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Quality of Agricultural Produce: Consumer Preferences and Perceptions

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Executive Summary

The purpose of this research was to gain a greater insight into the characteristics and beliefs consumers draw upon while selecting the produce they purchase. Health and environmental risk perceptions of many agricultural inputs and products were also collected as well as demographic information.

Nineteen produce characteristics were ranked by consumers. Locally grown produce and the country of origin were among the least important characteristics while freshness, taste/flavor, cleanliness, health value and absence of pesticides were among the most important characteristics. The survey also showed that most consumers made use of nutritional information and labeling while shopping for food and those who did, felt it aided them in making better purchase decisions.

Consumers exhibited a clear preference for low-input methods of agricultural production which minimize the use of pesticides. They believed that there were health benefits to organic produce and that they would purchase more organic produce if it were more readily available. Respondents also indicated that they believed pesticides in general, herbicides, fungicides and insecticides all had significant health and environmental risks. Consumers believed on average that the use of pesticides positively contributes to the cosmetic appearance, quality, and supply of produce. Conversely, they believed that a reduction in pesticide usage would increase both the healthfulness and prices of produce.

The results show where consensus and discord exist among consumers beliefs. Issues which have been the result of media campaigns and advertising such as oils used in cooking, tobacco products and alcoholic beverages show a greater degree of consensus than issues which are not often in the public spotlight. There were also areas in which consumers believed that there were inadequacies in the current produce market. Participants did not believe government food safeguards were sufficient to

protect public health nor did they believe the experts know enough about the long term effects of pesticide residues.

The goal of this research was to provide food marketing agents with a better understanding of consumer purchase behavior, preferences and beliefs. The results are especially encouraging to those developing marketing endeavors for low input produce such as organic and IPM produce.

Introduction

The quality and characteristics of produce play a large role in purchase decisions for most consumers. An evaluation of product characteristics can help individuals decide not only if they will purchase a product, but also the level of value it holds for them. For instance, certain combinations of characteristics will bring about higher prices in the market. This report has been designed to empirically quantify consumer preferences and risk perceptions with the intent of gaining a better understanding of consumer purchase behavior.

Structural and demographic changes in consumer tastes and preferences also necessitate determining consumer demand before new food products or marketing strategies can be planned. One such example which is an important topic covered in this report is a consumer trend disapproving of synthetic chemical inputs to agriculture. Possible reasons for this behavior 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. 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. The growing concern over chemical residues in fresh produce could manifest itself as changes in consumer behavior in two ways: (1) an increased demand for low input agriculture with reduced pesticide residues, or (2) decreased demand for fresh produce. For produce to be marketed successfully, it will be necessary to determine whether consumer concern for pesticide residues has resulted in fundamental changes in consumer attitudes and behavior.

Anticipating consumer needs and preferences can also aid producers in making profit seeking decisions. Today, conventional production methods are no longer the only options open to farmers. Integrated Pest Management (IPM), for example, is a system of pest control which has been developed with the purpose of decreasing the net

chemical pesticide inputs to agriculture. 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. In New Jersey, rising costs and increased application caused conventional growers to increase expenditure on chemical pesticides over 28% between 1985 and 1990. (Robson) The expanding application of pesticides has been a source of concern for consumers while the rising costs of production, a concern for producers. Conversely, organic growers use no synthetic pesticides or fertilizers. Organic production often involves labor intensive operations with no synthetic chemical inputs which will increase the cost of production. This may result in increased sale price of organic produce compared to conventional produce. The introduction of IPM presents a feasible and cost effective alternative to both conventional and organic agriculture. 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.

This report outlines and summarizes the results of a 1990 Rutgers Cooperative Extension survey dealing with consumers attitudes and beliefs which are drawn upon when selecting fresh produce. The results include sections on produce characteristics, shopping information and habits, health and environmental risk perceptions of a variety of agricultural inputs and products, general beliefs about the agricultural sector and sample demographics.

Literature Review

Previous studies of similar topics in food safety such as consumer preferences for organic produce and consumer risk perceptions of irradiated food illustrate links between socio-demographic groups and consumer behavior. For instance, it was found that pesticide residue concern levels were lower for more highly educated and high income households and safety information from the academic community was found to have the highest likelihood of acceptance by consumers (Byrne).

Other polls have indicated that there exists a segment of 70-85% of the national population that exhibits a medium to high degree of concern toward pesticide residues and pesticide usage. In brief, in a study of four U.S. cities, respondents in this segment were reported at 83% (Zellner and Degner), and another survey had 86% of respondents expressing concern for pesticide usage (Zind).

A University of Georgia study found that risk perceptions have a positive and significant effect on consumers' attitudes toward pesticide use. (Huang) One relationship studied the affect of socio-economic status on an individual's risk perception. Testing risk perceptions as a function of several dependent variables which included sex, education level, age, population density of region, and employment found that females are more likely to place pesticide residues as a top food concern. Findings such as these demonstrate the value in a careful assessment of consumer attitudes before marketing plans are developed.

Little empirical research has focused on analyzing the factors that explain consumer concerns and the relationship between reported concerns and food purchase or consumption behavior. (Huang) Willingness to pay for produce is also a function of product demand. With traditional demand theory, food safety is a demand curve shifter that is incorporated as a change in consumer tastes exogenous to the demand function. This prevents the interaction between price and other product characteristics and food safety to be modeled. Therefore, if food safety changes, the effect on demand will not be accurately represented. (Wilson-Salt) In effect this is quite similar to applying hedonic methods of evaluation (i.e. using a "product characteristics model") to address deficiencies in the traditional model. The model assumes that it is beneficial to define the elements of the set of alternatives which face consumers as bundles of characteristics of goods rather than bundles of goods themselves. This framework will provide ability to look at the tradeoff consumers make between food safety, other product characteristics and price.

Data Sources

The data for this report was collected in 1990 survey conducted by the Rutgers Cooperative Extension. Participants (1,200 households), selected from a local phone book, were randomly contacted by mail yielding a total of 656 responses. The survey instrument contained data about characteristics important to food purchasing behavior as well as health and environmental risk perceptions. In addition to attitudes and preferences, the questionnaire included items relating to demographic information such as age, sex, income, occupation, education, ethnicity, and household size. One half of the respondents were contacted about their willingness to participate in the survey. Each respondent received the questionnaire, a cover letter and an addressed stamped envelope. Additionally, a dollar was included as an incentive and a small compensation for the participants time. The cover letter introduced the survey and the importance of the information in improving the effectiveness of the program. The letter also assured confidentiality of the responses, that the survey had been approved by the Rutgers University Review Committee on research involving human subjects, and emphasized that completing the questionnaire would take only a few moments of their time.

The questionnaire and data collection procedure were pretested by having a group of 70 consumers with interests in food and nutrition take the survey.

Survey Results

Shopping Habits

The first series of questions was concerned with the determinants which consumers took into consideration while selecting fresh fruits and vegetables. The section was broken into two parts with the first part focusing on the relative importance of various produce characteristics in purchasing decisions. The second part dealt with the relative likelihood of any given characteristic being among the five most important characteristics. The respondents were presented with nineteen characteristics which they were asked to rank on an ordered scale of 0 to 6. A response of 0 denoted that the characteristic was not at all important in making purchasing decisions while a response of 6 indicated that the characteristic was very important in making purchasing decisions. A score of 3 was chosen if the characteristic was moderately important.

Table 1: Ranking of Produce Characteristics

Characteristic	Mean	S Dev	Characteristic	Mean	S Dev
Freshness	5.73	0.6	Color	4.49	1.3
Taste / Flavor	5.70	0.6	Aroma	4.43	1.5
Cleanliness of produce	5.33	1.0	Naturally ripened	4.30	1.6
Health Value	5.10	1.2	In season	3.98	1.6
Absence of pesticides	5.07	1.4	Product labeling	3.90	1.8
Visual Appearance	4.92	1.2	Produce loose in bin	3.69	1.8
Ripeness	4.74	1.2	Locally Grown	3.29	1.8
Absence of blemishes	4.69	1.4	Country of Origin	2.91	2.0
Absence of preservatives	4.67	1.6	Misting produce with water	2.83	1.8
Price	4.50	1.4			

Only two of the nineteen characteristics on average were decidedly less than moderately important, (country of origin and misting of produce with water, Figs. 1,2); that is, they were ranked on average below a score of 3. As we move down the ranking from the most important to least important determinants of consumer choice, the standard deviation of the responses tends to increase. This would indicate less consensus among respondents regarding the importance of the lower ranking

Country of Origin

Responses: 643 Mean: 2.914
Std. Dev.: 1.965

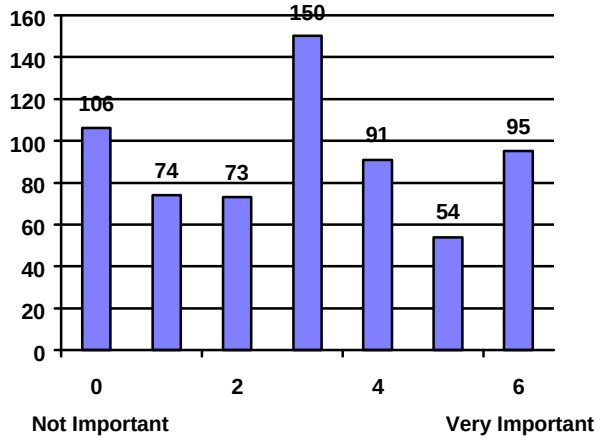


Figure 1

Misting with Water

Responses: 641 Mean: 2.826
Std. Dev.: 1.756

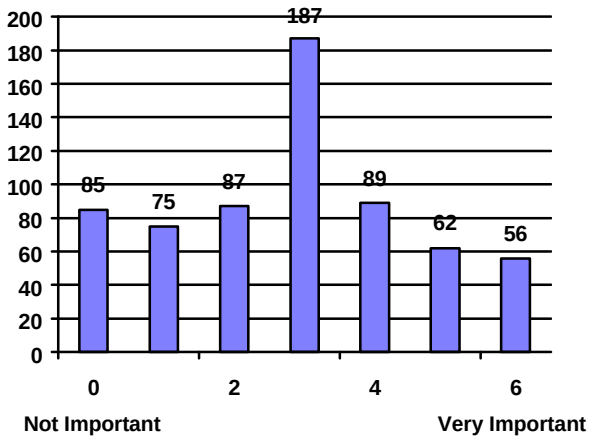


Figure 2

characteristics and a greater level of agreement on the importance of the higher ranking characteristics. Many of the higher ranking characteristics are conceptually more tangible than those of lower ranking. For instance, freshness, taste, cleanliness, and visual appearance (Figs. 3-6) are determinants which are immediately discernible to the consumer and directly related to the ability of the produce to satisfy the needs for which it is purchased. Conversely, many of the low ranking aspects such as country of origin and locally grown are more abstract and need not be directly linked to the quality

Freshness

Responses: 645 Mean: 5.731
Std. Dev.: 0.553

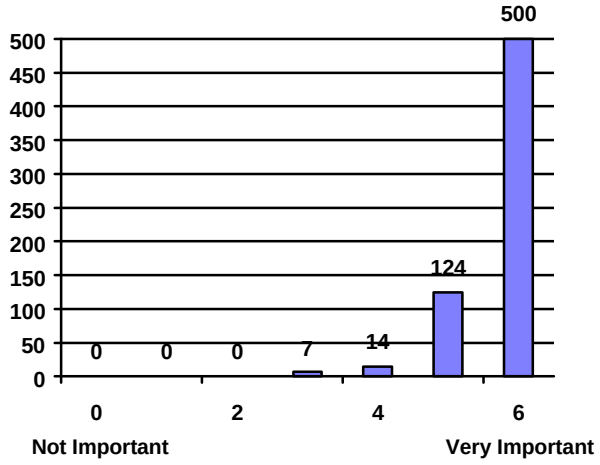


Figure 3

Taste/Flavor

Responses: 644 Mean: 5.706
Std. Dev.: 0.600

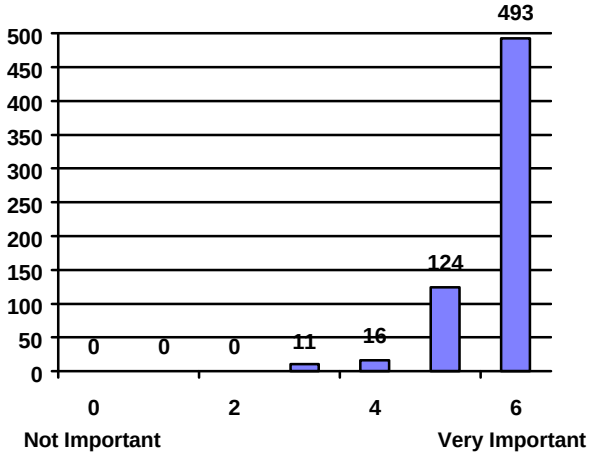


Figure 4

Cleanliness of Produce

Responses: 643 Mean: 5.331
Std. Dev.: 0.998

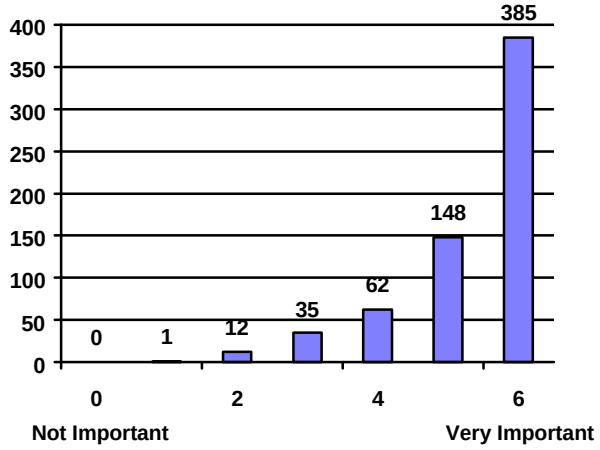


Figure 5

Visual Appearance

Responses: 642 Mean: 4.926
Std. Dev.: 1.172

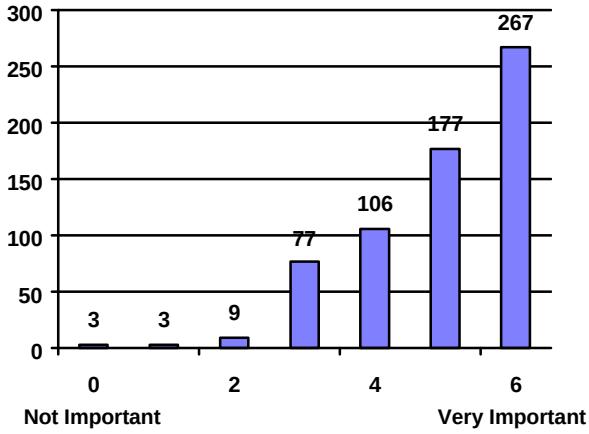


Figure 6

Produce Loose in Bin

Responses: 641 Mean: 3.695
Std. Dev.: 1.829

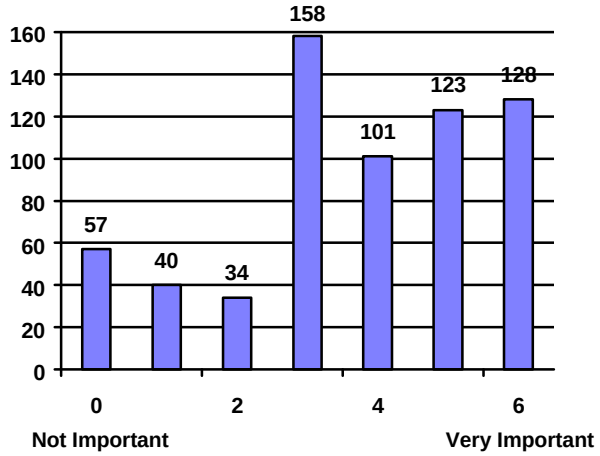


Figure 7

Product Labeling

Responses: 643 Mean: 3.909
Std. Dev.: 1.748

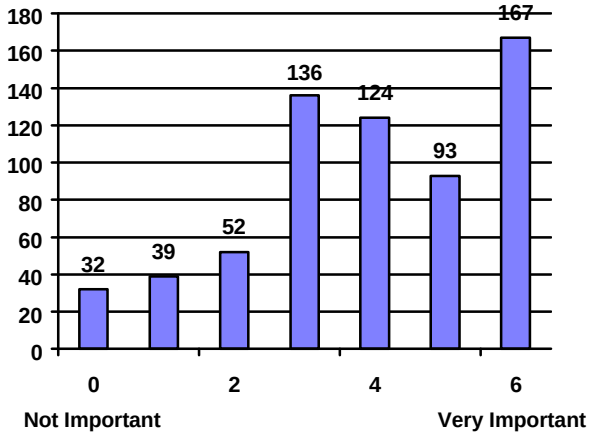


Figure 8

of the good. Several other low ranking characteristics such as misting of produce with water, produce loose in bin, and product labeling, (Figs. 7,8) are of a temporary nature because they apply only to the time during which the produce is on display at the retailer. Thus, these characteristics also need not be directly linked to the quality of the good. Two of the more abstract characteristics which did rank highly were the absence of pesticides, and health value (Figs. 9, 10). While these characteristics are not

tangible or immediately quantifiable upon visual inspection, they are nevertheless intimately related to the safety and quality of fruits and vegetables.

Absence of Pesticides

Responses: 642 Mean: 5.070
Std. Dev.: 1.376

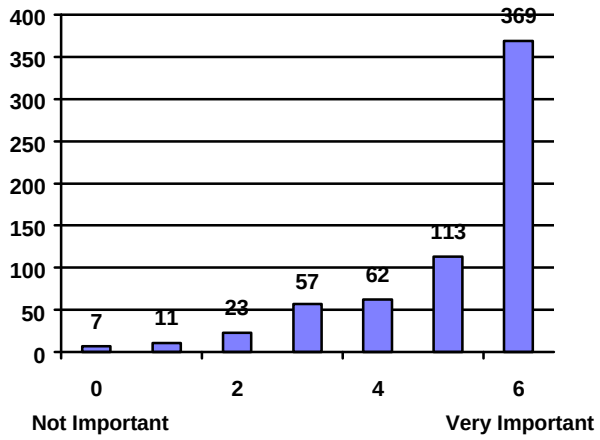


Figure 9

Health Value

Responses: 644 Mean: 5.108
Std. Dev.: 1.152

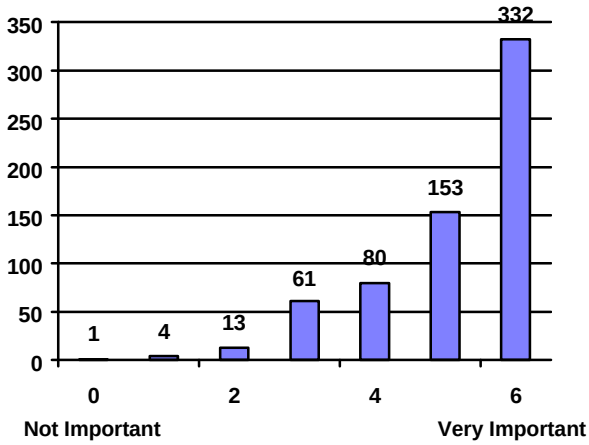


Figure 10

Absence of Blemishes

Responses: 645 Mean: 4.699
Std. Dev.: 1.376

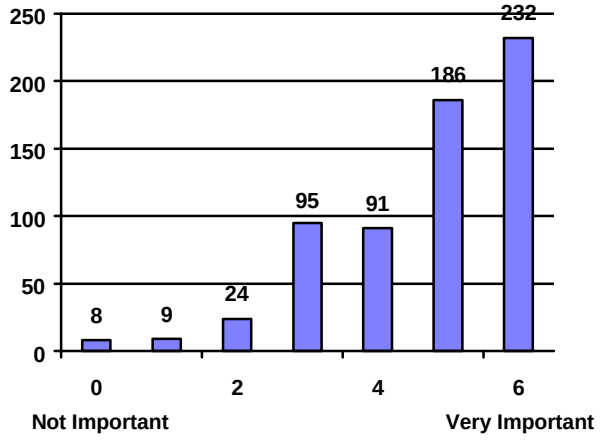


Figure 11

Absence of Preservatives

Responses: 640 Mean: 4.676
Std. Dev.: 1.549

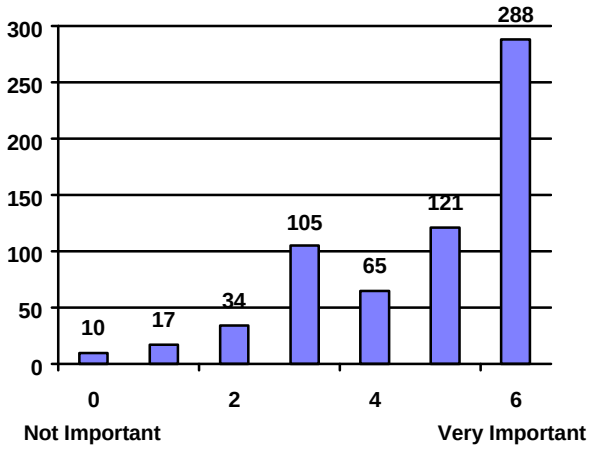


Figure 12

The responses for most of the nineteen characteristics were skewed toward “very important” with only a small percentage of responses below a score of 3. Nearly all characteristics had their highest frequency of responses at either a score of 3 or 6.

The characteristic “color” (Fig. 18) had a mode of 5 (197 of 643 responses) making it the only characteristic with a mode other than 3 or 6.

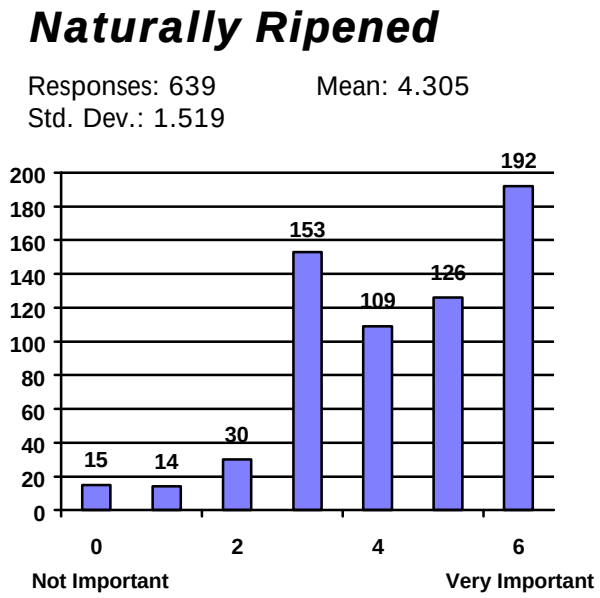


Figure 13

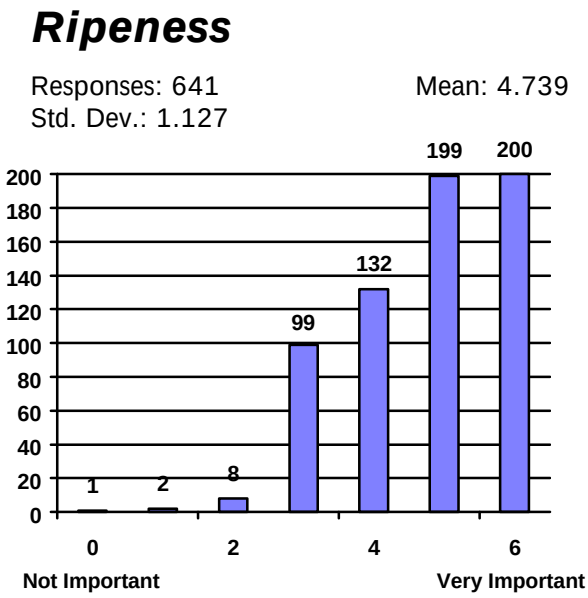


Figure 14

Freshness and taste/flavor (Figs. 3-4) were clearly chosen as the two most important characteristics in making produce purchasing choices by a rather significant margin. These high ranking characteristics had an overwhelming number of responses with a score of 6 and no responses below a score of 3. The characteristic freshness, which ranked first among all characteristics, exhibited 500 responses (77.5%) at a score of 6. Similarly, the characteristic “Taste/Flavor,” which ranked second among all characteristics, exhibited 493 responses (76.6%) at a score of 6. With standard deviations of 0.55 and 0.60, (the lowest by a significant margin) these two determinants also showed the highest degree of consensus among the respondents.

Cleanliness of produce and health value, (Figs. 5-10) which respectively ranked third and fourth, each had a sharp mode of 6 with a progressively lower frequency of responses at lower scores. Cleanliness of produce had 385 respondents (60%) selecting a score of 6 while health value had 332 respondents (52%) choosing a score of 6. Absence of pesticides and visual appearance, which rank fifth and sixth respectively were also sharply skewed toward a score of 6.

In Season

Responses: 641 Mean: 3.984
Std. Dev.: 1.574

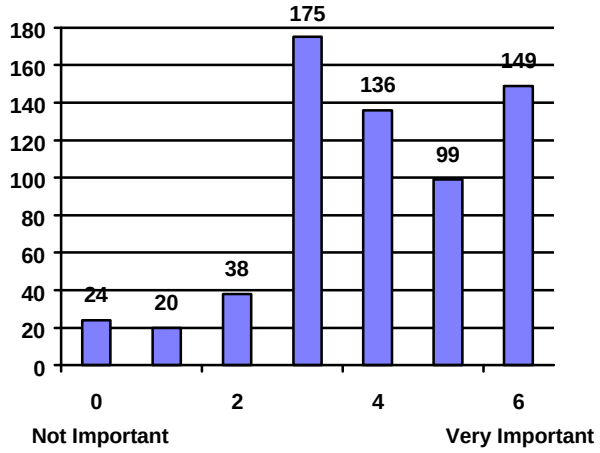


Figure 15

Price

Responses: 644 Mean: 4.509
Std. Dev.: 1.420

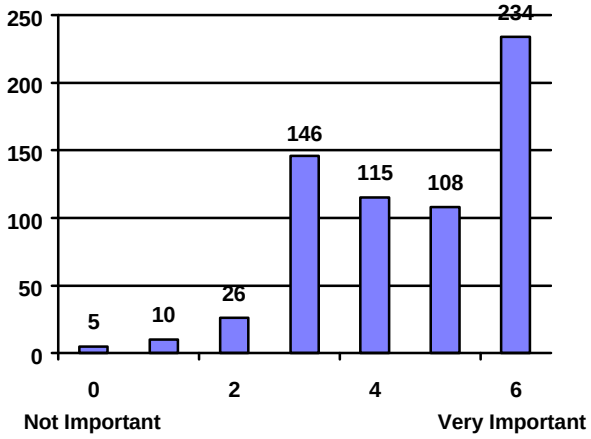


Figure 16

The three lowest ranking characteristics (locally grown, country of origin, and misting of produce with water) all exhibited a mode of three with a wide distribution of responses across the other possible answers. The country of origin characteristic had the highest frequency of respondents which assigned a score of 0 (16%) indicating they felt it was not important in making purchasing decisions. The characteristic naturally ripened, with 639 responses, showed the highest number of omissions. This could possibly be a sign of confusion among respondents regarding the characteristic.

Locally Grown

Responses: 643 Mean: 3.296
Std. Dev.: 1.750

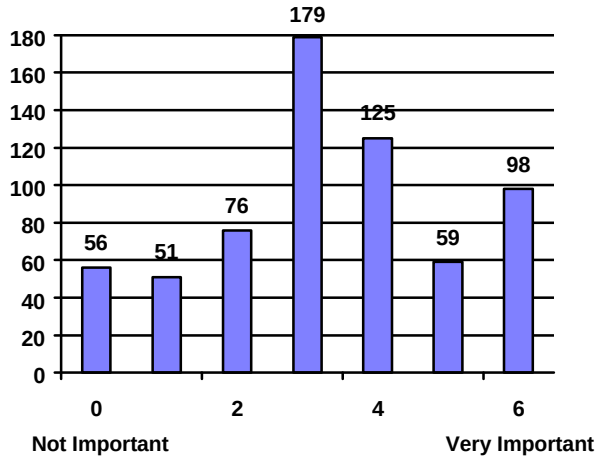


Figure 17

Color

Responses: 643 Mean: 4.499
Std. Dev.: 1.296

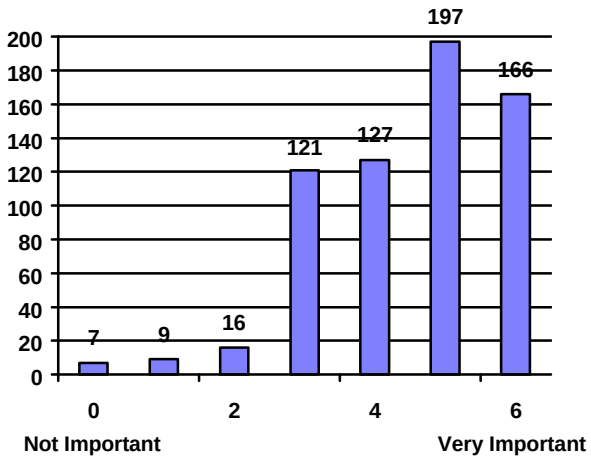


Figure 18

The second part of this section involved instructions to circle the five characteristics which were most important in deciding whether or not to purchase a particular fruit or vegetable. Interestingly, as shown in Table 2, the ranking of characteristics based on their likelihood of being chosen among the "five most important" was not always consistent with their overall level of importance as described in Table 1. Price, for instance, makes a significant jump to fourth place when compared to part 1. Absence of pesticides also increased from fifth to third place. This illustrates that while some characteristics are on average more important than others in making purchasing decisions, they may not be among the top characteristics considered when faced with deciding whether or not to purchase a particular fruit or vegetable. Other noteworthy differences included aroma, which dropped six places, health value and visual appearance which dropped two places and cleanliness of produce which rose two places. The characteristics which were most likely to be among the top five considered when purchasing fruits and vegetables were freshness, taste/flavor, the absence of pesticides, price, and the cleanliness of produce.

Table 2: Relative Importance of Produce Characteristics

Characteristic	*Mean*	*S Dev*	*Characteristic*	*Mean*	*S Dev*
Freshness	0.86	0.34	Naturally ripened	0.13	0.35
Taste / Flavor	0.60	0.49	In season	0.12	0.32
Absence of pesticides	0.51	0.50	Produce loose in bin	0.09	0.28
Price	0.44	0.49	Color	0.08	0.28
Cleanliness of produce	0.43	0.49	Locally Grown	0.07	0.25
Health Value	0.42	0.49	Country of Origin	0.05	0.21
Absence of preservatives	0.34	0.48	Product labeling	0.05	0.22
Visual Appearance	0.27	0.45	Aroma	0.03	0.18
Ripeness	0.25	0.43	Misting produce with water	0.01	0.08
Absence of blemishes	0.23	0.42			

The survey contained a section in which respondents were asked to comment on how frequently they visited various types of retail establishments. Of those who responded, 45% indicated that they visited supermarkets an average of once a week, while 54% indicated that they visited supermarkets more than once a week. All other types of stores had a significant number of respondents who never visited them. For example,

68% respondents never visit organic produce stores and 56% never visit health food stores. Very few respondents (14%) frequented year-round farm stands, produce stores (19%), health food stores (7%), or organic produce stores (3%) an average of at least once a week. After supermarkets, seasonal farm stands were the second most popular retail store being visited by 92% of respondents at least occasionally. This was followed by convenience stores which were visited by 87% of those responding at least occasionally. A sizable number of participants omitted their responses to all types of stores except supermarkets, indicating they were unfamiliar with other types of stores or that a given type of store was not available in their area.

When hypothetically offered six different types of information, consumers were asked which would be of the most use while shopping for fruits and vegetables. Information regarding pesticide residues was considered the most important and information on growing area was considered the least important (Figs. 19, 20). With a mode of 3, which meant "moderately important," growing area was the only type of information with a mode other than 6, meaning "very important." The majority of respondents (64%) felt information regarding pesticide residues would be very important.

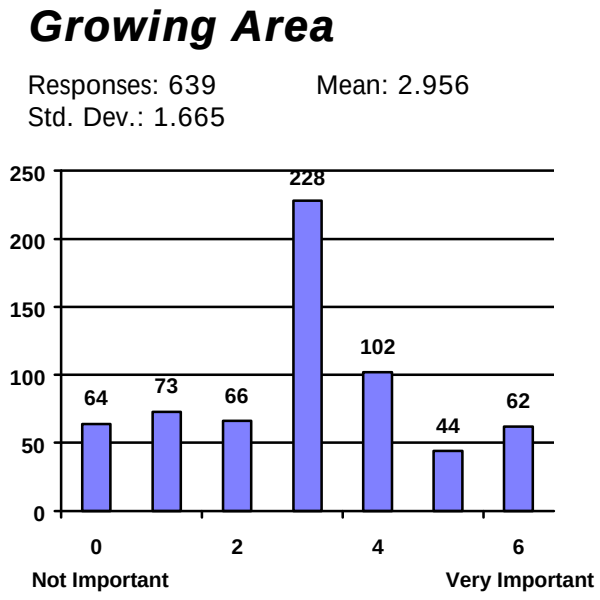


Figure 19

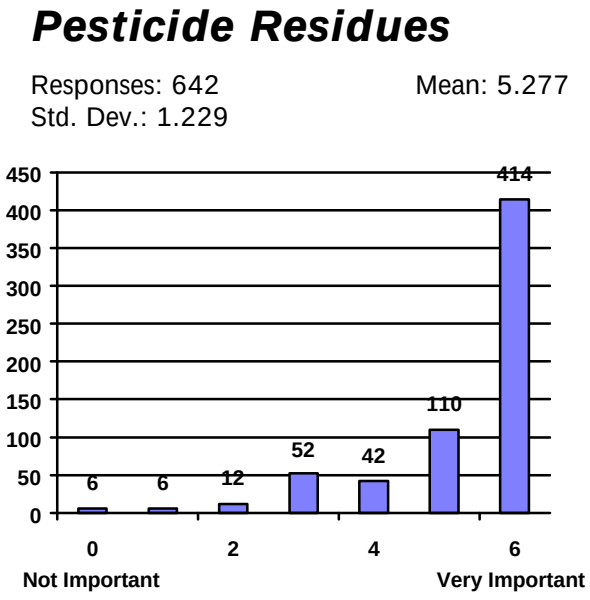


Figure 20

Information on whether fruits and vegetables were field ripened placed second with 44% selecting a score of very important (Fig. 21). At slightly lower levels of

importance, vitamin content, harvest date, and gas-ripened placed third, fourth and fifth respectively (Figs. 22 - 24). When compared to the other types of information, gas-ripened had a 3% higher rate of omission, likely due to a lack of familiarity with the topic.

Field Ripened

Responses: 640 Mean: 4.710
Std. Dev.: 1.522

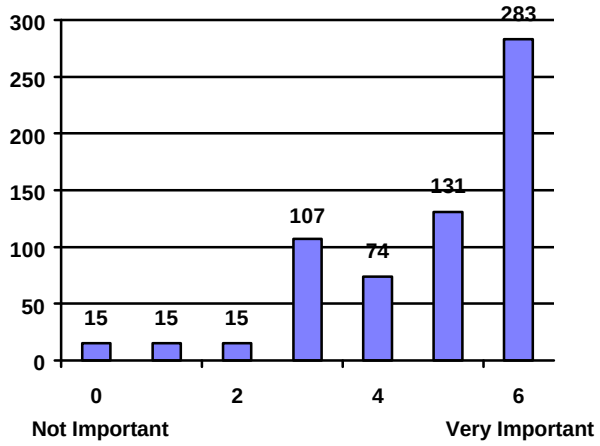


Figure 21

Vitamin Content

Responses: 640 Mean: 4.242
Std. Dev.: 1.595

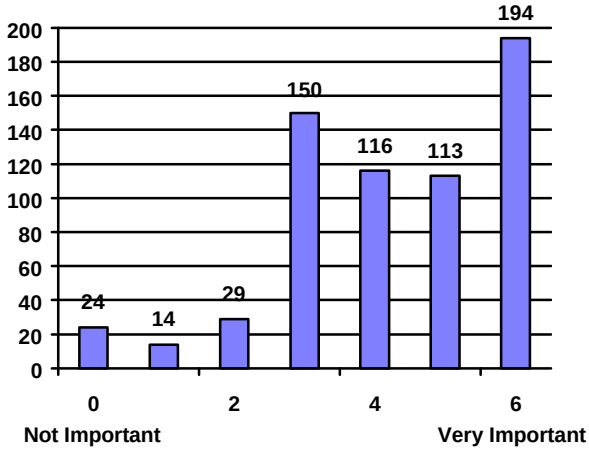


Figure 22

Harvest Date

Responses: 640 Mean: 4.078
Std. Dev.: 1.768

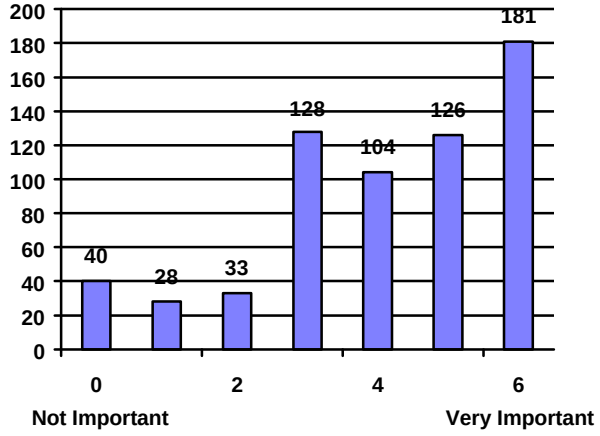


Figure 23

Gas Ripened

Responses: 622 Mean: 4.075
Std. Dev.: 1.869

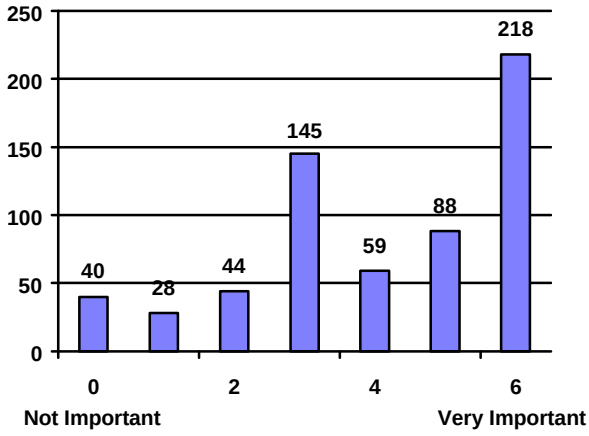


Figure 24

In a section regarding consumer awareness, 85% of respondents indicated that they read nutritional information while shopping for packaged food (Fig. 25). The majority of participants (87%) indicated that nutritional information on food packages helped

them to make better purchase decisions (Fig. 26) while 83% said that nutritional information about fruits and vegetables helped them make better purchase decisions (Fig. 27).

Figure 25

Do you read nutritional information while you are shopping for packages food?
Responses: 638 Std. Dev.: 0.355

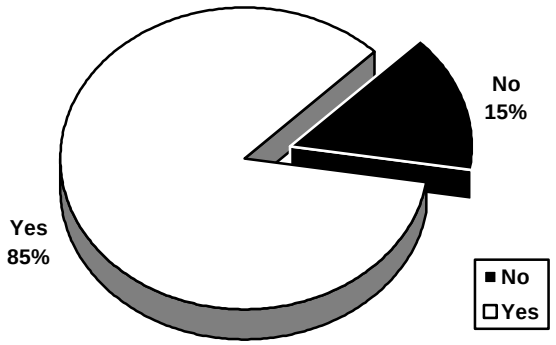
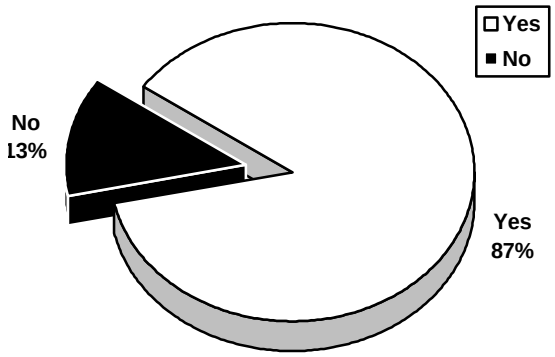


Figure 26

Does nutritional information on food packages help you make better purchase decisions?
Responses: 638 Std. Dev: 0.331



Consumers indicated that they did not know as much as they wanted to regarding the food purchases they made. Of those surveyed, 80% wanted to know more about the nutritional value of packaged foods (Fig. 28) while 74% wanted to know more about the nutritional value of different fresh fruits and vegetables (Fig. 29). Only 6.8% felt that they were very confident in choosing the most healthful packaged food when they shopped. Of the 621 who responded, 43% were moderately confident and 19% were less than moderately confident that they were making the most healthful packaged food selections. Similarly, only 8.2% were very confident that they were choosing the most healthful fruits and vegetables while 14% were less than moderately confident.

When asked about their source for nutritional information about fruits and vegetables, only 10% of respondents indicated that it was available in the store where they regularly shopped. However, 89% of the respondents said they would make use of this information if it were available while shopping for fruits and vegetables (Fig 30).

Figure 27

Does nutritional information about fruits and vegetables on food packages help you make better purchase decisions?

Responses: 639 Std. Dev.: 0.378

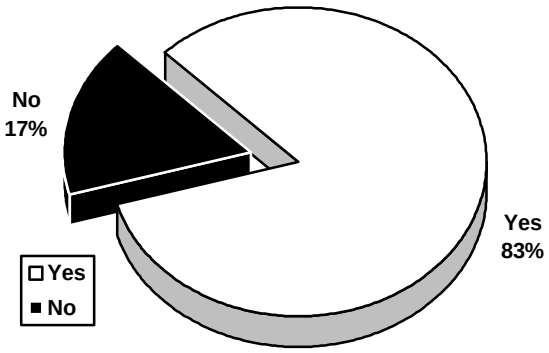


Figure 28

Do you feel that you know as much as you would like to know about the nutritional value of packaged food?

Responses: 636 Std. Dev: 0.401

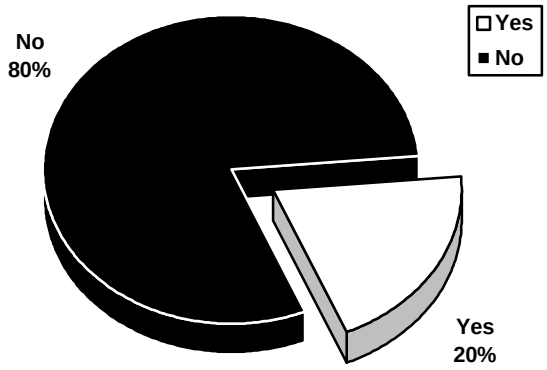


Figure 29

Do you feel you know as much as you would like to know about the nutritional value of different fruits and vegetables?

Responses: 639 Std. Dev.: 0.441

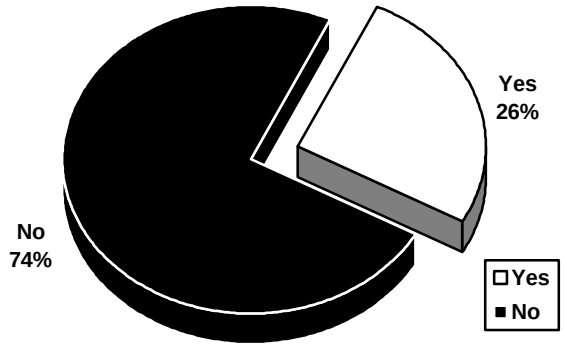
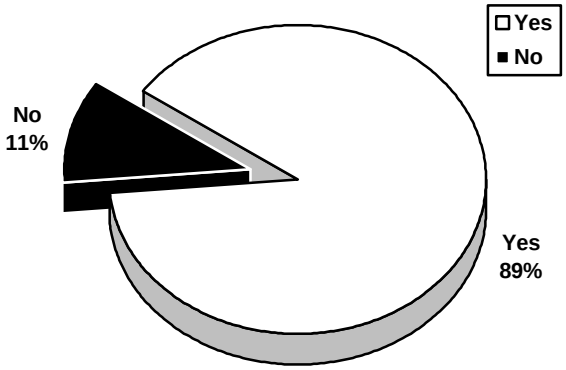


Figure 30

Would you make use of nutritional information if it was made available in your store in the future?

Responses: 590 Std. Dev: 0.318



Perceptions of Environmental and Health Risks

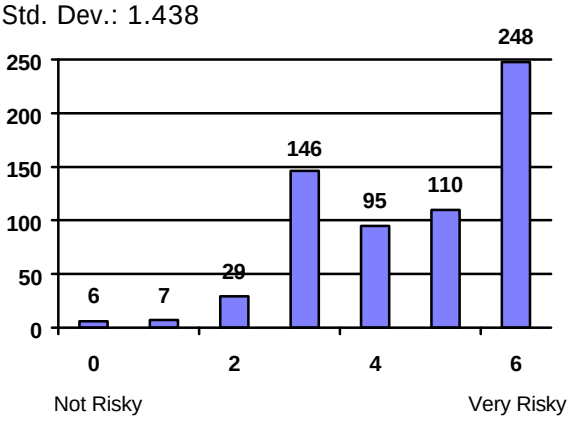
In a lengthy section of the survey, respondents were asked to comment on their personal opinions and impressions regarding the risk of a series of agrichemicals, food products, and some personal consumption items. They were asked to rate each item based on the perceptions of risk posed to human health and to the environment on an ordered scale of 0 to 6. A score of 0 indicated that the respondents found a particular topic not at all risky, while a score of 3 indicated a moderate degree of risk and a score

of 6 very risky. The first series of topics were chemicals used in agricultural production. The results were characterized by a high degree of polarization around scores of 6 (very risky) and scores of 3 (moderately risky) with a modest amount of responses at scores of 4 and 5. There were few who chose scores less than 3 for most of the agrichemicals. In every case, more respondents omitted questions on the environmental risk than the health risk. When responding about pesticides in general, 39% felt that they were very risky to human health, 23% felt that they posed a moderate risk, and only 6% felt that they posed less than a moderate risk to health (Fig. 31).

Pesticides in General (Figure 31)

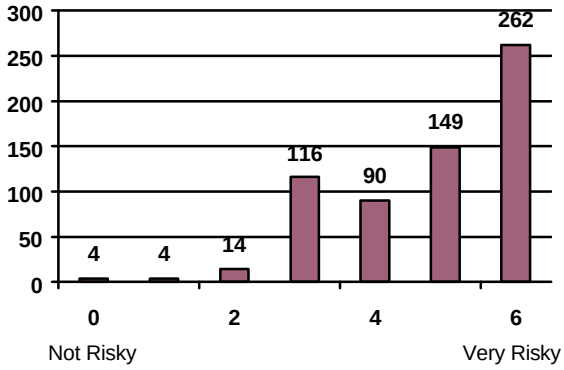
Health Risk

Responses: 641 Mean: 4.556
Std. Dev.: 1.438



Environmental Risk

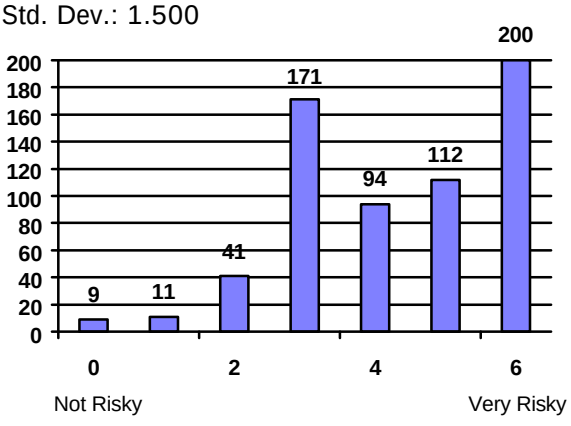
Responses: 639 Mean: 4.784
Std. Dev.: 1.298



Herbicides (Figure 32)

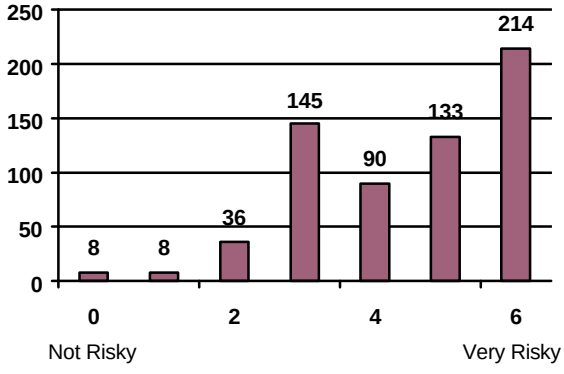
Health Risk

Responses: 638 Mean: 4.297
Std. Dev.: 1.500



Environmental Risk

Responses: 636 Mean: 4.452
Std. Dev.: 1.456

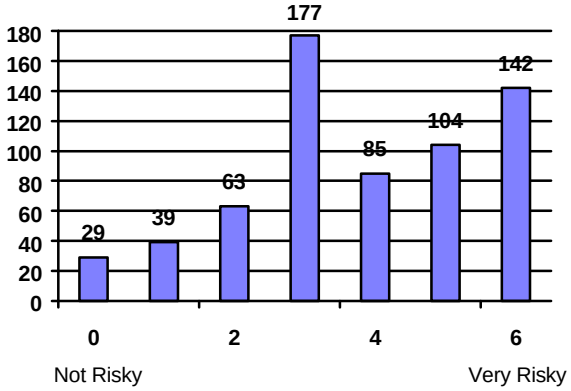


Interestingly, there was a greater level of concern for environmental risk from pesticides as 41% of respondents felt that they were very risky to the environment and only 3% felt that there was less than a moderate risk posed to the environment. When asked about herbicides, 31% felt that they were very risky to health and only 9% felt that they were less than moderately risky to health (Fig. 32). Respondents also indicated a high level of perceived environmental risk with only 8% indicating that they were less than moderately risky.

Antibiotics (Figure 33)

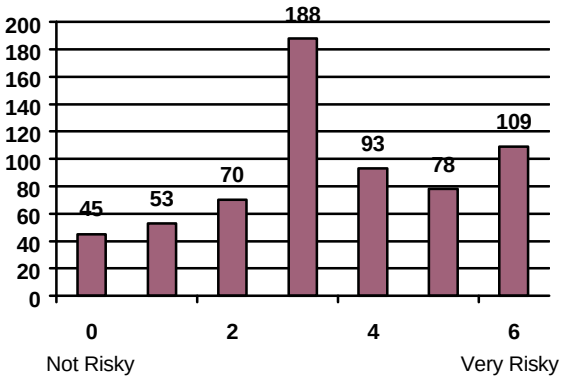
Health Risk

Responses: 639 Mean: 3.768
Std. Dev.: 1.717



Environmental Risk

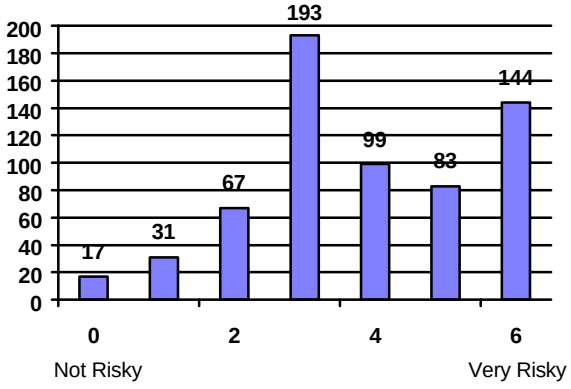
Responses: 636 Mean: 3.416
Std. Dev.: 1.758



Fungicides (Figure 34)

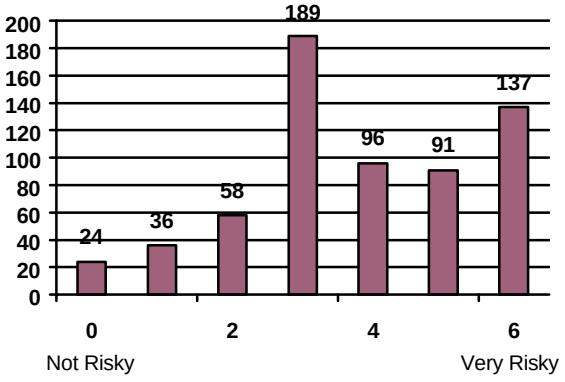
Health Risk

Responses: 634 Mean: 3.815
Std. Dev.: 1.614



Environmental Risk

Responses: 631 Mean: 3.771
Std. Dev.: 1.659



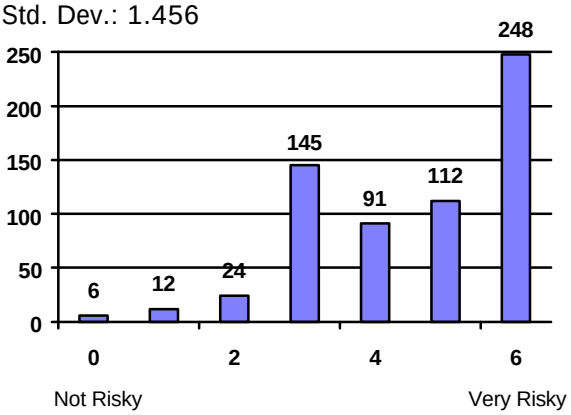
The responses for antibiotics and fungicides shared several similarities. Both were categorized by significantly more respondents choosing a score of 3 rather than 6 for

health and environmental risk. There was also a large increase in the number of respondents who selected scores less than moderately risky. Of those who responded, 21% felt that antibiotics posed less than a moderate health risk, while 26% felt antibiotics posed less than a moderate environmental risk (Fig. 33). Similarly, 18% felt that fungicides were less than moderately risky toward health while 19% felt that they caused less than a moderate environmental risk (Fig. 34). The responses for the environmental risk of antibiotics had a wide distribution across all possible scores indicating a lack of consensus among participants (Fig. 33).

Insecticides (Figure 35)

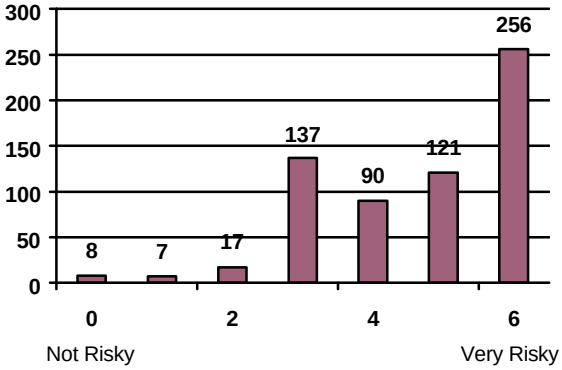
Health Risk

Responses: 638 Mean: 4.556
Std. Dev.: 1.456



Environmental Risk

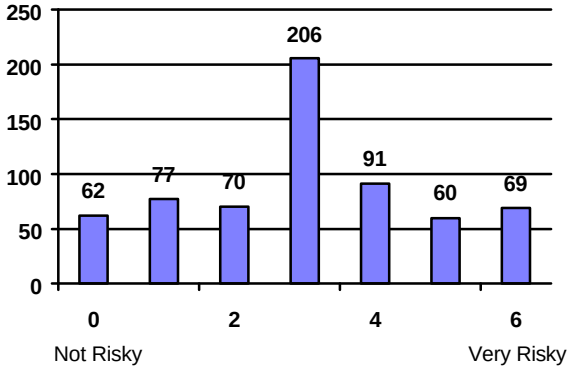
Responses: 636 Mean: 4.643
Std. Dev.: 1.418



Fertilizers (Figure 36)

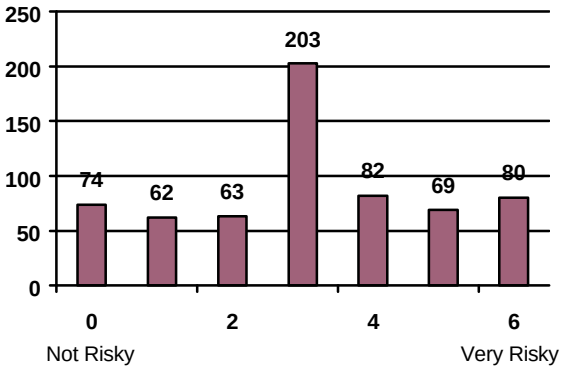
Health Risk

Responses: 635 Mean: 3.012
Std. Dev.: 1.725



Environmental Risk

Responses: 633 Mean: 3.080
Std. Dev.: 1.801



The frequency of responses for the health risk of insecticides were almost identical at all scores as the health risk of pesticides in general (Fig. 35). This may suggest that many respondents associated “pesticides in general” more closely with only “insecticides” rather than fungicides or herbicides. Of those responding 39% felt that insecticides were very risky toward health and 40% felt they were very risky toward the environment. Only 6.5% felt that the health risk from insecticides was less than moderately risky while 5% felt that the environment risk from insecticide use was less than moderately risky.

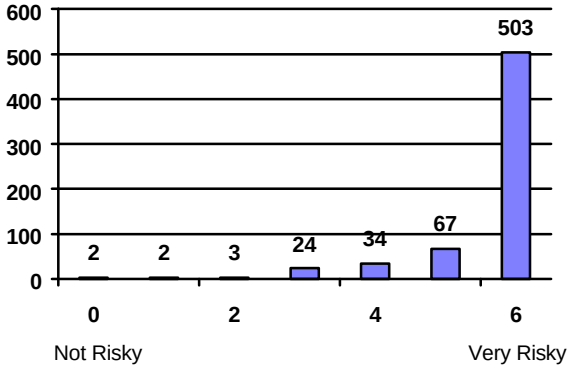
Both the responses for health risk and environmental risk of fertilizers had a significant peak at the mode of three with a fairly even number of responses across the other scores (Fig. 36). In both cases, 32% of respondents felt fertilizers were moderately risky. Overall, respondents felt that insecticides, herbicides, fertilizers, and pesticides in general all posed a greater threat toward the environment than toward human health. Conversely, they demonstrated the belief that antibiotics and fungicides were more harmful to human health than toward the environment.

Of the remaining topics, there was a higher degree of consensus about the health risks than the environmental risks associated with each topic. All but two, tobacco products and alcoholic beverages, exhibited a sharp mode of 3 in both health and environmental risk (Figs 37, 38). With respect to health, tobacco products had the lowest standard deviation and highest degree of consensus among participants. An overwhelming majority (79%) indicated that tobacco products were very risky toward health as well as the very risky toward the environment (55%). Only 1% of those surveyed felt tobacco products were less than moderately risky and 10% felt that alcoholic beverages were less than moderately risky. There was a high degree of discord over the environmental risk of alcoholic beverages with a mode of 3 (24%) and a wide dispersion of responses across the other scores.

Tobacco Products (Figure 37)

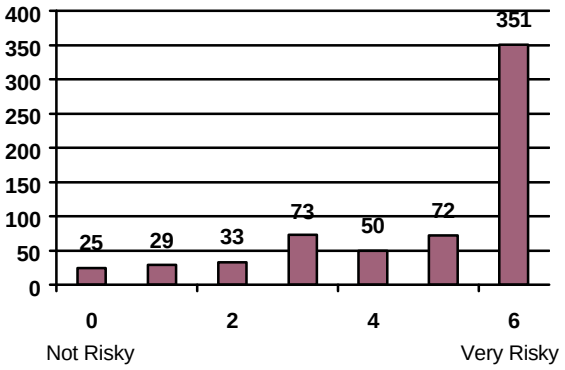
Health Risk

Responses: 635 Mean: 5.620
Std. Dev.: 0.885



Environmental Risk

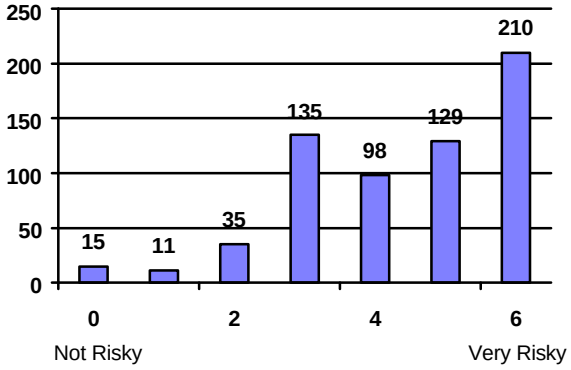
Responses: 633 Mean: 4.712
Std. Dev.: 1.792



Alcoholic Beverages (Figure 38)

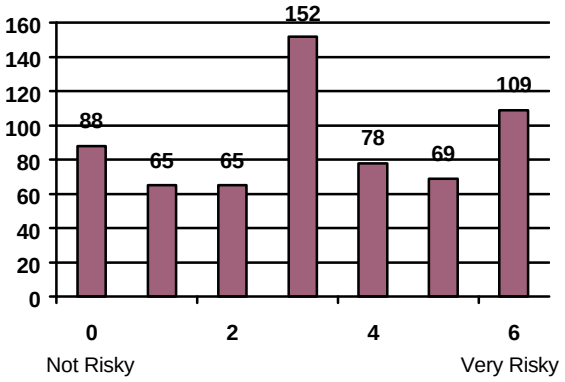
Health Risk

Responses: 633 Mean: 4.396
Std. Dev.: 1.532



Environmental Risk

Responses: 626 Mean: 3.134
Std. Dev.: 1.976



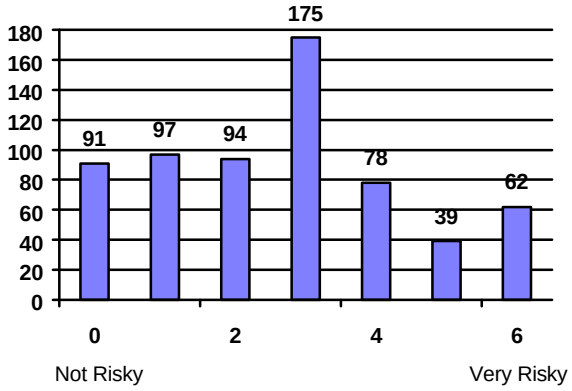
Fruits and vegetables were rated almost identically with respect to both health and environmental risk (Figs. 39, 40). Both fruits and vegetables featured modes of 3 (27%-28%) for both health and environmental risks. Each featured somewhat more individuals choosing scores of less than moderately risky than those who chose scores of more than moderately risky. Fruits for example had 44% of respondents choosing a less than moderately risky health threat while only 28% choosing a more than moderately risky health threat. The extremely high degree of consistency between the responses for fruits and vegetables could suggest that consumers do not in fact

visualize them as two distinct commodity groups but as one group with similar production processes and health benefits.

Fruits (Figure 39)

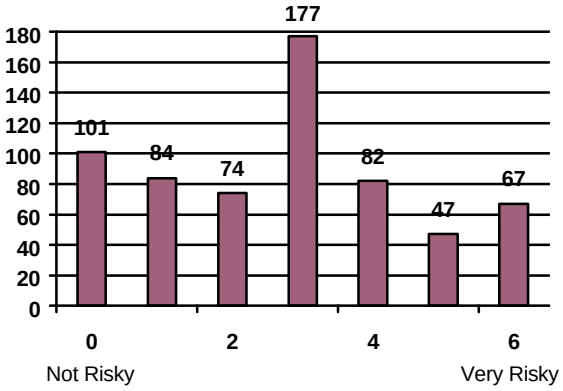
Health Risk

Responses: 636 Mean: 2.655
Std. Dev.: 1.782



Environmental Risk

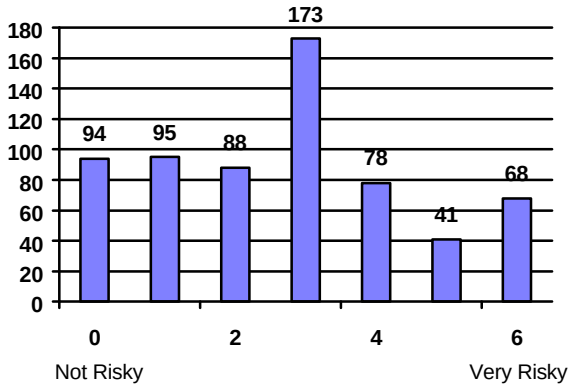
Responses: 632 Mean: 2.734
Std. Dev.: 1.844



Vegetables (Figure 40)

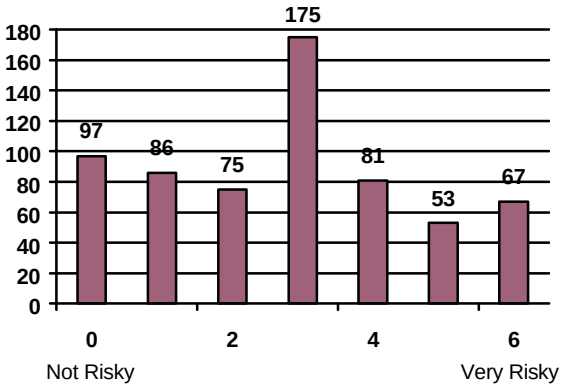
Health Risk

Responses: 637 Mean: 2.692
Std. Dev.: 1.820



Environmental Risk

Responses: 634 Mean: 2.763
Std. Dev.: 1.844



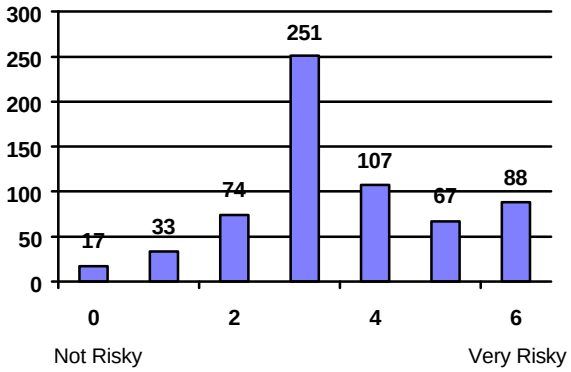
Over the counter (OTC) medication and personal care products exhibited similar health and environmental risk results (Figs. 41, 42). OTC medications averaged a slightly higher than moderately risky health threat, and a slightly lower than moderately risky environmental threat. Conversely, personal care products averaged a slightly lower than moderately risky health threat and a slightly higher than moderately risky environmental threat. The survey provided deodorants as an example of personal care

products which, with aerosol cans could account for the higher environmental risk than OTC medications.

Over the Counter Medications (Figure 41)

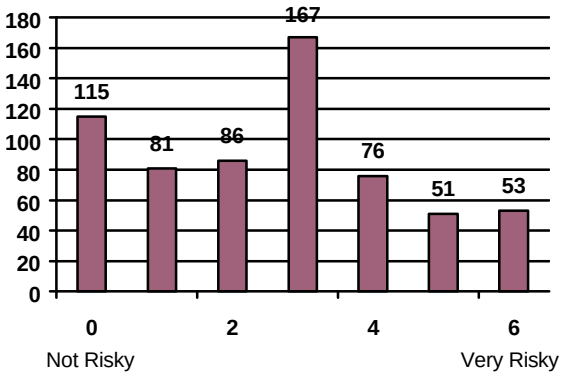
Health Risk

Responses: 637 Mean: 3.492
Std. Dev.: 1.468



Environmental Risk

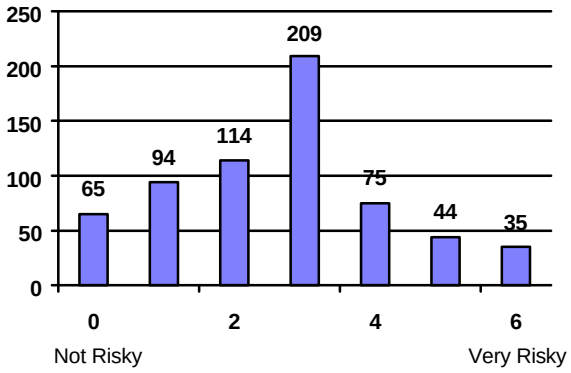
Responses: 629 Mean: 2.593
Std. Dev.: 1.827



Personal Care Products (Figure 42)

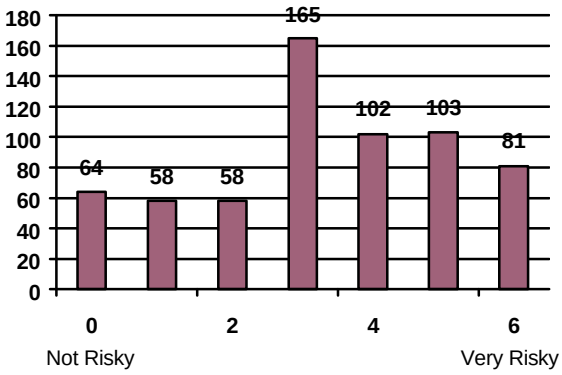
Health Risk

Responses: 636 Mean: 2.639
Std. Dev.: 1.566



Environmental Risk

Responses: 631 Mean: 3.293
Std. Dev.: 1.805



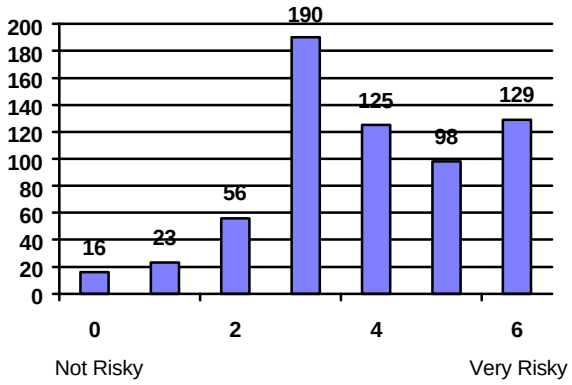
There was a higher than average degree of consensus that there were health risks associated with the consumption of red meats, shellfish and the use of oils and fats in cooking (Figs. 43, 44, 45). With respect to health risks, all three areas had modes of three with a significant number of responses at riskier scores. Only 13% felt that oils and fats were less than moderately risky, with similar results in red meats (15%) and shellfish (19%). Of the three areas, oils and fats scored the lowest level of

environmental risk with only 29% of individuals believing a greater than moderate amount of risk existed.

Red Meats (Figure 43)

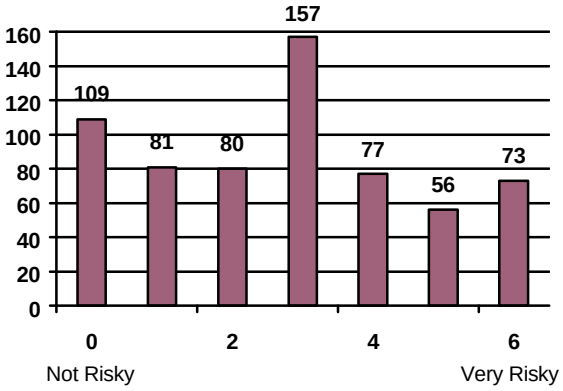
Health Risk

Responses: 637 Mean: 3.875
Std. Dev.: 1.526



Environmental Risk

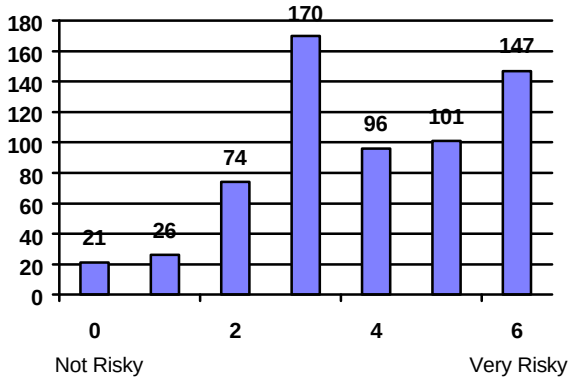
Responses: 633 Mean: 2.745
Std. Dev.: 1.908



Shellfish (Figure 44)

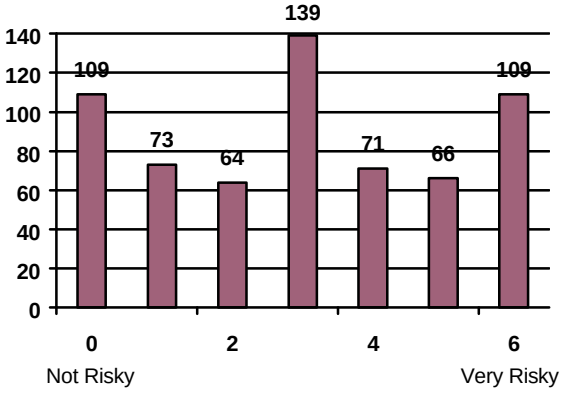
Health Risk

Responses: 635 Mean: 3.866
Std. Dev.: 1.644



Environmental Risk

Responses: 631 Mean: 2.988
Std. Dev.: 2.052

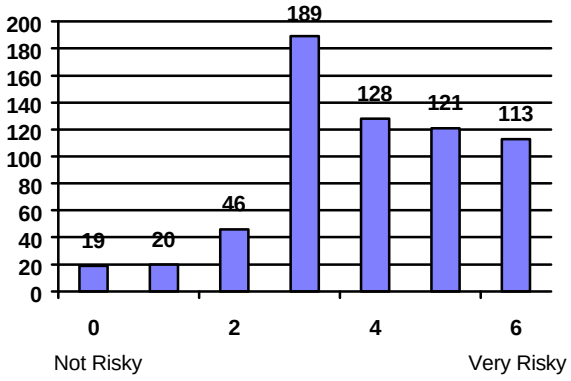


Fish, poultry products, and dairy products (Figs. 46, 47, 48) all featured a relatively high standard deviation for health risk responses which all averaged close to a score of 3. Dairy products and poultry products were among the lowest scoring with respect to the degree of environmental risk. Only 27% of respondents felt that dairy products were more than moderately environmentally risky while 27% felt that poultry products were more than moderately risky toward the environment.

Oils and Fats Used in Cooking/Baking (Figure 45)

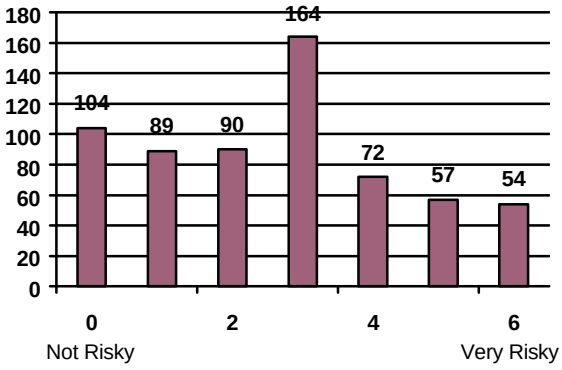
Health Risk

Responses: 636 Mean: 3.889
Std. Dev.: 1.496



Environmental Risk

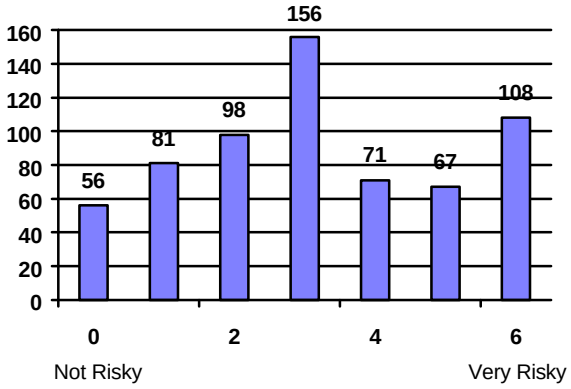
Responses: 630 Mean: 2.631
Std. Dev.: 1.819



Fish (Figure 46)

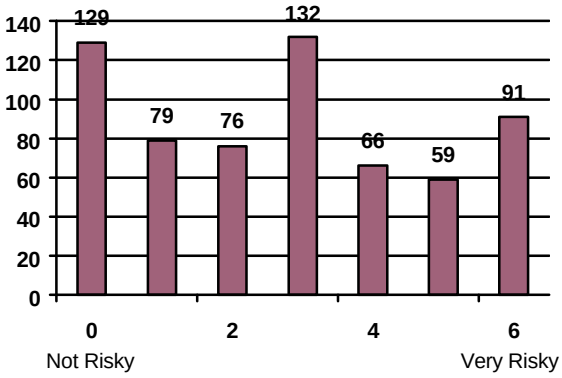
Health Risk

Responses: 637 Mean: 3.158
Std. Dev.: 1.868



Environmental Risk

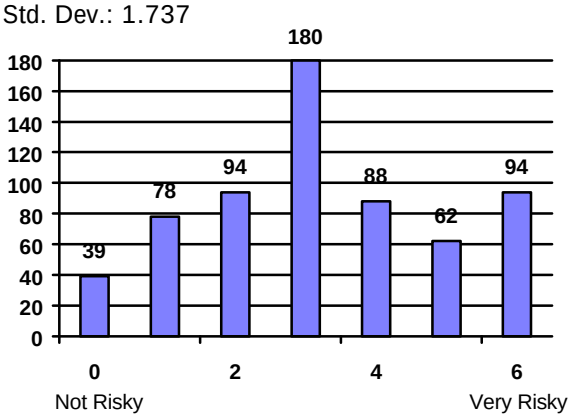
Responses: 632 Mean: 2.740
Std. Dev.: 2.042



Poultry Products (Figure 47)

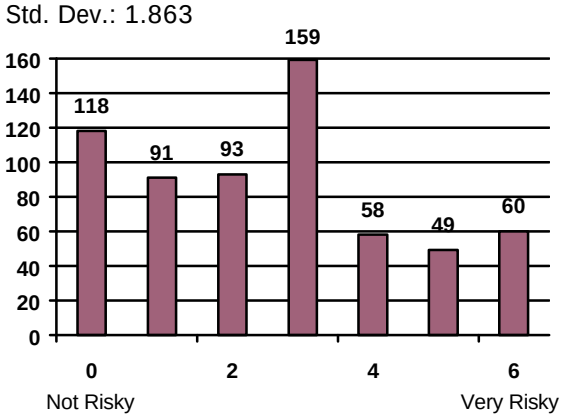
Health Risk

Responses: 635 Mean: 3.200
Std. Dev.: 1.737



Environmental Risk

Responses: 628 Mean: 2.533
Std. Dev.: 1.863

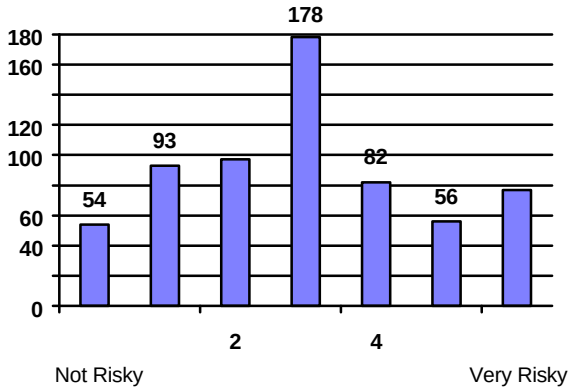


Fish, shellfish and alcoholic beverages had among the largest degree of discord regarding environmental risk. On average, dairy products and fish were ranked at somewhat less than moderately risky while shellfish approximately ranked at moderately risky.

Dairy Products (Figure 48)

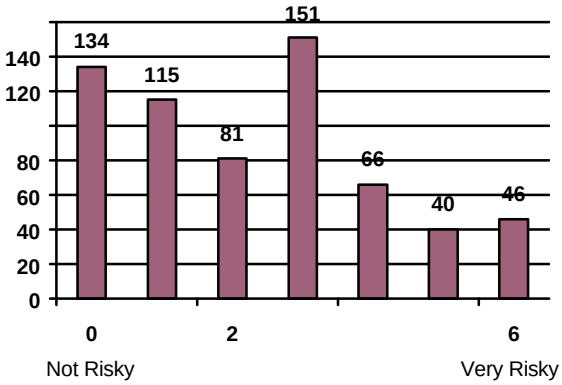
Health Risk

Responses: 637 Mean: 2.968
Std. Dev.: 1.752



Environmental Risk

Responses: 633 Mean: 2.322
Std. Dev.: 1.821



Consumers believed on average that the use of pesticides positively contributes to the cosmetic appearance, quality, and supply of produce. Conversely, they believed that a reduction in pesticide usage would increase the healthfulness and increase the prices of produce. The vast majority of respondents (75%) agreed to some extent that produce would be more healthful if pesticide usage was reduced while 15% were indifferent and only 10% disagreed to some extent (Fig. 49).

Figure 49

If pesticides were not used to the degree they are now, produce would be more healthful.

Responses: 634 Mean: 2.364
Std. Dev.: 1.629

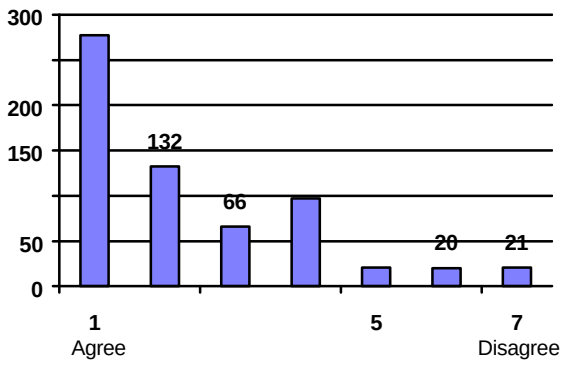
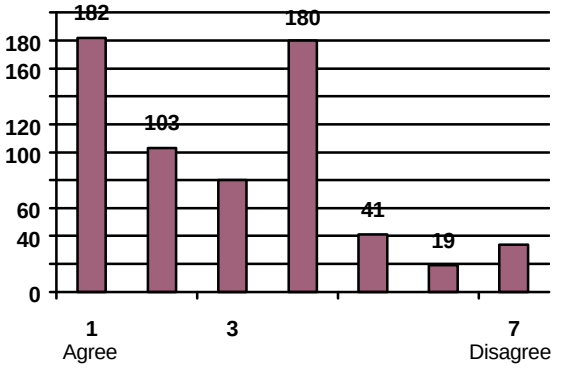


Figure 50

The use of synthetic chemicals in agriculture has a negative effect on consumers' health.

Responses: 639 Mean: 2.981
Std. Dev.: 1.721



While there was some degree of consensus that pesticide usage had certain benefits, a lack of trust was also clearly evident. Over 54% believed that farmers are typically ready to apply pesticides, even when there is no immediate need. Additionally, there was a clear consensus (75%) that the long term health effects of pesticide usage were not fully known (Figs. 51, 52). Although there was a rather wide spread of responses, 54% believed that government safeguards were not adequate to protect public health (Fig. 53). The majority of respondents (57%) believed that the use of synthetic chemicals

Figure 51

Farmers are too ready to apply pesticides, often when there is no immediate need.

Responses: 635 Mean: 3.056
Std. Dev.: 1.658

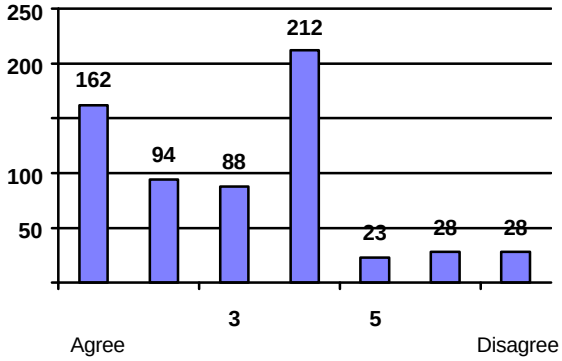


Figure 52

Experts know enough about the long term health effects of produce pesticide residues.

Responses: 641 Mean: 5.567
Std. Dev.: 1.890

Figure 53

Government food safeguards are generally adequate to protect public health.

Responses: 638 Mean: 4.503
Std. Dev.: 1.983

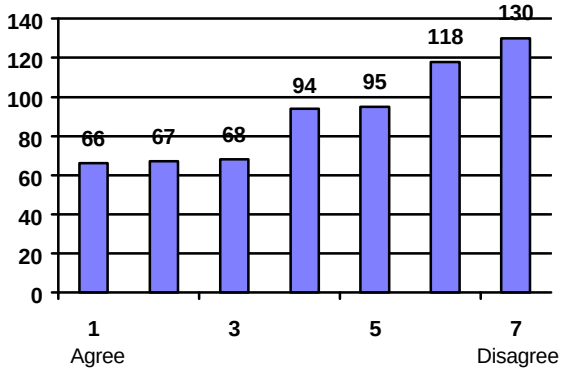
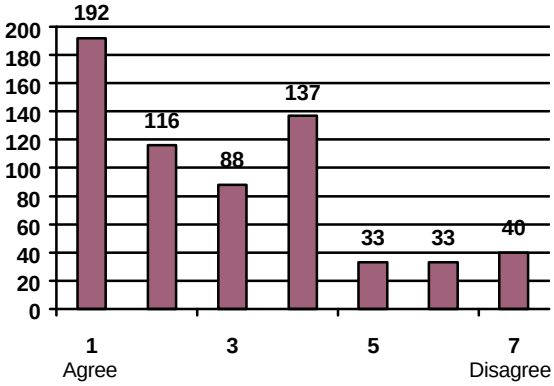


Figure 54

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

Responses: 639 Mean: 2.940
Std. Dev.: 1.808



in agriculture has a negative effect on consumers' health while 28% were indifferent or unsure (Fig. 50). Similarly, 62% believed that the use of synthetic agrichemicals resulted in a negative effect on the environment while 21% were unsure (Fig. 54).

Consumers showed a clear preference for pesticide reduction with 91% agreeing to some extent that U.S. farmers should use production methods that reduced the amount of pesticides used. To a lesser degree, 66% of the respondents also favored a reduction in the amount of fertilizers used with 25% indicating that they were indifferent and 8% disagreeing (Fig. 55, 56).

Figure 55

U.S. farmers should use production methods that reduce the amount of pesticides used.

Responses: 641 Mean: 1.755
Std. Dev.: 1.255

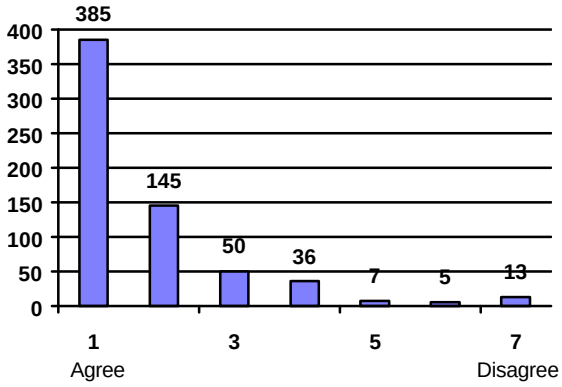


Figure 56

U.S. farmers should use production methods that reduce the amount of fertilizer.

Responses: 637 Mean: 2.615
Std. Dev.: 1.589

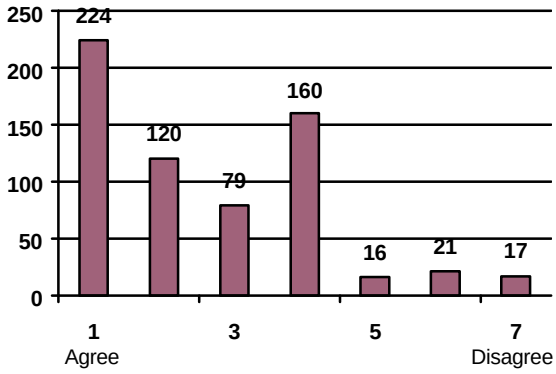


Figure 57

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

Responses: 640 Mean: 1.860
Std. Dev.: 2.862

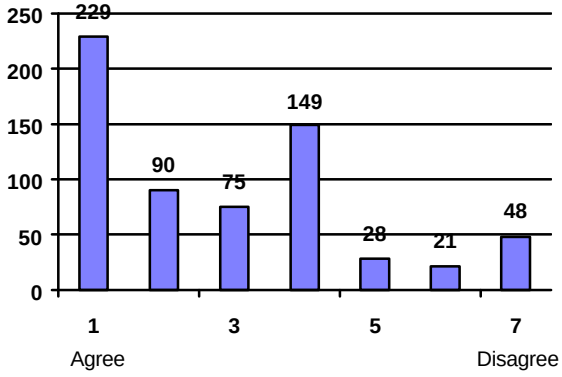
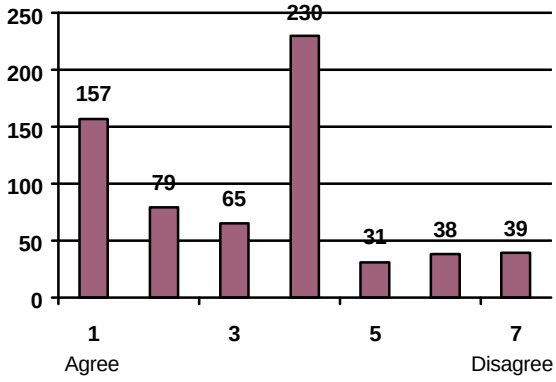


Figure 58

The U.S. government should help small farmers stay in business.

Responses: 639 Mean: 2.325
Std. Dev.: 1.840



When asked about non-conventional produce, 61% responded that they would probably buy organic produce if it were more readily available, however there was no mention of a price differential in the survey instrument (Fig. 57). While 72% believed that there was a difference between organically grown vegetables and other types of produce, only 44% believed that there was a significant health benefit associate with organic produce (Figs. 59, 60).

Figure 59

There is basically no difference between organically grown fruits and vegetables and other types of produce.

Responses: 641 Mean: 5.464
Std. Dev.: 1.794

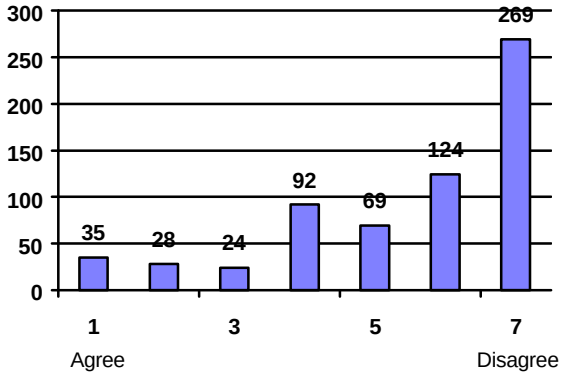
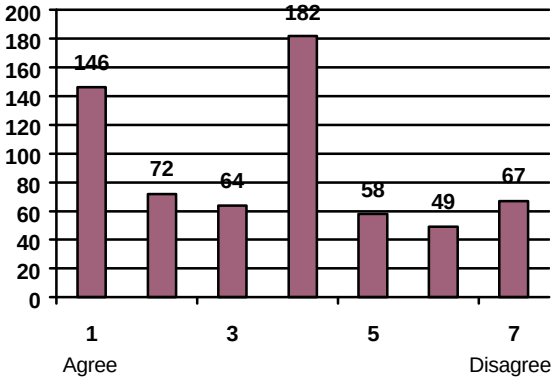


Figure 60

The health benefits associated with organic produce are great.

Responses: 638 Mean: 3.547
Std. Dev.: 1.937



Sample Demographics

Demographic questions regarding age, gender, income, political orientation, and political party membership showed 20-40 responses less than the average question response rate. Of the 645 responses, 53 (8.2%) individuals did not reveal their age. The youngest respondent was 20 years of age while the oldest was 85 years of age. Of the 592 respondents that did disclose their age, the largest representative age group was 36-50 year olds with 33.1% of the population. Following were the 20-35 year old age group (27.4%), the 51-65 year old age group (25.6%), and the 66-80 year old age group (13.9%).

Of the 614 respondents who revealed their gender, approximately 71% were female and 29% were male. Single individuals accounted for 11% of the sample, while 73%

indicated that they were married, 8% were separated or divorced and 6% were widowed. Nine individuals (1.4%) selected “other” as their current marital status.

The annual household income of 50% of the 615 respondents was at least $50,000, while 16% had a household income between $40,000 - $49,999, and 15% had a household income between $30,000 - $39,999. Only 9.3% indicated household incomes between $20,000 - $29,999 and 7% fell into the $10,000 - $19,999 income bracket. Seventeen individuals (3%) had an annual household income of less than $9,999.

The majority of respondents had at least some college. Of the 637 that reported their age, 25% had completed some college, 27% were college graduates, 7.5% had completed some graduate school, 10.8% had received masters degrees, and 3% had received doctoral degrees.

Of the 630 who responded, 13% reported that the neighborhood in which they lived could be considered a rural area, 6% indicated that they lived in an urban area, and the majority (81%) indicated that they lived in a suburban area.

The average household size was 2.7 people with responses ranging from 1 to 9 people. Households of one individual made up 11% of the sample, while households of two people accounted for 35%, households of 3 people made up 20% and households of 4 people accounted for 22%. Households of 5 or more people made up approximately 11% of the sample. Of the 632 who responded, 47% indicated that they purchased groceries for children in their household, while 53% indicated they did not.

Conclusions

The results of a consumer survey illustrated respondents' beliefs and preferences regarding the agricultural produce they purchase. Of nineteen produce characteristics which were ranked by participants, freshness, taste/flavor, cleanliness, health value and absence of pesticides were chosen among the most important. The survey also showed that most consumers made use of nutritional information and labeling while shopping for food and those who did, felt it aided them in making better purchase decisions.

Consumers exhibited a clear preference for low-input methods of agricultural production which minimize the use of pesticides. They believed that there were health benefits to organic produce and that they would purchase more organic produce if it were more readily available. Respondents also indicated that they believed pesticides in general, herbicides, fungicides and insecticides all had significant health and environmental risks. Consumers believed on average that the use of pesticides positively contributes to the cosmetic appearance, quality, and supply of produce. Conversely, they believed that a reduction in pesticide usage would increase both the healthfulness and prices of produce.

Participants did not believe government food safeguards were sufficient to protect public health nor did they believe the experts know enough about the long term effects of pesticide residues.

This research may lead to a better understanding of consumer purchase behavior, preferences and beliefs. These findings may be especially encouraging to those developing marketing strategies for low input produce such as organic and IPM produce.

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