not know/not sure

Suppose your favorite vegetable that you purchase regularly costs $1 per pound. Would you pay slightly more for IPM-certified produce?

❑ no
❑ yes, I would pay between 1 cent and 5 five cents more for IPM produce
❑ yes, I would pay between 6 cents and 10 cents more for IPM produce
❑ yes, I would pay between 10 cents and 15 cents more for IPM produce
❑ yes, I would pay between 15 cents and 20 cents more for IPM produce
❑ yes, I would pay over 20 cents more for IPM produce

Would you switch supermarkets to be able to purchase IPM produce?

❑ yes ❑ no

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

- ❑ never
- ❑ seldom
- ❑ usually
- ❑ always

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

❑ yes ❑ no

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 10 cents and 15 cents more for organic produce
- ❑ yes, I would pay between 15 cents and 20 cents more for organic produce
- ❑ yes, I would pay over 20 cents more for organic produce

***Please select the amount and types of produce you purchased in 1995:***

Conventional Produce ___ all ___ most ___ some ___ none

Organic Produce ___ all ___ most ___ some ___ none

***How do you feel about the following statements?***

| | Agree | Neutral | Disagree |
|---|---|---|---|
| Conventional produce is generally safe to consume ..... | 1 | 2 | 3 |
| There is basically no difference between the safety of conventional, IPM and organic produce ..... | 1 | 2 | 3 |
| The use of synthetic chemicals in agriculture has a negative effect on the environment ..... | 1 | 2 | 3 |
| I would buy organic produce if it were more readily available ..... | 1 | 2 | 3 |
| I would buy organic produce if it were cheaper ..... | 1 | 2 | 3 |
| I would buy IPM produce if it were more readily available ..... | 1 | 2 | 3 |

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

How many persons, including yourself live in your household? _____

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

Are you the primary shopper for food in your household?

❑ yes ❑ no

Do your consider your neighborhood

❑ urban ❑ suburban ❑ rural

Please select your gender

❑ female ❑ male

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

| ❶ | ❷ | ❸ | ❹ | ❺ |
|---|---|---|---|---|
| less than 20 | 21 - 35 | 36-50 | 51-65 | over 65 |

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

| ❶ | ❷ | ❸ | ❹ | ❺ | ❻ | ❼ | ❽ |
|---|---|---|---|---|---|---|---|
| Some Grade School | Some High School | High School Graduate | Some College | College Graduate | Some Graduate School | Masters Degree | Doctoral Degree |

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

| ❶ | ❷ | ❸ | ❹ | ❺ | ❻ | ❼ | ❽ |
|---|---|---|---|---|---|---|---|
| Less than $9,999 | $10,000 to $19,999 | $20,000 to $29,999 | $30,000 to $39,999 | $40,000 to $49,999 | $50,000 to $59,999 | $60,000 to $69,999 | More than $70,000 |

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

| ❶ | ❷ | ❸ | ❹ | ❺ | ❻ |
|---|---|---|---|---|---|
| Single | Married | Separated | Divorced | Widower(d) | Other |

If you live in New Jersey, please select the county you reside in.

| ❶ | ❷ | ❸ | ❹ | ❺ | ❻ | ❼ |
|---|---|---|---|---|---|---|
| Mercer | Somerset | Middlesex | Morris | Monmouth | Bergen | Other_____ |

***Thank you for your help in completing this survey and have a good weekend!***

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N.J. Agricultural Experiment Station
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