CONSUMER ATTITUDES AND WILLINGNESS TO PAY FOR INTGRETED PEST MANAGEMENT PRODUCTS IN JORDAN

By
Tala Husam Abdallah Qtaishat

Supervisor
Dr. Ahmed Shukri Al-Rimawi

Submitted in Partial Fulfillment of the Requirements for the
Degree of Master Science in
Agricultural Economics and Agribusiness

Faculty of Graduate Studies
University of Jordan

August 2001

The thesis was successfully defended and approved on:

Examination Committee	Signature
Dr. Ahmed Al-Rimawi, Chairman	
Prof. Mohammed Samir Al-Habab	
Dr. Thabet Allawi	
Prof. Mohammed Eabidat	
Prof. Fayaz Al-Zoubi	

Dedication

To who gave me light in my life, hope in my study and their shoulders when I need to cry ……..

To my Parents and to my brother Hashem

Tala

Acknowledgment

Special and sincere respect, gratitude and deep appreciation are expressed to my advisor Dr. Ahmed Shukri Al-Rimawi for his invaluable supervision, great efforts in guidance, encouragement, and parenthood environment throughout the course of research work.

I am particularly indebted to Dr. Emad Karablih for his help in data analyses and his support throughout my research.

Special respect and thank to Dr. Mohammed Eabidat for his great contribution in designing sample of the research and his reviewing to the questionnaire.

I would like to acknowledge Dr. Mohammed Samir Al-Habab for his reviewing the questionnaire in the research.

Appreciation is also extended to the examination committee members, Prof. Thabet Allawi, and Prof. Fayaz Al-Zoubi for their valuable comments on the thesis.

Great appreciation is also due to all of my family for their patience and supporting through my study.

I would like to express my thanks to my friend Ayman Al-Salti for his assistance, support, concern and encouragement.

Finally I thank the staff of the Department of Agricultural Economics and Agribusiness.

List of Contents

Subject **Page**

List of Tables

List of Figures

List of Appendices

Abbreviations

B.Sc.	Bachelor of Science
Bt	*Bacillus thuringensis*
C.I.	Confidence Interval
CPS	Consumer Protection Society
CV	Contingent Valuation
DDT	Dichorodiphenyl Trichloro-ethane
df (s)	Degree of Freedom (s)
EPS	Environmental Protection Society
FAO	Food and Agricultural Organization for the United Nation
GTZ	German Technical Cooperation Agency
IPM	Integrated Pest Management
MOA	Ministry of Agriculture
MOH	Ministry of Health
NCARTT	National Center for Agricultural Research and Technology Transfer
OLS	Ordinary Least Square
WTP	Willingness-to-Pay or Willingness-to-Purchase

Abstract

Consumer Attitudes and Willingness to Pay for Integrated Pest Management Products in Jordan

By
Tala Husam Abdallah Qtaishat

Supervisor
Dr. Ahmed Shukri Al-Rimawi

The use of chemical pesticide by fruit and vegetable growers has become a top concern for consumers. Most of the research on the subject of Integrated Pest Management (IPM) products had been production oriented. No study in Jordan has analyzed the marketability and consumers' attitude to IPM products. The purpose of this study is to present an empirical evaluation of consumers' attitude, awareness level, and perception to IPM products, and to empirically evaluate which demographic characteristics influence consumers to be more likely to purchase and more willing to pay for IPM grown products. Validity and reliability of the measure were affirmed. A consumer survey was administered and completed to collect the primary data and attitude of consumers toward fresh products. Descriptive statistics, non-parametric tests, and regression models were used to analyze the data.

The findings indicate that the degree of food safety awareness level among respondents was high. Most of the socio-economic characteristics of the respondents were statistically significant with respect to the awareness level. The respondents indicated strong support for IPM through both a high willing-to-purchase and willing-to-pay (WTP) a premium for IPM grown products. Income was found to be the most significant determinant of willing-to-pay for IPM grown products. Participants with high monthly income were more likely to express an interest in purchasing IPM products and also appeared less likely to strictly purchase conventional products. Females, younger individuals, and risk aversion consumers were more likely to pay a premium for IPM products.

It is recommended that awareness campaigns have to be developed and implemented through some mechanism to educate the public about IPM products, and to promote the consumer's demand for the safe products. More efforts should be exerted by the state to direct and to

promote the producers to adopt the environment friendly IPM production methods, provided that it is technically sound, and economically feasible. Practical measures should be developed to provide assurance to the consumers of IPM products. This includes chemical residue testing of fresh vegetables, labeling of the products, and monitoring the safety of the production method. It is recommended that as the price is the main limiting factor to the wide use of IPM products, more research is needed to reduce the cost of production of IPM products.

Part One
Descriptive Frame of the Study

INTRODUCTION OF THE STUDY

1.1 General

Jordan is considered to be an arid or a semi-arid country has limited resources in the agricultural sector. Thus, agricultural development can be largely achieved by using advanced technical agricultural methods to enhance water and land resources productivity.

The private agricultural sector has utilized most of the available resources and techniques to face the increasing demand on food. The use of available resources has been accompanied by a wide use of pesticides and chemical fertilizers, without due regard to the harmful long-term effect on the environment, namely the quality of the soil and the ecological balance.

One of the environment friendly techniques that has been used to compact these harmful effects was the Integrated Pest Management (IPM). The IPM is a system of agricultural pest control and has been developed to reduce the reliance on a purely chemical approach to protect agricultural crops from pest damage. The use of non-synthetic pest controls on vegetables and fruits may reduce the amount of inorganic pesticide residues directly consumed by humans.

The IPM system was originated in the developed countries in the1960's, when environmental groups and entomologists became concerned about the unintended side effects resulting from pesticide use in agricultural production. Even with decades of entomology and production

agricultural production. Even with decades of entomology and production research, IPM is still considered to be in its infancy (Burn *et al.*, 1987) and the pressure for growers to adopt IPM is expected to increase. As for its use in Jordan, the IPM program was introduced in 1980, but its real application started in 1995.

Many techniques used in (IPM) products involve the use of ecologically based sensible methods to protect public health. These techniques involve the prevention of pesticides, solar radiation, hormone degradation, temperature treatment, and modified atmospheric treatment. There are different approaches including biological, mechanical, and rational use of chemical controls (to be discussed in chapter 2). Biological control methods include the use of beneficial insects, pathogens and parasites to control pests. Mechanical control methods include traps and/or hand removal mechanism. Chemical control refers to the use of chemical pesticides. The control chosen are the ones, which work best and pose the least risk to people (Hollingsworth, 1997).

The Ministry of Agriculture in Jordan and the National Center for Agricultural Research and Technology Transfer (NCARTT), sought the assistance of the German Technical Cooperation Agency (GTZ) to promote the use of the IPM production system in Jordan. A project was initiated in 1995 which was basically an educational and enlightening program to increase the awareness of the farmers of the negative effects of wide use of

are sheets of solar radiation, sieves to control pests, and pollinating transfer. The main obstacles in using other methods are due to high costs.

Health concerns of the wide use of pesticides including insecticides, herbicides, and fungicides are increasing. Although pesticides may be affecting the controlling pests, they may also pose risks to people, pets, wildlife, and the environment.

Jordan is one of the pioneering developing countries in paying attention to the health aspects and ecological balance of the local environment. As a result of what has been mentioned, the government facilitates and encourages the usage of modern techniques to meet the needs of the environment and health conditions. All of the available methods were used to face the increasing demands for the protection of human beings and for the environmental conservation. This is considered the key word of the new millenium.

With the escalation in food safety concerns and the rise in direct-to-consumer agricultural marketing, IPM products have become increasingly demanded in recent years. Synthetic pesticide usage by fruit and vegetable growers has become a top concern for consumers compared to other food safety issues because of the high risk of chemical residues on the health of the consumers.

In accordance with the aforementioned information, IPM appears to be an encouraging system that can often save time; increase profits by

lowering costs through reducing the use of artificial inputs in the production process without adversely affecting the yield and quality of agricultural products. In addition, IPM reduces the risks to agricultural workers, wildlife, and soil organisms.

1.2 Problem Statement and Justifications

Synthetic chemical pesticides were first marketed in the United States in the late 1940's and have facilitated a dramatic increase in the productivity of agricultural labors. However, pesticide usage by fruit and vegetable growers has been nearly seven times greater than other agricultural sectors (Fernandes- Cornejo *et al.*, 1994) and also poses the problem of direct human consumption of chemical residues. Numerous studies have placed pesticide residue 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 and attitudes of the risk posed by pesticides can be translated into very real effects in the marketplace (Dunlap and Beus, 1992). For instance, within days of a 60-minute program reporting the risks of Alar, a pesticide that was used in the production of apples, farmers, agribusiness, 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 (Govindasamy, 1997). Accordingly, IPM 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 damage to farm workers, groundwater, wildlife and the environment have also been documented (Weaver *et. al.*, 1992).

In Jordan, the abuse mixing of pesticides is one of the serious and worrying agricultural problems. It was found that about (80%) of the farmers (sample of 900 farmers from the highlands and Jordan Valley) mix pesticides, and sometimes incompatible compounds are mixed together, which causes reduction and loss of the effectiveness of the pesticides used. These practices, most of the time cause an imbalance in the environment and result in forcing the farmer into a circle of increased usage of agricultural chemicals (Schuenemann *et. al.*, 1992). Taking into consideration that the heavy and misuse of agricultural chemicals is not only a waste of the limited existing natural and financial resources, but it is also a pollutant of the environment and affects the health of consumers.

Furthermore, many studies and reports showed and concentrated on the problems of the heavy and random spraying of pesticides, and the degree of pesticide accumulation and contamination of the Jordanian environment, soil, water and agricultural crops. One of those studies was conducted in 1994, through analyzing 411 samples of human milk and 299 samples of blood plasma, which were obtained and selected randomly from five different geographical regions, representing about 85% of the Jordanian population. The results showed that the samples were contaminated with many hazardous pesticides, but with high variation in the concentration and percentages of population occurrence. The concentration of Dichlorodiphenyl Trichloro-ethane (DDT) residue and its derivatives was high in the samples compared with the acceptable levels, taking into account that DDT has been banned in Jordan since 1985, and a positive correlation was found in the wives of farmers (Naser, 1994). Hamdan *et al.* (1996) indicated that the situation calls for new arrangements to reduce the problems provoked by this continuous use of these pesticides, which has resulted in negative environment impacts as well as health problems for consumers and farmers. And with the rise of consumer food safety concerns, IPM system has received greater attention. Yet, nearly all of the relevant research, which has focused on IPM products, has been supply or production oriented. Up to this date, no studies have analyzed the marketability or consumer attitudes to IPM

products. On the other hand, there are no empirical or economic studies in Jordan for marketing the IPM products (i.e. only chain stores like Safeway, C-TOWN, AL- Ahlia Superstores, Agricultural Company for IPM Products known as *AMAN* which means (safe food), and other stores which sell these products).

1.3 Objectives of the Study

The main objectives of the study are:

(1) Measuring the consumer's attitude toward the IPM products and examining the social and economic factors that affect their attitude.

(2) Measuring the awareness level of consumers through identifying the sources of information and its impact on consumers' attitude to buy new and untraditional products.

(3) Evaluating the consumer willingness to pay for IPM products, which are considered the safest fresh fruits and vegetables.

1.4 Hypothesis of the Study

The main hypotheses of the study are the following:

Consumers with different socio-economic characteristics exhibit different attitudes toward the IPM products. In view of this and based on a review of previous studies of food safety risk perceptions and willingness-to- pay for food borne risk reduction, it is hypothesized that the following factors are initially expected to significantly affect consumers' attitudes and willingness- to –pay for IPM products.

1- Males are expected to be less willing to purchase IPM grown products than females.

2-Those with higher income are expected to be more willing to purchase and more willing to pay a premium for IPM products.

3-Those with higher levels of education and income are expected to be more knowledgeable of IPM before taking the survey than those with lower levels of income and education.

4-Those who have higher risk aversions toward pesticide usage are expected to be more willing to purchase and more willing to pay a premium for IPM products.

5-Respondents with children are expected to be more aware of the risks of pesticides, therefore, more willing to purchase IPM products.

1.5 Organization of the Study

The study is divided into three main parts, and sub-divided into eight chapters:

(A) Part one includes four chapters as follows: Chapter One; presents an introduction, problem statement, objectives, hypotheses and organization of the study. Chapter Two explores information about IPM system and products and a comparison between IPM and the organic products. Chapter Three covers the literature review of the major issues of the study. This part ends with a Fourth Chapter that addresses the methodology of the study, sources of data and approaches of data analysis.

(B) In Part two, Chapter Five, Chapter Six, and Chapter Seven present the main findings of the survey, analyzed and used to test the hypotheses of the study.

(C) Finally, Part three synthesizes the salient study findings; draws conclusions, and recommendations.

ENVIRONMENTALLY SAFE FRIENDLY PRODUCTS

2.1 Integrated Pest Management System

Anticipating consumer needs and preferences can aid producers in making profit-seeking decisions. Today, conventional production methods are no longer the only option open to farmers. Integrated Pest Management (IPM), for example, is a system of pest control which evolved amidst concerns of entomologists and other scientists that certain pests were building resistance to synthetic pesticides (Greene, 1991).

IPM utilizes a system of highly balanced substitutive and natural approaches to pest control, which together minimize the dependence on synthetic chemicals. 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. Yet, the high proximity of agricultural land to areas of high population density also necessitates a cautious approach to chemical pesticide use. (Robson *et. al.*, 1995)

Research in IPM combines both efficiency and substitutive approaches. Together these approaches have resulted in significantly less

intensive pesticide applications and have led 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 establishments 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).

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 pesticides residues is 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 (Govindasamy, 1997).

2.1.1 IPM techniques:

Lynch, 1997 indicated that IPM tools included the following:

1-Biological pest management which includes the use of microbial organisms-such as *Bacillus thuringensis (Bt)*-beneficial organisms, and genetic resistance varieties to insects, pathogens, and other pests.

2-Cultural pest management which includes crop rotations, tillage, alternations in planting and harvesting dates, trap crops, sanitation procedures, irrigation techniques, fertilization, physical barriers, border sprays, cold air treatments, and habitat provision for natural enemies of crop pests.

3-Areawide pest management systems combine primarily biological and cultural methods of pest management to contain or suppress insect pest populations over large definable areas. This is in contrast to traditional IPM systems, which are implemented on individual farms and ranches. Areawide pest management is implemented through partnership with growers, commodity groups, and government agencies.

4-Pesticide efficiency tools include scouting and economics threshold, expert systems, precision farming, and bio-engineered herbicide tolerance.

2.1.2 Toward assessment of integrated pest management

In 1997, the USDA National Initiative on IPM calls for a broader assessment of IPM practices than has occurred in the past. Past efforts to evaluate IPM program impacts has generally focused on the cost and efficacy of IPM practices, and assessment of environmental impacts has often been limited to measuring changes in pesticide use. Broadening the assessment to document the economic, environmental, and public-health impacts adds further complexity (Lynch, 1997).

Economists use a set of well- established methods to assess the impacts of IPM adoption on producers' profitability. The primary methods of estimating farm-level profitability through calculating partial or enterprise budgets, which capture changes in prices and quantities of inputs and outputs resulting from the adoption of IPM methods. Farm budgets also are important inputs in more aggregate assessment of IPM impacts. For exaplmes, if the sample of farm budgets is large enough, estimates of change in aggregate crop production levels and input demand can be calculated for a given region or for the country as a whole. This information in turn is used to analyze the distribution of benefits and costs of IPM adoption among producers and consumers, regions, and socioeconomic groups (Fernandez-Cornejo, 1996).

More difficult is the assessment of actual or potential environment and public health impacts associated with different levels of IPM adoption. Many impacts of pesticide use occur off-farm and over time, making it difficult to link specific farm practices directly with environmental impacts. Thus, directly assessing the physical or biological impacts of changes in pesticides use is complex.

Lynch, 1997 explained that in developing comparative risk estimation and ranking methods for the environmental and public health impacts of pesticides use and alternative pest management approach, analysts face two challenges. First, gaps exist in the data needed to evaluate pesticide impacts in areas of potential concern to society. For example, much of the ecological effects data on pesticides come from single species toxicity tests, but species or groups of species vary in their sensitivity to different pesticides. In addition, information on other important factor persistence, pesticide formulation, weather, application methods, and use of safety precautions, all of which can be site and time specific, are often not available. Second, analysts must determine which (a) environmental and public health impacts to assess, (b) how to quantify or measure changes in impacts, and (c) the weights to be assigned to different impacts. Potential areas to examine include impacts on water quality, worker safety, and the welfare of aquatic, avian, and other beneficial organisms. Indicators of the effects of IPM efforts might be reduced pesticide runoff, decreased

pesticide related illness, increase in populations of beneficial organisms, and shifts to biological pesticides (Lynch, 1997).

A unifying framework is needed to assess trade-off among economics, environmental, and public-health impacts of alternative pest management technologies. No one technology will be superior in all areas of assessment. A particular technology practice may reduce damage potential in one assessment category (e.g., water quality) but increase damage potential in another category (e.g., worker health). An additional concern is how benefits and costs of IPM adoption are distributed between producers and consumers, as well as regions and socioeconomic groups. (Weaver *et al.*, 1992).

2.1.3 Success of integrated pest management

IPM contributes to cost reduction and in cost saving. In developed countries, most of the entomology literature cites numerous references to the production benefits enjoyed by participating growers. 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 (Rebson *et. al.*, 1995). A survey in 1985 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% and costs were reduced by $75 per acre. With IPM techniques a national evaluation team estimated that the total annual cost saving benefit to farmers in 15 states using IPM during the 1980's exceeds $500 million (Greene, 1991). When trained scouts an IPM field, reductions in the number of pesticides 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).

In Jordan IPM technology is highlighted as a major step towards sustainability in agriculture (Khassawneh, 2000). It couples the practical concerns of providing stable pest and disease control, with the protection of human health and environment. Also, it is ecologically conscious, better economically, and might become more acceptable socially. Descriptive statistics showed that, the IPM adopters applied IPM techniques on (78%) of their plastic houses in Jordan Valley (Khassawneh, 2000).

2.2 Marketing organic products

The defining characteristic of organic agriculture is the absence of synthetic chemical pesticides. This attribute addresses the strong risk aversions to the ingestion of pesticide residues, which has been shown to be held by the majority of American consumers (Zellner and Degner, 1989). Furthermore, in an altruistic sense, significant concerns about pesticides damage to wildlife, farm workers, and the environmental have also been documented (Weaver *et. al.*, 1992) which bolster support for low input products. When pest control does become necessary in organic agriculture, natural pesticides and biological controls can help decrease crop damage and short-run economic losses. If used in conjunction with crop diversification, rotation, and cultural practices, organic methods of pest control customarily limit disease and insect damage to acceptance levels (Klonsky *et. al.*, 1992). In comparison to conventional agriculture, however, organic production is often quite labor intensive and can result in greater products losses to disease and insects.

Estes and Smith (1996) found only a casual link between willingness-to-pay and the cosmetic appearance of organic products. This suggests that the most important motivation consumers exhibit when

purchasing organic produce is a sensitivity to their health and safety rather than other produce cosmetic characteristics.

Successful marketing of organically grown products presents its own challenges. The market for organic foods is one of the fastest-growing agricultural segments of the economy. A nationwide study in U.S.A. showed that sale from the organic food industry are nearing $3 billion a year and are currently at an annual rate of over 20% (McEnery, 1996). Organically grown products are typically sold for a premium price over conventional grown products. However, returns to growers are dictated by the total supply, consumption demand, and the available organic outlets (Klonsky *et. al.*, 1992).

Despite rapid growth in production and sales, consumer demand for organic products is still relatively small when compared to conventional products. While similar studies have been undertaken in the past, the market for organic products has quickly evolved in recent years. Increased awareness of organic products necessitates that new research is carried out to document the current dynamics of the organic market. (Goldman, 1991).

2.3 Comparison IPM and Organic Products

The expanding application of pesticides has been a source of concern for consumers and the rising costs of conventional product production are a concern for producers. Conversely, organic growers use non-synthetic pesticides or fertilizers. In addition to being highly labor intensive, without the benefits of chemical pesticides, organic agriculture may result in fluctuation 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, safe for the consumer and farm worker, and more sustainable for the environment. IPM focuses on determining an economic threshold at which the benefits of pesticides usage outwight 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, pesticides 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 methods of production offer benefits to both producers and consumers. (Govindasamy, 1997). These benefits have fueled government and more recently, significant private investment interest in the development of low-input production techniques. While much empirical and econometric analysis has illustrated consumer preference for organic products, less than 1% of all products grown in this country can currently be considered organic. Conversely, growers who adopted IPM make up a fast growing share of the agricultural sector with significant success in lowering pesticides at reduced costs. 74% of fruits and vegetable growers preferred an emphasis on IPM research, while only 13% preferred on 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).

الصفحة غير موجودة من أصل المصدر

Literature Review

3.1 General IPM Definitions

This chapter discusses the concepts and research literature related to consumer attitudes and willingness-to-pay for IPM products, the consumer characteristics, attitudes and preferences (perceptions) which have a bearing on the likelihood of purchasing IPM products.

Since the 1970s, researchers and farmers have sought to develop safer, and more ecologically sound ways to manage pests. Integrated Pest Management (IPM) draws from a variety of disciplines and uses a diversity of production methods, ranging from reinforcing a pest's natural enemies, to disrupting a pest's life cycle, to careful whether monitoring and scouting (Cate *et al.*, 1994).

The Food and Agriculture Organization of the United Nations (FAO) defined IPM as " a pest management system. That, in the context of the associated environment and the population dynamics of the pest species, it utilizes all suitable techniques and methods to maintain the pest populations at levels below those causing economically unacceptable damage or loss". (FAO), (1983). FAO definition concentrated on the using environmental and economical techniques, while Burgess (1989) and

Edward *et al.* (1990), definition was more concerned about the combination of the pest control that can be used in IPM system.

Burgess (1989) indicated 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. (Burgess, 1989).

Edward *et al.* (1990) defined IPM as "a sustainable approach to managing pests by combining biological, mechanical and chemical, physical and cultural tools to minimize economic, health and environmental risks, by using economically and ecologically appropriate and sustainable control methods".

Fernandez-Cornejo (1996), and Lynch (1997) showed that when IPM definition the important thing is how to manage pests on the long-run term.

Fernandez-Cornejo (1996) defined IPM as "an ecosystem-based strategy that focuses on long-term prevention of pests or their damage

through a combination of techniques such as biological control, habitat manipulation, modification of cultural practices, and use of resistant varieties". Pesticides are used only after monitoring indicates that they are needed according to established guidelines and treatment are made with goal of removing only the target organism. Pest control materials are selected and applied in a manner that minimizes risks to human health, beneficial and non-targeted organisms, and the environment.

Lynch (1997) indicated that we could define IPM in a number of ways. There is general agreement that it is "a system approach to pest management that combines a wide array of crop production practices with careful monitoring of pests and their natural enemies". IPM practices include use of resistant varieties, timing of planting, techniques of cultivation, biological controls, and judicious use of pesticides. IPM systems are designed to anticipate pests and prevent them from reaching economically damaging levels.

In accordance with the aforementioned definitions, IPM can be defined as a system of pest control techniques which reduce the pesticide load in the environment, develop pest control programs that are economically, environmentally, and socially acceptable, and finally increase utilization of natural pest controls.

3.2 Concern of Food Safety

Several studies indicating a growing concern of the pesticides residues. This study is concerned with the analysis of the consumer preference, perception, and concerns to reduce synthetic pesticides in their foods.

More than 30 years ago, Bealer and Wilits (1965), 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. Further more, residues consumed by humans were found to have an even lower level of concern. Only 6% of the respondent indicated they were very concerned about pesticide use and approximately one half responded they were not at all concerned (Bealer and Willits, 1968). In further studies when compared to Bealer and Willits' original findings, consumer perceptions have shifted dramatically over the past 30 years. (Kidwill, 1994).

Follow up to the Bealer and Willits the survey by Sachs, Blair and Richter (1984), again the survey was administrated 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 pesticides usage has risen

and knowledge of pest control practices had also greatly increased. Concern was also escalated for pesticide damage to wildlife and agricultural workers. Their analysis indicated that none of the differences between 1965 and 1984 could by 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.

Zellner and Degner (1989) have reported a number of other research initiatives on 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. And another study found that 86% of respondent expressed concern of 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 (Burgress *et. al.*, 1989).

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.

Ongoing nationwide research by the Food Marketing Institute, which begun 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).

3.3 Consumer Attitudes to IPM Products

Most definitions seem to agree that an attitude is a state of readiness, a tendency to act or react in a certain manner when confronted with certain stimuli (Oppenheim, 1978).

Aiken (1991) defined an attitude as "a learned predisposition to respond positively or negatively to a certain object, situation, institution, or

person. As such it consists of cognitive (knowledge or intellective), affective (emotional and motivational), and performance (behavioral or action) components".

Bruhn *et. al.* (1992) studied the consumer attitude to information about IPM. He used the descriptive analysis for that, and he 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 predict the acceptance of IPM or demand for IPM products, but to determine the effect of information regarding IPM in consumer's attitudes of food safety. Even after the videos was viewed, however, one quarter of the participants still maintained that pesticides should never be used to control insect pest populations (Bruhn *et. al.* 1992).

Many studies revealed how the socio-econmoic factors of the respondents' effect on the concerned about the safety of pesticide usage one of these studies was 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 lower 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 that has been supported by other studies. Overall, the sample demonstrated that pesticides 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.

To see how the respondents tend to accept that IPM products not just help in the protection of human being but also the environment the study by Hollinsworth *et. al.* (1993) indicated that the majority of the respondents (63%) agreed or agreed strongly that IPM grown products is safer than non- IPM products 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 surveyed consumers, farmstand owners, and food industry representative to assess the potential

for certification and labeling of produce growing using IPM. 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.

A university of Georgia study indicated that risk perceptions have a positive and significant effect on consumers' attitude toward pesticide use (Huang, 1993). One relationship studied the effect 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 (Huang, 1993).

The study by Kidwell (1994) explained the reasons why consumers altered their attitude to purchasing or buying low-input produce rather than conventional produce. He said that consumers have revealed a relatively high degree of personal concern over pesticide residues, but most have not significantly altered their purchasing behavior. 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 products. While the majority of participants indicated they would be willing to pay more than conventional prices to obtain IPM products, the high prices often found in organic produce are more likely limit the attractiveness of IPM to most consumers.

Govindasamy, (1997) presented an empirical data of consumer preferences and attitude to IPM grown products. A consumer survey was administered in 1997 to investigate the opinions and attitudes of consumers of fresh products. In his bulletin used descriptive analysis to show that the respondent indicted strong support for IPM grown products and more response to produce that is labeled as "IPM Grown".

Marta Zurbriggen, (1998) provided in her study an overview of attitudes, preferences and characteristics of consumers who shop at farmers' markets. Beside demographics, the characteristics examined in her report included consumption trends of fresh fruits and vegetables in terms of quantity and variety, preferences for IPM produce, amount spent per visit, frequency of visits and number of farmers' market patronized. She used a descriptive analysis and he found that the respondent ranked the quality of products and employee attitude as very good, while appearance of facility, convenience of location, variety of products, cleanliness of facility, parking and prices received a mean score between good and very good. In general, consumers tend to agree that freshness and direct contact with farmers are the main factors that drive people to farmers' markets; that

these facilities help support local agriculture and that by attracting customers to downtown areas, farmers' markets boost local economies. (Zurbriggen, 1998).

3.4 Consumer Willingness –to-Pay for IPM Products

The concept of Willingness-to-Pay or Willing-to-Purchase (WTP) reflexes the value that the people reveal to the benefits derived from a protected or safety products such as IPM products.

Many factors have been found to affect the willingness-to-pay for low-input products. In most cases, gender and income are among the most significant determinants. In general, while income is usually found to be significant in estimating willingness-to-pay for pesticide risk reduction, conflicting findings have been reported. Most studies have found that willingness-to-pay for risk reduction increases with income (Elnagheeb and Jordan, 1990). However, Byrne *et al* (1991) detected that income and willingness-to-pay for reduced pesticide grapefruit were inversely related. Paradoxically, many studies have also found safety concerns decrease as income increases. The effect of education has also been found to have conflicting influences on individual pesticide risk concerns (Byrne *et. al.*) and willingness-to-pay for risk reduction. He also found that females and

lower earning households were more likely to have high concerns over pesticide usage. Persons with at least a bachelors degree were found to be less likely to have risk aversions to pestcide residues.

Ott *et al.*, (1991) found that while consumer support for chemical residue testing in fresh produce was strong, and 54% of those who indicated that pesticides usage was a food concern were willingness-to-pay more to obtain pesticide free produce, the premium they were willingness-to-pay was very low. Only about one tenth of the sample indicated they would be willing to pay more than an additional 10%. And they documented a negative correlation between education and willingness-to-pay for chemical residue. Ott *et al.*, (1991) also found that despite high aversions to pesticide residues, willingness-to-pay for alternative agricultural produce decreased when willingness-to-accept cosmetic defects were considered. Ott (1989) found that females, college graduates, and shoppers over 50 years of age were all more concerned with pesticide use in agriculture.

Weaver *et. al* (1992) reported that 56% of consumers indicated a willingness-to-pay of at least a 10% premium to obtain pesticide free tomatoes. Only 19% of the sample indicated that they were unwilling to pay any premium at all. Gender significance was also found which showed females to be more likely than males to pay a premium for IPM products. Weaver noted that females and households with children were more likely

to have higher risk versions toward pesticide residues than their counterparts.

Hollingsworth *et. al* (1993) reported that 75% of respondents said they would purchase IPM-labeled products over non-labeled products if there was no price differential and 40% were willing to purchase IPM-labeled products if it costs slightly more than non-labeled products.

Underhill and Figueroa (1996) attempted to explain cross sectional differences in willingness-to-pay for IPM products 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 those younger individuals, with higher earning, and those who live in urban settings were the most likely to pay more for certified IPM products (Underhill and Figueroa, 1996).

Govindasamy and Italia (1997) evaluated which demographic characteristics cause consumers to be more likely to purchase IPM grown products. They found that participants with higher annual income were more likely to express an interest in purchasing IPM products and also appeared less likely to strictly purchase conventional products. The results also indicated those females, those with higher annual incomes, younger individuals, and those who frequently purchase organic products are all

more likely to pay a premium for both IPM and organically grown products.

Lai *et al.* (1997) analyzed the willingness-to-pay of consumers in Atlanta and Berlin for quality attributes of fresh vegetables. Using the random utility model. The findings of this study indicated that the majority of consumers were willing to pay for improved quality attributes of fresh vegetables. Therefor, production, marketing, and research oriented toward quality improvement of fresh produce may both meet consumer demand and generate greater profits for the fresh vegetable industry. The willingness-to-pay for fresh vegetable attributes by Berlin respondents provides an opportunity to explore export possibilities of produce to meet consumer demand. Furthermore, the development of vegetables with minimal chemical residue and a system of chemicals tracing and residue testing will encourage Berlin consumers with higher incomes to pay a premium for fresh vegetables. The differences in consumer perceptions and willingness to pay across different factors and countries may be related to differences in consumer awareness of nutrition and food safety and perceptions of the relative values of quality and higher premium. Therefore, different approach in educational and marketing campaigns in the two cities may help increase consumer awareness of food safety and improve their perceptions of vegetable quality.

Akgungor *et al.*, (1999) investigated the Turkish consumer's willingness-to-pay for a label that guarantees that pesticides residues in foods do not cause health problems. A Tobit model was used to estimate a demand model. To determine the probability of purchase, a Probit model was estimated. The results indicated that on average, the Turkish consumers were willing to pay up to 2% price premium for safety foods that are certified to have no pesticide residues at levels harmful to human well-being. Also the results indicated that the willingness-to-pay and the probability to purchase tested and certified foods is dependent on the degree of consumers' perceived risk level due to pesticide residues.

3.5 Awareness Level through Defining the Sources of Information

The source of information is a method to increase the awareness level to the consumers and it could be through newspaper articles, television, radio reports, or other media channels that help in the defining the food safety issues.

Food advertisement is a powerful tool for positioning and promoting food products in a highly competitive market. Run-away product proliferation and competition for supermarket shelf space has resulted in

the success of only a small percentage of newly introduced food products (Senauer, 1991). Yet the effects of food marketing can greatly increase the chances of success for food products. Positive food advertisement, even in the presence of negative information presented in the media, has been shown to have a positive effect on market demand for food commodities (Chang and Kinnucan, 1991). Many studies have provided aggregate estimates of the effect of food advertisement and sources of information on overall commodity demand, (e.g. Green *et al.*, 1991 Brester and Schroeder, 1995). It appears that modifications in consumer behavior may arise from new advertisements. Advertisement is used in several ways, by using newspaper articles, television, radio reports or other media channels.

Before studying the consumer exhibits in IPM products, some mechanism must be developed to educate the public about IPM (Govindasamy, 1997). 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.

Burgress *et. al* (1992) found that few respondent (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 products. Similarly, they found that many were willing to spend 10% to 25% more for produce grown using IPM techniques.

A study at the University of California illustrated the benefit of additional information and educational programs 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).

THE STUDY METHODOLOGY

The Study Methodology

4.1 Methods of Data Collecting

The data were collected through the following means:

(A) Primary data collection using a structured questionnaire and personal interviews with a sample of IPM consumers and non-IPM consumers in the grocery shops (Chain Stores) where these products are sold.

(B) Secondary sources were used in conjunction with the primary data, including statistic reports from different sources of information, such as the concerned ministries and public agencies. In addition, studies and publications by non-governmental organizations and various consultant agencies were utilized.

4.2 Sample Design

While IPM can be used in virtually all types of agriculture, the choice was made to limit the survey to vegetable products. Focusing on this area, hoping that it would provide a consistent frame of references and eliminate differences in perception that consumers might have about fruits and vegetables.

The population of the study was divided into two main groups:

1) Non-IPM consumers; who usually purchase the conventional products.
(2) Consumers of IPM products; who heard about IPM and also they purchase its products.

In order to draw a comparison between the two groups; it was necessary to include not only consumers who purchase IPM products, but also consumers who do not. Therefore, it was necessary to take the sample under similar circumstances, and relatively homogeneous set of natural conditions.

For the consumer survey a convenience sample was used in order to acquire the responses to this survey. Convenience sampling is useful in marketing research for certain specialized purposes to determine the consumer attitudes and is chosen purely for expedience (e.g., items are selected because they are cheaper to find and measure) (Boyd, 1989). Information about our subject and the size of the study population is not available; thus, convenience sample can be of value in exploratory work to help understand the range of variability of response in a subject area. Talking to a sample of consumers may help to identify issues.

The Contingent Valuation (CV) method was used in the survey to gather information about the willingness to pay from respondents. Data collected through the CV method is increasingly more prevalent in analyzing food safety issues through mail surveys, personal interviews, and telephone interviews. While simply asking consumers about their preference through CV is direct and straightforward, there is always the uncertainty that consumers behavior revealed through hypothetical questionnaires may not be representative of actual behavior. Even with the danger of biases, Contingent Valuation has shown that these biases can be kept acceptably small with a well-designed survey instrument (Govinadasamy, 1997).

Copies of the survey were distributed and completed by respondents at grocery shops and markets such as Safeway, C-Town, AL- Ahlia Super Stores, Agricultural Company for IPM Products *AMAN* (safe food), and other super stores which sell IPM products. The survey was conducted throughout days of the week starting in the morning and throughout the afternoon hours, during the period of March and April 2001. The interviews were conducted in supply shops and at the end of each day, the collected information from the consumers were checked, coded, and entered into prepared sheets on the computer by using the Statistical Package for Social Science (SPSS). Descriptive statistics were used to summarize the data using tables, graphs, and charts. Analytical statistics

were non-parametric methods and multivariate analyses were used to analyze the data.

4.3 Interviews

Prospective respondents were asked if they would be willing to participate in a short survey, which was a part of partial fulfillment of the requirements for the degree of Master of Science in Agricultural Economic and Agribusiness Department in the University of Jordan. 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, or IPM products were given prior to the acceptance of being interviewed. All respondents were assured of complete confidentiality and no means of any kind were used to identify participants once their survey had been completed and the researcher emphasized that completing the questionnaire would take only a short while of their time.

When the questionnaire was introduced to the consumers, the importance of participating in the study and how the results would help improve safety of the types of products available at the local grocery stores was explained.

Overall, 240 copies of the questionnaire were distributed to respondents from both IPM consumers and Non-IPM consumers. 40 questionnaires were discarded because they were incomplete. Therefore, 200 interviews were useful, and thus the effective response rate was found to be 83 percent.

4.4 Questionnaire

The questionnaire was developed following the review of the research papers related to the subject of the study the questionnaire was developed. Also, the topics in the questionnaire were based on the several surveys developed for assessing the demand for IPM products, in addition to the attitudes and preferences of the consumers to IPM products. The questionnaire was reviewed by a number of the academic staff of the Faculty of Business Administration, Department of Marketing; and academic in the Department of Agricultural Economic and Agribusiness Management of the Faculty of Agriculture at the University of Jordan. The questionnaire was found to be useful to the research work and all the comments of the academic staff were taken into consideration and the questionnaire was reorganized accordingly.

In addition, the questionnaire was pre-tested by a group of 16 selected individuals. 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 and the questionnaire was distributed in Arabic language (See Appendix). The pre-tested responses were not included in the analysis.

The questionnaire included and covered the following aspects:

- Demographic information such as age, gender, education, and household size. Respondents were asked about their monthly household income, marital status and whether there were children living in the household.
- Awareness of IPM products, willingness to pay and buy IPM products and to place a value on IPM products. A Contingent Valuation question explained that a given type of conventional product cost (1JD) per unit and then inquired if they would be willing to pay slightly more for IPM products. The possible answers ranged from "not willing" to "willing to pay over 20%" for low-input agricultural products. Questions were also included to see whether consumers would be willing to purchase packed IPM products, or they prefer to pick their own purchases from loose products.
- Consumption habits and personal attitudes and ways to ensure the safety of the products and their comments on the use of ingredient

labels and food advertisements. Respondents were asked which departments were preferred to be responsible for monitoring IPM products.

- To use IPM products, respondents were asked to comment on their perception of the risk inherent to the use of chemical inputs to agricultural products. These inputs included pesticide usage, growth stimulants, and artificial fertilizers.
- A series of five questions was included to further test pesticide usage attitudes and willingness to pay for low input agricultural products.
- A brief statement was presented in the questionnaire to define IPM and to indicate the possibility of negative health effects of using pesticides in agricultural products. The purpose of this statement was to get the consumers acquainted with the concept of IPM products and to see whether this new information would change their attitudes.

4.5 Data Analyses

Following is a brief presentation of the analyses methods that were used in analyzing the data collected. To run the analyses, the Statistical Package for Social Science (SPSS) version 10.0 was used, STATA

Corp.2001.Stata Statistical Software: Release 7.0 and TSP (Time Series Processor) were adopted. Results are presented and discussed in Chapters Five, Six, and Seven of this study.

4.5.1 Measuring attitudes

Different methods can be used to obtain information on a person's attitude, including direct observation of how the person behaves in relation to certain things (Aiken, 1991). That is, what does the person actually do or say in situations in which the attitude objects are present? Willingness to do a favor, sign a petition, or make a donation to some cause is examples of behavioral measures of attitudes.

The most popular methods of measuring attitudes are to administer an attitude scale. An attitude scale, consisting of a set of positive and negative statements concerning a subject of interest (Aiken, 1991). One of the attitude scales was Likert scale as with the method of equal-appearing intervals. Rensis Likert's method of rating begins with the collection of a large number of statements expressing a variety of positive and negative attitudes toward a specified object or event. In the consumer survey, there were different positive and negative statements, positive attitudes such as "the use of chemicals in agriculture has negative effects on the environment" and the negative attitudes such as "there is no basic

difference between IPM and conventional products". A four-point scale was used to avoid concentrating on the responses at the median response should a three or five-point scale has been selected. Positively stated items are scored 1 for disagree, 2 for not-sure, 3 for agree, and 4 for strongly agree. In contrast, negatively stated items are scored 4 for disagree, 3 for not-sure, 2 for agree, and 1 for strongly agree. A respondent's total scores on the initial attitude item set are computed as the sum of scores for the individuals' item. After obtaining the total scores of all respondents on the initial item set, a statistical procedure is applied to each item. Likert scale is easy to construct, and has a higher reliability coefficient.

4.5.2 Measuring the awareness level of the consumers

The first two objectives of the study were for measuring the awareness level and attitudes of consumers. Non-Parametric test was used to measure the awareness level. The *Mann-Whitney* test was used to test the null hypotheses. The null hypothesis was for the second objective "there is no change in the perception of the consumers after they read the statement that explains the risks associated with the use of pesticides in agriculture". While the alternative hypothesis was "there is a change in their perception". These tests were used in cases of the two groups such as the test of the awareness level of non-IPM consumers to see whether their

attitudes changed after getting new information about the IPM concept (Before, and After). The test was used to determine whether there is a relationship between the consumers' socio-demographic characteristics and the awareness level of the importance of IPM products. The *Kruskal-Wallis* test or *one -way analysis of variance* was used in cases of more than two groups such as (age, education, and income level).

4.5.2 Conceptual framework of the willingness-to-pay

Analytically, the empirical model began with the neoclassical demand utility maximization framework in which consumers attempt to maximize utility subject to budgetary constraints imposed by their purchasing power:

$$\begin{aligned} &\max && u(X_1, X_2, \mathrm{K}\ \mathrm{K}\ X_n) \\ &\textit{subject to}: && \Sigma\ P_i X_i = Y \end{aligned} \qquad \textbf{\{Eq. 1\}}$$

Where u is the level of utility or satisfaction generated by consuming a set of goods and services. X_i represents the quantity of the *ith* good consumed, Y is the consumer's discretionary income and P_i is the price of the *ith* good.

The Lancaster Product Attributes Framework and expected utility theory was drawn upon to provide a theoretical basis for utilizing

explanatory variable other than prices and income in estimating consumption demand. The Lancaster model proposes that consumers purchase goods for the attributes and characteristics, which those products contain. Ladd and Zober (1982), Van Ravenswaay and Hoehn (1991), and Baker and Crosbie (1993) have all applied the product attributes framework to define product demand as a function of product attributes. Following those extensions, consider a demand system for product X, where X has a vector of product attributes, a:

$$X = X(P, a, Y) \quad \text{(Eq. 2)}$$

Where vector a contains dummy variables denoting IPM, or conventional products. Because consumers have collectively demonstrated a belief that pesticide residues pose a risk to human health, the choice of selecting IPM products should take into account some measures of risk perceptions. In such a scenario, purchase decisions between conventional and IPM products is made based upon the expected utility and the perceived level of risk associated with consuming either type of products.

An approach followed by Viscusi (1989), and Eom (1994) explicity incorporated consumers' risk perceptions into an expected utility framework. Eom (1994) derived an expected indirect utility dependent on income, price, risk perception, and socio-demographic characteristics. Individuals will have separate expected utility functions for each different

consumption choice they are presented with. In this case, the selection is between conventional products (good I) and IPM grown products (good II) and the consumption decision is dependent on the maximum of the individual expected indirect utilities:

$$EV(Y, P^{I}, P^{II}, \pi^{I}, \pi^{II}; S)$$

$$\max [EV^{I}(Y, P^{I}, \pi^{I}; S), EV^{II}(Y, P^{II}, \pi^{II}; S)] \qquad \text{\{Eq. 3\}}$$

Where Y is income, P^{I} and P^{II} are the per unit price of conventional and IPM products, π^{I} and π^{II} are risk perceptions, and S is a vector of socio demographic characteristics. Among the more important explanatory variables are some measures of income (Y), price (P) risk perception (π), and socio-demographic variables (S: education, marital status etc.).

Components of equations 2 and 3 can be combined to yield a more robust demand relationship than traditional theory provides:

$$X = X(P, a, Y, \pi, S) \qquad \text{\{Eq. 4\}}$$

Where P is a measure of price, a is a vector of product attributes (i.e. a dummy variable which denotes IPM products, etc.), Y is a measure of income, π is some measure of risk aversion, and S is a vector of socio-demographic variables. Equation 4 serves as our basic theoretical foundation.

The Logit, Probit, and Tobit models (multivariate analyses) were selected as the regression method in the analysis of willingness-to-pay. The Logit technique is a better procedure for capturing the magnitude of the independent variable effects for qualitative variables than are Probit models (Amemiya, 1983). The Logit model is also favored for its mathematical simplicity and is commonly used in a setting where the dependent variable is binary. Because the data sources provided individual rather than aggregate observations, the common estimation method of choice was the maximum likelihood method (Gujarati, 1992).

Hall *et al.* (1991) indicated that Probit model is used for analyzing the determinates of a choice between two discrete alternatives. And, Logit model can be a good way of examining the determinants of these choices, when the dependent variable involves two or more discrete choices. In the only two choices, it provides an alternative to the Probit model. So, estimates from the two models will be very similar. Even though, Ordinary Least Square (OLS) regression analysis has been most commonly used to describe multivariate relationships, since the study deals with categorical dependent variables, such as "Yes" or "No", (OLS) regression is in-appropriate. Maddala (1992) stated that, if both models are computed, one should make some adjustments in the coefficients to make them comparable through multiplying the coefficient of the Probit model by (0.625). To determine the relationships (positive or negative) between the

dependent and independent variables, a comparison took place between the expected signs of the statistically significant coefficients and the results. Significant coefficients were determined by t-values that were complied from the solutions of the models.

Because the use of the conventional R^2 –type measures is not a representative measure for the goodness of fit in case of models with qualitative dependent variable, which has only two values (0 or 1). The proportion of high correct predication measure was taken instead of the R^2 measure. It indicates how many from the studied cases were correctly predicated (Maddala, 1992). And because the objective was to decompose the effects of explanatory demographic variables, the final model specifications were more dependent on the significance of the parameter estimates than the overall predictive power of the models.

The empirical model assumes that the probability of observing the dependent (for instance, willingness-to-pay a premium for IPM products), P_i, is reliant on a vector of independent variables (X_{ij}) associated with consumer i and variable j, and a vector of unknown parameters β. The likelihood of observing the dependent variable was tested as a function of variables, which included socio-demographic and consumption characteristics.

$$P_i = F(Z_i) = F(\alpha + \beta X_i) = \frac{1}{[1 + \exp(-Z_i)]}$$

Where:

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

P_i = the probability observing a specific outcome of the dependent variable (i.e. the individual will be willing to pay at least a 10% premium to obtain or purchase IPM grown products) given the independent variables $X_i s$.

e = the base of natural logarithm approximately equals 2.7182.

Z_i = the underlying index number or βX_i

α = the intercept.

And βX_i is a linear combination of independent variables so that:

$$Z_i = \log\left[\frac{P_i}{(1-P_i)}\right] = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \mathrm{K} + + B_n X_n + \varepsilon$$

Where:

i = 1,2,.....,n are observations

Z_i = the unobserved index level or the log odds of choice for the *ith* observations.

X_n = the *nth* explanatory variable for the *ith* observation.

β = the parameter to be estimated.

ε = the error or disturbance term.

The dependent variable Z_i in the above equation is the logarithm of the probability that a particular choice will be made. The parameter

estimates do not directly represent the effect of the independent variables. To obtain the estimators for continuous explanatory variables in the Logit model, the changes in probability that $Y_i = 1(P_i)$ brought about by a change in the independent variable, X_{ij} is given by:

$$\left(\frac{\partial P_i}{\partial X_{ij}}\right) = \frac{[\beta_i \exp(-\beta X_{ij})]}{[1+\exp(-\beta x_{ij})]^2}$$

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

$$\left(\frac{\partial P_i}{\partial X_{ij}}\right) = P_i(Y_i : X_{ij} = 1) - P_i(Y_i : X_{ij} = 0)$$

Two models were developed to predict the likelihood of a dependent variable, which included the purchase of IPM products, and the switch of supermarket to purchase IPM products. Table (4-1) represented the explanatory variables used in the regression models and Table (4-2) represented the dependent variables were used in the regression models.

The Tobit model was applied to estimate the payment of a premium price for IPM products. The Tobit model is similar to the Logit and Probit models, but the dependent variable in this model is observed if it is greater than zero and is not observed if it is less than zero. It is also known as a censored normal regression model because some observations on

dependent variable (those for which $Y^* \leq 0$) are censored (we are not allowed to see them).

The following regression model as indicated by Maddala (1992) had been taken into consideration when the Tobit model was analyzed,

$$Y_i^* = \beta_0 + \sum_{j=1}^{k} \beta_j X_{ij} + u_i$$

Where Y_i^* =is observed if $Y_i^* > 0$ and is not observed if $Y_i^* \leq 0$; a variable shows paying premium for IPM.

X's= are the factors supposed to influence Y_i^* (factors affecting their paying)

B_0=is a constant

u_i=is the error term

Table (4-1): Explanatory variables used in the regression models

Variable	Explanation	Expected sign
Gender	1 if the individual is female and 0 otherwise	+
Age group	Age of the respondents (18-25=1, 26-35=2, 36-45=3, 46-55=4,over 55=5)	+
Education level	(eliminating grade school=1, secondary high school=2, community college=3, B.Sc.=4,graduated studies=5)	+
Monthly Income	(150-300=1,300-450=2, 450-600=3, 600-750=4, over 750=5)	+
Marital Status	Married=1, Single=0	? *
Hsize	Household size(number of people in the household)	+
Child	1 if there are children residing in the household and 0 otherwise	+
Kids	Number of kids under 15 years	+
Paying	Premium prices for IPM (no pay=0, 5-10%=1, 10-15%=2, 15-20%=3, over 20%=4)	?
Being Breadwinner	1 if the individual is the breadwinner for his/her family and 0 otherwise	?
Consumption	1 if the individual consumes IPM and 0 otherwise	+
Switch Supermarkets	1 if the individual switches supermarkets to be able to purchase IPM and 0 otherwise	+
Risk1	Residues from pesticides (not hazard=0, not sure=1, somewhat hazard=2, serious hazard=3)	+
Risk2	Growth stimulants(Hormones) (not hazard=0, not sure=1, somewhat hazard=2, serious hazard=3)	+
Risk3	Artificial fertilizers (not hazard=0, not sure=1, somewhat hazard=2, serious hazard=3)	+

Note: * means unknown sign

Table (4-2): The dependent variables used in the regression models

Model	Dependent Variable	Explanation
1-Logit and Probit	Consuming IPM Products	Binary variable: the consumption of IPM products; the variable takes the value of 1 if the respondents purchase IPM and 0 otherwise.
2- Logit	Switch Supermarket to Purchase IPM Products	Binary variable: the switch supermarkets to purchase IPM products; the variable takes the value of 1 if the respondents switch supermarkets and 0 otherwise.
3- Tobit	Paying a Premium Price to Purchase IPM Products	Paying for IPM products the variable takes the value (0, 5%, 10%, 15%, and 20%); which is the premium price that the respondents pay

After the initial test under this specification, explanatory variables were dropped from the model in an attempt to increase performance.

In many cases, similar categories were combined (such as divorced, and widowed were combined with married categories) when there were very few responses in a given category. Dropping categories to prevent perfect collinarity and to make the interpretation of results easier.

4.6 Validity and Reliability of Measurement

Validity: Measure tells what the scale measures are supposed to measure. To test face validity, the questionnaire was reviewed by academic staff in the Faculty of Business Administration and Faculty of Agriculture at the University of Jordan to see whether the questions were relevant or not and after that the survey was reordered. The questionnaire was pre-tested by a group of 16 selected individuals. 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.

Reliability: Measure is the indispensable attribute of consistency. If the same measures were applied to the same objects today and next week, the results should be almost identical. The Cronbach's α test is used to estimate reliable coefficients (the degree to which the test measures the same factors). The Cronbach's Alfa was found 0.6642 for the questions of shopping habits, 0.6274 for the food safety risk questions, and 0.6592for the consumers' attitude and willingness-to-pay for low input agriculture questions. So, because the value of Alfa was more than 0.6 which is the minimum accepted value for measurement of reliability (Sekran, 1984), this indicates that the attitude scale is quite reliable.

Part Two
Consumer Survey Results of the Study

RESULTS OF THE DESCRIPTIVE STATISTICS ANALYSIS AND THE NON-PARAMETRIC TEST OF THE AWARNESS LEVEL

Results of the Descriptive Statistics Analysis and the Non-Parametric Test of the Awareness Level

The major focus of this chapter is to present a descriptive analysis and univariate analysis of consumer preferences and perceptions of IPM grown products. Additionally, information regarding the awareness level of the consumers to the shopping habits, risk perceptions, and the demographic background would help to construct a profile of the respondents. In this chapter, the information collected from consumers was compared and analyzed. Findings of descriptive statistics, and univariate analyses for the variables obtained from the survey are presented.

5.1 Level of Awareness:

Measuring the awareness level of the respondents is one necessary step to ascertain which consumers are mostly likely to make use of IPM products in actual purchase practices. In addition to aggregate measures of pesticide usage, specific consumer demographic characteristics can be tested for their marginal contributions to pesticide usage. Both healthy and dietary professionals as well as the food-marketing sector hold interest in the consumer awareness level to IPM products. In general, the implications

of IPM products marketing research provide an array of advantages to a wide scope of commercial and health care departments.

In the questionnaire, there were several statements to test the awareness level of the respondents, the survey stated "12 statements which were both negative and positive". Each statement has four positions that were given simple weights of 4, 3, 2, and 1 for scoring purposes. In the positive statement like "the use of synthetic chemicals in agriculture which has a negative impact on the environment" the score ranged between 4 for strongly agree, 3 for agree, 2 for not sure, and 1 for disagree. As for the negative statement like "there is basically no difference between the safety of conventional and IPM products" the score ranged between 4 for disagree, 3 for not sure, 2 for agree, and 1 for strongly agree. After recording the scores for each respondents, they were calculated. In the survey, there are 12 items which mean that 48 is the maximum score (4x12) and 12 is the minimum score (1x12). So the range of the respondents' awareness level was from 48 to 12 points, the average of the awareness level was 37.7100, and the standard deviation was 4.3486. The respondents' scores ranged between 33.3614- 42.0586 in which case the awareness level is considered average, if it is more than 42.0586, their awareness is considered high and if it is less than 33.3614 their awareness level is considered low.

5.2 Profile of the Respondents:

The purpose of this part is to investigate the socio-demographic characteristic factors affecting the awareness level of respondents to IPM products. It focuses on some major factors, which are associated with the perceptions and behavior of participants.

In order to successfully market new food products, demographic shifts and differences must be well understood and the needs for specific consumer segments must be taken into account. Changes in public awareness of food safety issues and growing interest in healthy eating habits have affected the demand for food products. Numerous studies have established the significance of socio-demographic characteristics (e.g. Nayge, 1996; Klopp and McDonald, 1981).

A demographic characteristic breakdown of the 200 completed responses is given in all Tables that show the relationship between each socio-economic factor and the awareness level. The average household size was 4.73 individuals with an average of 1.35 persons under the age of 15 living in each home. Households with children made up 61.5 percent of the sample.

5.2.1 Personal, social, and economic factors

5.2.1.1 Gender

Urban women play an important role in major decision making issues, which should be considered in purchasing goods from the grocery shops. Dunlop and Beus, 1992 found that women are more likely than men to place pesticide residues as a top concern, which means that their awareness level toward the food safety issues is higher.

Table (5-1) indicates the relationship between the level of awareness of food safety issues and the gender of respondents. Females comprised 44.5 percent of the participants. The mean rank of the level of awareness for females was found insignificant with gender of the respondents. The Mann-Whitney test presents no relation between gender and the awareness level to food safety issues (P=0.197). This result is in contrast with what is expected that women have interest in food safety issues.

Table (5-1): The relationship between the level of awareness of food safety and the gender of respondents

Gender	Number	%	M-W Test * Mean Rank	P-Value
Male	111	55.5	95.78	0.197
Female	89	44.5	106.38	
Total	200	100		

Note: 1. Mann-Whitney U calculated was =4416.000.
2. * M-W stands for Mann- Whiteny Test

5.2.1.2 Age

Many studies in U.S.A. indicated that middle age consumers are more likely to use safe products than older individuals (Bender and Derby, 1992).

The respondents age categories in the study sample are revealed in Table (5-2). In agreement with Bender and Derby, middle age individuals were more likely to use safe products than older ones. Respondents between 18-25 years old accounted for 10% of the sample, and about one sixth of the sample were found to be over 55 years old. The largest age group was 36-45 year olds, which comprised 27.0% of the sample. It appears that middle age individuals are relatively more innovative, progressive, and more likely to demand new products than older individuals, who seem to be less interested in trying new products. Older individuals have more restricted diets due to medical advice or health problems whereas middle age individuals have less motivation to look for more healthy alternatives.

The Kruskal-Wallis test which was undertaken between the age of the consumer and the awareness level to food safety issues shows that the null hypothesis is rejected at the 1%, 5%, and 10% levels of significance (P=0.001). Therefore, the hypothesis that the age of the consumer is related to the awareness level to IPM products is supported by the results.

Table (5-2): The relationship between the level of awareness of food safety and the age of respondents

Age Categories(Years)	Number	%	K-W Test * Mean Rank	P-Value
18-25	33	16.5	63.24	0.001
26-35	49	24.5	103.01	
36-45	54	27	117.88	
46-55	34	17	108.90	
Over 55	30	15	96.58	
Total	200	100		

Note: 1. Chi- square χ^2 calculated value was =19.609 with 4 *dfs*.
2. * K-W stands for Kruskal- Wallis test.

5.2.1.3 Income level

Previous studies of similar topics in food safety such as consumer preferences for friendly products and consumer risk perceptions and awareness level to safety 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 income households (Byrne, 1991).

The distribution of the respondents in the study sample according to their income is shown in Table (5-3). It shows that more than half (58%) of the participating households had monthly income of at least 600JD, while (30%) had a monthly income of less than 450JD. It can be noticed that the

respondents with higher incomes are more likely to purchase safe products and that result is in agreement with Govindasamy (1997).

The Kruskal Wallis test indicated that the mean rank of the awareness level is significant for respondents with the highest two classes of monthly income where by the P-value was (P=0.0001). Therefore, the alternative hypothesis that income is related to the awareness level to food safety issues is accepted. To know which mean rank has a big difference with other mean rank the ANOVA and "LSD" tests were used and the result showed that respondents' with the highest monthly income have big mean difference between the other incomes and P-value was statistically significant at (P= 0.0001).

Table (5-3): The relationship between the level of awareness of food safety and the income level of respondents

Income Level	Number	%	K-W Test	P-Value
			Mean Rank	
150-300	33	16.5	63.88	0.0001
300-450	27	13.5	68.69	
450-600	24	12	74.91	
600-750	56	28	99.03	
More than 750	60	30	145.58	
Total	200	100		

Note: Chi- square x^2 calculated value was =62.291 with 4 *dfs*.

5.2.1.4 Marital status

Govindasamy (1997) indicated that those who were married including divorced or widowed were less likely to purchase conventional products exclusively when compared to those who were single individuals.

Table (5-4) indicates marital status of the respondents in the study sample. The majority of the respondents were found to be married (74.5%) while 23.5% were single.

There was a big difference between the two compared groups. The Mann-Whitney test shows that the mean rank of the awareness level to safe products is significantly high for respondents who were married (P=0.001).

Table (5-4): The relationship between the level of awareness of food safety and the marital status of respondents

Marital Status	Number	%	M-W- Test	P-Value
			Mean Rank	
Single	47	23.5	75.60	0.001
Married*	153	76.5	108.15	
Total	200	100		

Note: Mann-Whitney U calculated was =2425.000.

*2% of the married group were found to be divorced or widowed.

5.2.1.5 Educational level

Educational level was found to significantly enhance safe product usage in a number of related studies. Those with higher levels of education were found to be more likely to use safe products (Guthrie *et al* (1995); Feick 1986). Many studies reported that increasing the respondents' educational level had a positive effect on the awareness level.

The educational level of the respondents in the study sample is presented in Table (5-5). More than three quarters of the respondents were found to have at least community college education, which suggests that IPM users are more likely to be with higher education levels, while 23% of the respondents had not received a college degree.

The Kruskal Wallis test indicated that the mean rank of the awareness level to food safety issues was significantly higher for respondents with post secondary education (P=0.004). Therefore, the alternative hypothesis that education is related to the awareness level of food safety issues is accepted.

Table (5-5): The relationship between the level of awareness of food safety and the education level of respondents

Education Level	Number	%	K-W Test Mean Rank	P-Value
Some grade school	21	10.5	63.02	0.004
Some high school	25	12.5	85.31	
Community College	16	8.0	108.50	
B.Sc. degree	119	59.5	111.02	
Graduate studies	19	9.5	93.18	
Total	200	100		

Note: Chi- square x^2 calculated value was =15.584 with 4 *dfs*.

5.3 Shopping Habits:

In a series of questions aimed at providing insight to the shopping habits of the sample, respondents reply on how much they made use of ingredients labels, product advertising, and media reports in their shopping. These questions were primarily included for the purpose of statistical prediction to examine whether consumers would purchase IPM products. The answers to these questions take score from "4 for always, 3 for usually, 2 for occasionally, and 1 for never". However, these questions offer much information about the background and attitudes of grocery shops. Many of the survey results are presented graphically. For each bar chart figure, the x-axis represents the number of the participants who made each response and the y-axis represents the relative frequency.

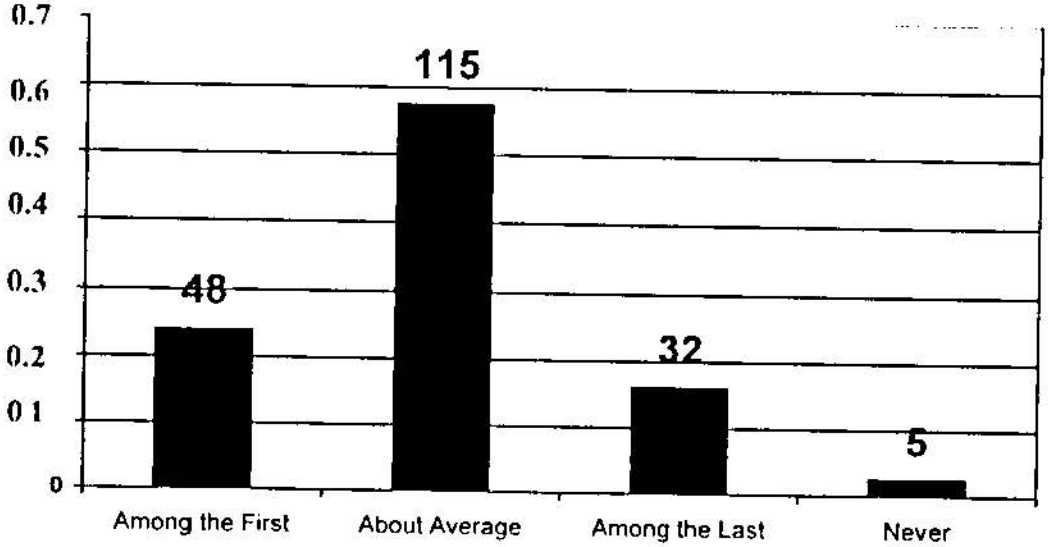
When respondents were asked to classify themselves in terms of trying a newly introduced food product in the supermarket the score was "4 for among the first, 3 for about average, 2 for among the last, and 1 for never". (Figure 5-1). More than half of them indicated that they felt they were about average in their willingness-to purchase a new product, 24 percent were among the first to try. While 16 percent were among the last or never to try new food products who may be classified by regard to (Bennett, 1988) who classified the adopters of the new products into categories which are innovators, early adopters, early majority, late majority, and laggard. The percentage of each category was 2.5, 13, 34, 34, and 16 respectively.

When respondents were asked whether that they checked the ingredient label on the food they purchase from the supermarkets, over 95 percent of the respondents reported that they checked the ingredient label on the foods they purchased at least occasionally. The largest group (44.0%) selected "usually" as their frequency for making use of food labeling (Figure 5-2).

For most of new products, selective targeting of a specific audience is necessary. Bennett, (1988) showed that the segmentation of the markets according to the socio-demographic factors of the consumers help in the rapid response in the changing market needs and is more effective to allow state strategic planning for new products. However, any modifications in

consumer behavior arising from new advertising campaigns are intrinsically limited by the existing use of food advertisements. Only 26 percent of the survey participants indicated that they were "usually" or "always" affected by food advertisements in newspapers, while more than half of the respondents (51.0%) said they occasionally made use of these advertisements (Figure5-3). 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 5-4), however very few classified themselves in the extreme categories (i.e."always" or "never").

Figure (5-1)

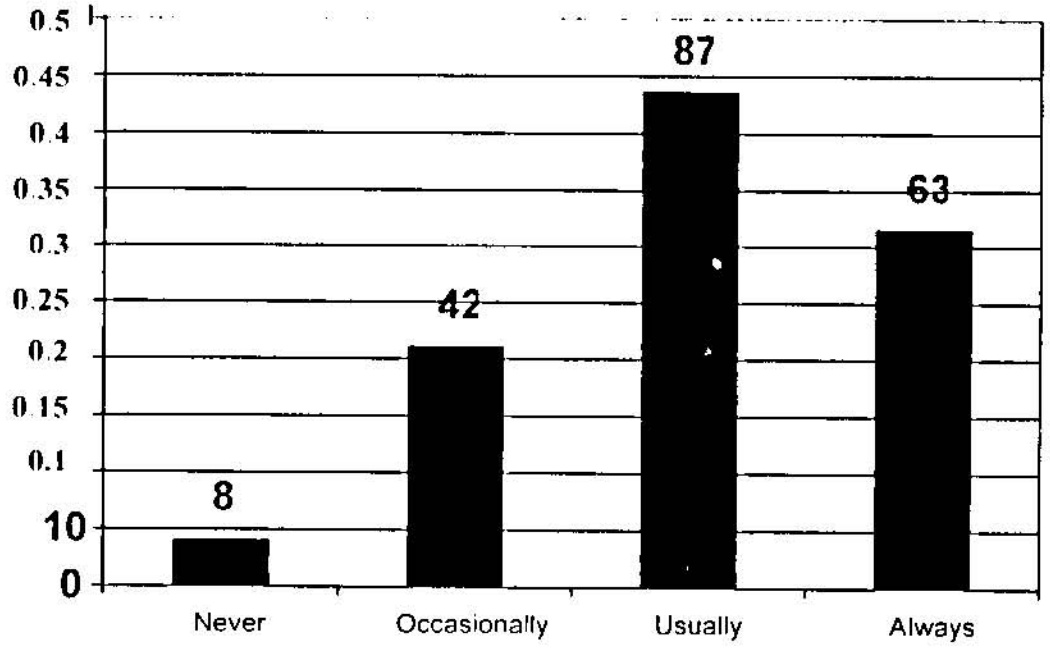


Self-classification of respondents in terms of trying a newly introduced food product in the supermarket.

Responses: 200 Mean: 3.03 Std.Dev.: 0.708 C. I.* (95%): 2.9212-3.1188

* C.I.: 95% Confidence Interval of the Difference

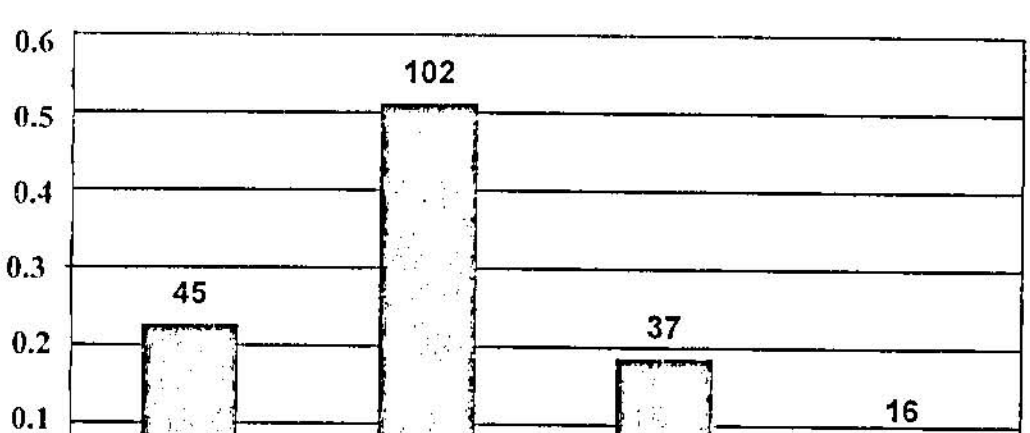
Figure (5-2)



Distribution of respondents according to the check of the ingredient label on the food.

Responses: 200 Mean: 3.110 Std.Dev.: 0.742 C. I. (95%): 3.0065-3.2135

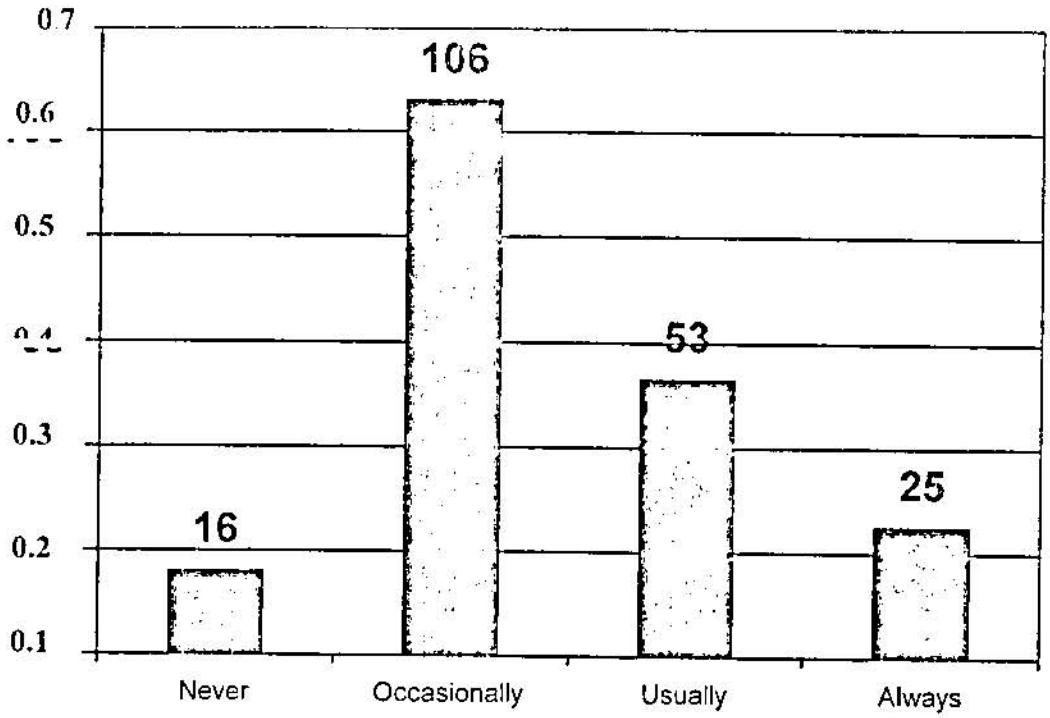
Figure (5-3)



Distribution of the respondents According to using food advertisements in the newspaper that help in choosing food items

Responses: 200 Mean: 2.12 Std.Dev.: 0.846 C. I. (95%): 2.0073-2.2427

Figure (5-4)



Distribution of the respondents by the frequent use of newspaper articles or TV. and radio reports on food safety issues.

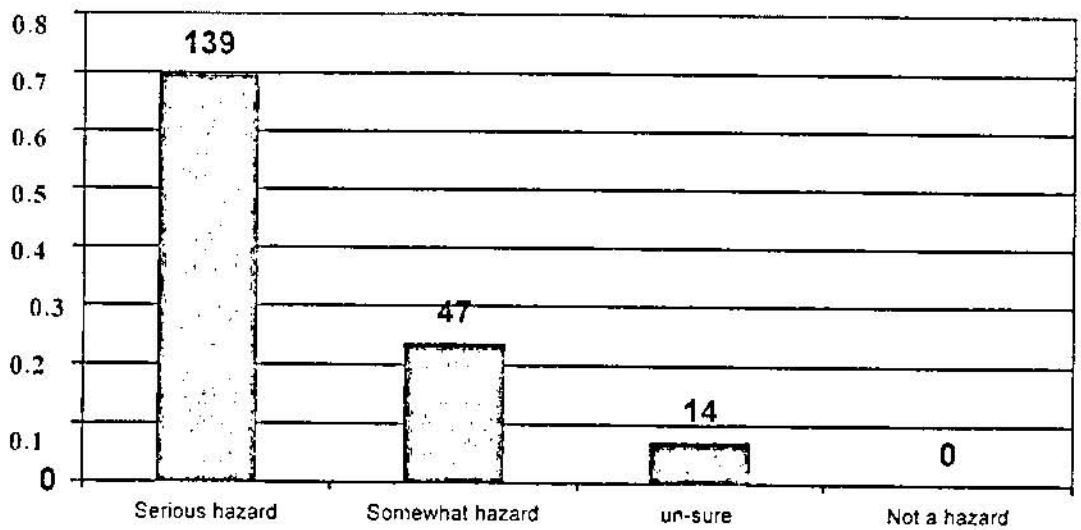
Responses: 200 Mean: 2.435 Std.Dev.: 0.809 C. I. (95%): 2.3160-2.5440

5.4 Food Safety Risks:

Pesticide residue has repeatedly been documented as the leading source of food safety concern among consumers (Byrne *et al.*, 1991; Misra, Huang and Ott, 1991; Govindasamy, Italia and Liptak, 1997). Regardless of whether these fears are legitimate or exaggerated, public perceptions of

A lower mean response indicates lower levels of concern about a particular food safety issue. Higher standard deviation of responses generally indicates a lower degree of consensus about the issues that were ranked as most hazardous and a greater dispersion of responses for issues ranked as less hazardous. The score of the hazard take the following rank: 4 for serious hazard, 3 for somewhat hazard, 2 for not sure, and 1 for not a hazard.

When posed with three food safety issues: pesticide residues, growth stimulants, and artificial fertilizers, residues from pesticides and herbicides were perceived to be the most hazardous food safety issues. Pesticide residues (Figure 5-5) had the lowest standard deviation among the three 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 classifying food risks that made them realize that they were involved in a "pesticide" study. Growth stimulants and artificial fertilizers used in agricultural production were ranked as the second and third most hazardous of the food safety issues in the set (Figure 6-5,and 7-5 respectively).



Distribution of the respondents according to their rating to the pesticide residues

Responses: 200 Mean: 3.625 Std.Dev.: 0.6118 C.I (95%): 3.5446-3.7154

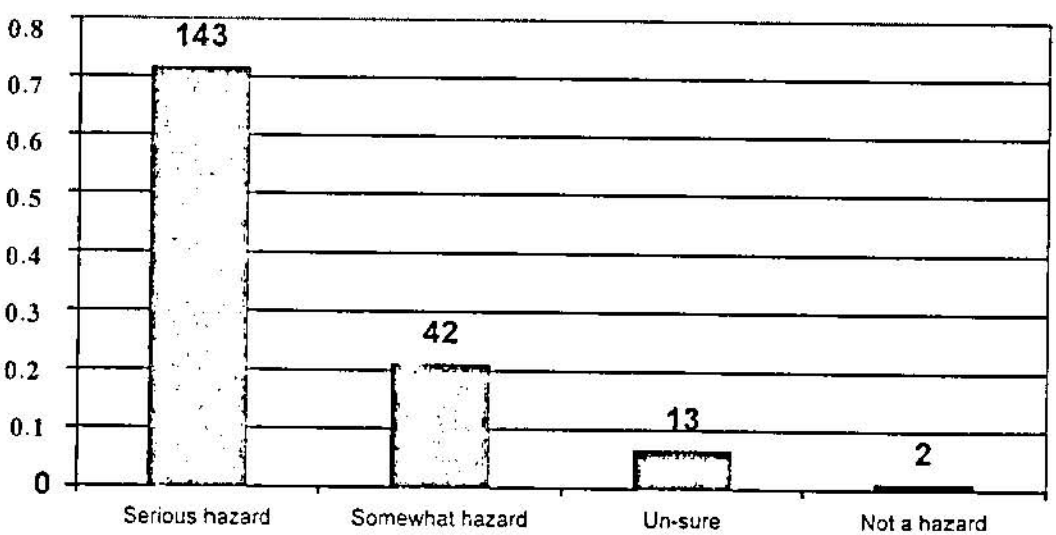
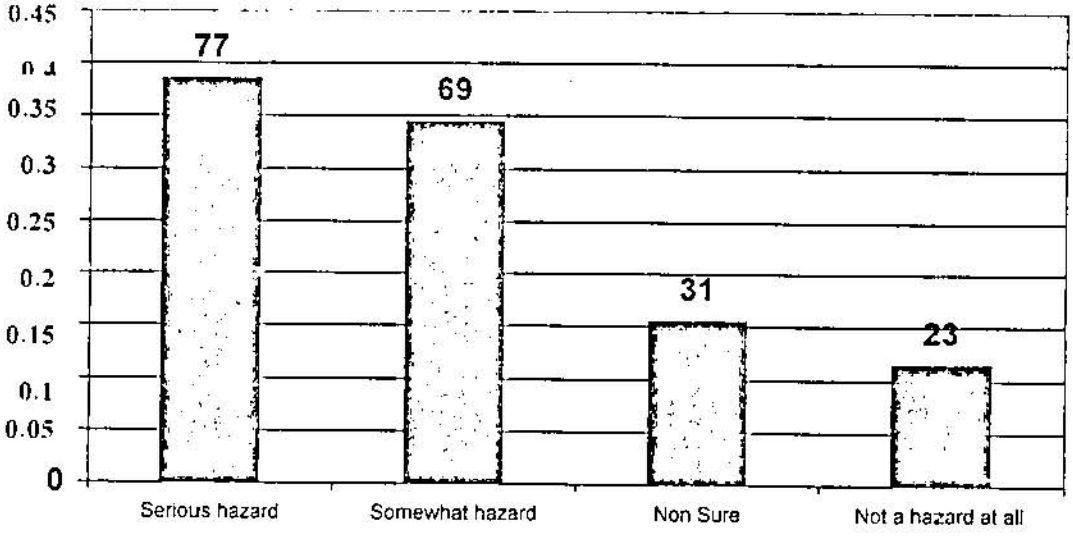


Figure (5- 6): Distribution of the respondents according to their rating to the growth stimulants

Responses: 200 Mean: 3.63 Std.Dev.: 0.650 C.I. (95%): 3.5339-3.7161

Figure (5- 7)



Distribution of the respondents according to their rating to the artificial fertilizers

Responses: 200 Mean: 3.00 Std.Dev.: 1.00 C.I.(95%): 2.8602-3.1398

Among the food risk questions, responses about growth stimulants and artificial fertilizers exhibited the highest number of emotions at questions possibly indicating a higher care of public familiarity with these topics for these series of questions.

RESULTS OF THE CONSUMERS' ATTITUDE TO IPM PRODUCTS

Results of the Consumers' Attitude to IPM Products

This chapter will interpret the analysis of the consumers' attitude and their response to IPM products. In addition it presents an empirical evaluation of consumer preferences and perceptions to low-input agriculture like IPM products. Also, to examine how the demographic characteristics affect their response.

6.1 Consumer Response to IPM Products:

Structural and demographic changes in consumer response and preferences necessitate determining consumers' demand before new products or marketing strategies can be planned. One example, which is an important topic covered in this study, is a consumer trend disapproving synthetic chemical inputs to agricultural products. Possible reasons for this behavior may be explained by the uncertainty inherent to agrochemical use.

6.1.1 Consumers have prior knowledge about IPM products

Survey questions dealt with whether individuals would be willing to purchase IPM products or not. Table (6-1) illustrates how many individuals have heard, and at the same time, purchased IPM products prior to taking

with higher levels of education were more willing to purchase IPM products, especially those who were at least community college graduates. The Kruskal Wallis test indicated that the mean rank of the consumption of IPM products was significantly higher for respondents with post secondary education (x^2=17.054 and P=0.002).

3-Age: Dunlap and Beus, (1992) found that those with middle age respondents tend to show more concern about pesticide usage and respond to IPM products than adults. When compared to other age groups, those 18-25 years of age seemed to be the least who have any knowledge about IPM products, while 65 percent for the group between 36-45 indicating they would purchase IPM products. Individuals over the age of 45 highly approved IPM products. The Kruskal Wallis test indicated that the mean rank of the consumption of IPM products was significantly higher for respondents with younger age level (x^2=37.840 and P=0.0001).

4-Marital status: Between the marital status categories, married individuals expressed the highest willing to purchase IPM products. There was a large difference between the two compared groups. The Mann-Whitney test presents a relationship between marital status and the consumption of IPM products (U= 1945.500 and P=0.0001).

5-Gender: Males have been reported to be less likely than females to make frequent use of IPM products (Guthrie *et al.*, 1992). There was a difference between the two compared groups. The Mann-Whitney test

presents a relationship between gender and the consumption of IPM products (U=4039.500 and P=0.016).

Table (6-1): Cross- tabulation of the knowledge about IPM products by selected socio-economic variables

Prior Knowledge of IPM						
Socio-economic Variables	YES		NO		Mean Rank	P-Value
Gender	N	%	N	%		0.016
Male	47	42.3	64	57.7	92.84	
Female	53	59.6	36	40.4	110.05	
Age Group						0.0001
18-25	3	9.1	30	90.9	59.59	
26-35	19	38.8	30	61.2	89.28	
36-45	35	64.8	19	35.2	115.31	
46-55	25	73.5	9	26.5	124.03	
Over 55	18	60	12	40	110.50	
Education Level						0.002
Some grade school	2	9.5	19	90.5	59.59	
Some high school	14	56	11	44	104.34	
Community College	9	56.25	7	43.75	106.75	
B. Sc. degree	63	52.9	56	47.1	104.35	
Graduate studies	12	63.2	7	36.8	113.66	
Monthly Income Level						0.0001
150-300	3	9.1	30	90.9	59.88	
300-450	6	22.2	21	77.8	72.72	
450-600	5	20.8	19	79.2	72.24	
600-750	39	69.6	17	30.4	95.33	
More than 750	47	78.3	13	21	150.50	
Marital status						0.0001
Single	7	14.9	40	85.1	65.39	
Married	93	60.7	60	39.2	111.28	

Note: Overall sample 200 respondents. 100 (50%) Yes, and 100 (50%) No

6.1.2 Consumers switch supermarkets to purchase IPM products

Respondents were asked if they would switch supermarkets to be able to purchase IPM products (Figure 6-1). 60.0% of the respondents said they would switch supermarkets to be able to purchase IPM products. Roughly two-thirds of the respondents of those who indicated they would be interested in purchasing IPM products also said they would switch supermarkets to get IPM products.

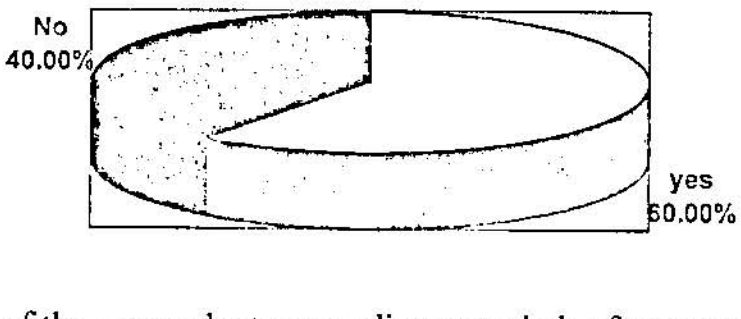
Cross-tabulated results are presented in Table (6-2):

1-Gender: Govinadasamy (1997) indicated that women were more likely to switch supermarkets than men. The Mann-Whitney test shows that the mean rank of the switching of supermarket to purchase IPM products is insignificant with gender of the respondents (U=4344.0000 and P=0.085).

2-Income: Anderson (1993) showed that participants with higher annual household income were far more likely to switch supermarkets to obtain IPM products. The Kruskal-Wallis test shows that the mean rank of the switching supermarket to purchase IPM products is insignificant and unrelated to the level of income of the respondents (x^2=2.063 and P=0.724).

3-Marital Status: Zurbriggen (1998) indicated that in general, marital status was the least demographic breakdowns, which explained the least response to switch supermarkets to purchase IPM products. The Mann-Whitney test shows that the mean rank of the switching supermarket to

Figure (6-1)



Distribution of the respondents according to switch of supermarkets to be able to purchase IPM products

Note: Number of the Respondents was 200

Table (6-2): Cross- tabulation of the switch of supermarket to purchase IPM products by selected socio-economic variables

Switch Supermarket						
Socio- economic Variables	YES		NO		Mean Rank	P-Value
Gender	N	%	N	%		0.085
Male	71	64	40	36	105.96	
Female	48	54	41	46	93.81	
Age Group						0.321
18-25	14	42.4	19	57.6	107.67	
26-35	28	57.1	21	42.9	100.18	
36-45	28	51.9	26	48.1	89.15	
46-55	23	67.6	11	32.4	108.65	
Over55	26	86.7	4	13.3	104.33	
Education Level						0.57
Some grade school	14	66.7	7	33.3	104.64	
Some high school	14	56.0	11	44.0	94.85	
Community College	9	56.25	7	43.75	91.00	
B. Sc.Degree	73	61.3	46	38.7	104.25	
Graduate studies	9	47.4	10	52.6	88.37	
Monthly Income Level						0.724
150-300	19	57.6	14	42.4	100.38	
300-450	18	66.7	9	33.3	100.26	
450-600	15	62.5	9	37.5	110.57	
600-750	31	55.4	25	44.6	103.07	
More than 750	36	60.0	24	40.0	94.33	
Marital status						0.085
Single	29	61.7	18	38.3	104.83	
Married	90	58.8	63	41.2	99.17	

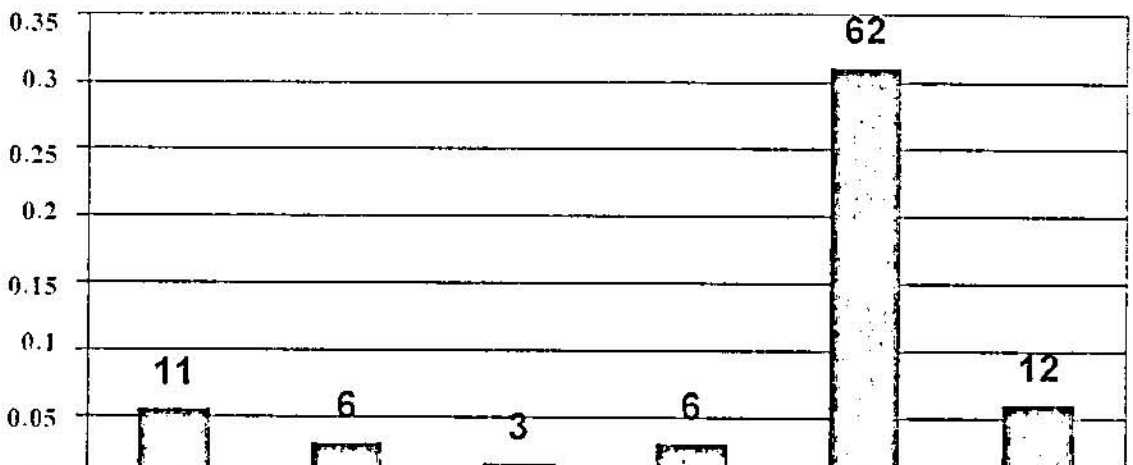
Note: Overall Sample 200, 119 Yes (59.5%), and 81 No (40.5%).

6.2 Sources of Information about IPM Products

Food marketers use mass media in several ways. Food promotions can inform consumers and differentiate the products based on price or availability and also be used to introduce new food products. In the case of newspaper advertisements, which is an important form of promotion for the grocery markets, the primary motivations of the consumer are price and quality (Govindasamy, 1995).

Sources of information about IPM products for the consumers with prior knowledge about IPM products are presented in (Figure 6- 2). These sources include newspaper articles, television, radio reports, special magazines, grocery shops, and other sources. Contrary to what was expected, radio and television had the lowest percentage. 62 percent of the respondents know about IPM products from grocery shops. 26 percent of the respondents know about IPM products from mass media like newspaper articles, television, radio reports, and scientific magazines. 12% of respondents know about IPM from other sources of information like the IPM project in Jordan, and GTZ.

Figure (6- 2)



Distribution of the respondents according to their sources of information about IPM products

Note: Number of Respondents was 100.

6.2.1 Benefits of additional information about IPM products

Bruhn *et al.* (1992) presented that the respondents were questioned before and after viewing two brief videos about IPM practices in controlled conditions after watching the video presentations. The objective of that was to determine the effects of information regarding IPM on consumers' perception of food safety. Diaz-Knauf *et al.* (1995) illustrated the benefits of additional information and educational programs on the use of

Respondents were asked to read and be introduced to a short definition about IPM products and the negative effects of chemicals on family health. The statement appears to change their attitudes to IPM products. The Mann-Whitney test presents that the mean rank of the awareness level was significantly higher of drawing the attention of the respondents to harmful effect of the chemical residues (U=1620.00 and P=0.002).

6.3 Preference of IPM Products

The quality and characteristics of products play a significant role in the purchase decision 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 price in the market.

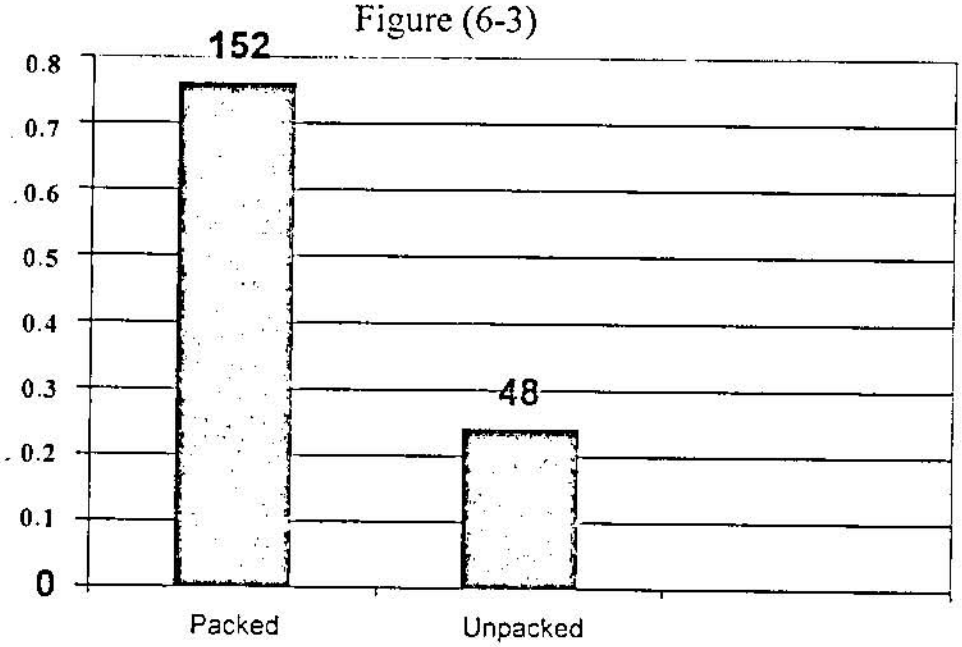
Two questions in the survey have been designed to empirically quantify consumer preferences and risk perceptions with the intent of gaining a better understanding of consumer purchase behavior. Through seeing how the consumers prefer to get IPM products and which departments on the side of the consumers must be responsible for IPM products.

departments on the side of the consumers must be responsible for IPM products.

6.3.1 Preference to packed IPM products

Respondents were asked if they prefer to get IPM products loose or packed (Figure 6-3). About 76 percent of the respondents answered they preferred IPM products packed. The reasons for that were more hygienic, more trust in packed products, it is labeled, and it is likely to be used in a conventional product, and a better quality. One fourth of respondents answered that they preferred to get IPM products in an unpacked way. The reasons for that were to pick their own loose products, and to choose the suitable quantity and quality.

Figure (6-3)



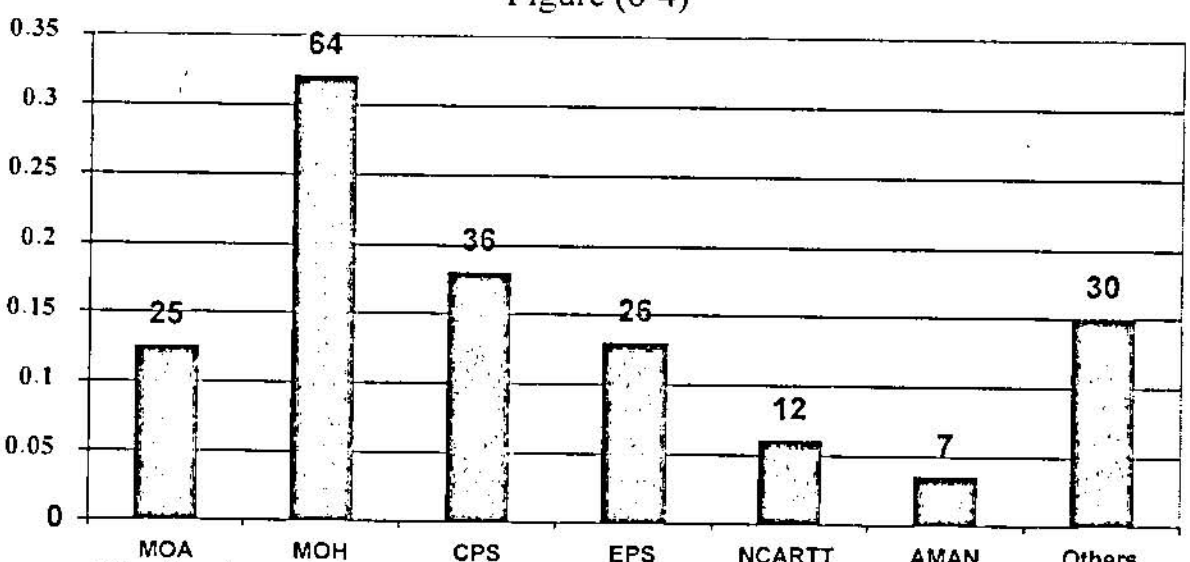
Distribution of the respondents by their preference to get IPM products packed or non-packed

Note: Number of Respondents was 200

6.3.2 Assurance of IPM products

Second question to assurance of IPM products, was "which institution do you prefer to be responsible for the production of IPM products and you trust?". As (Figure 6-4) shows many consumers (32%) prefer and have trust in the "Ministry of Health" (MOH), 18 percent of respondents prefer the "Consumer Protection Society"(CPS). While "Environmental Protection Society" (EPS) and "Ministry of Agriculture" (MOA) have 13 percent. Only 9.5 percent of the respondents preferred *AMAN* Company to be responsible for the assurance of IPM products. About 15 percent of the respondents indicated that they prefer to establish an independent agency to issue assurance certificates about the production of IPM products and these responses follow up the label on IPM products.

Figure (6-4)



Distribution of the respondents according to institution they prefers to be responsible for the production of IPM products

Note: Number of Respondents was 200

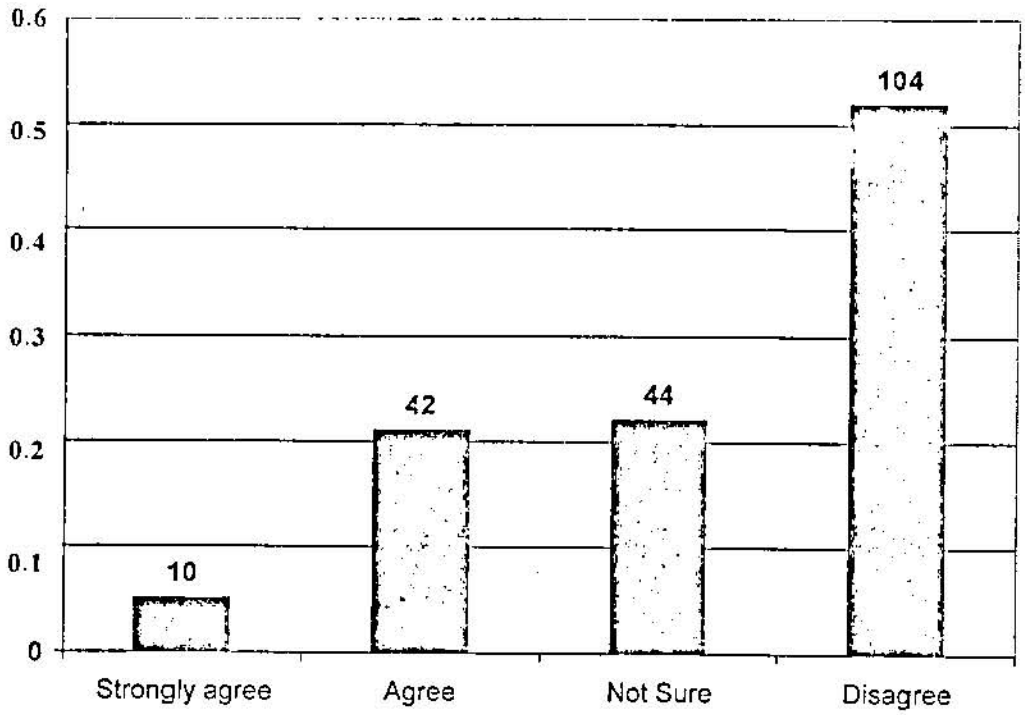
6.4 Consumers' Attitude for Low-Input Agriculture Products (IPM)

Intensification of agricultural production and wide use of chemicals in agriculture raised concern of consumers about the safety of agricultural products.

Growing concerns about pesticide residue in fresh products could manifest themselves 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 conventional fresh products (Weaver, 1992). For low –input agriculture to be marketed successfully, it will be necessary to determine whether the consumer concern for pesticide residues has resulted in fundamental changes in consumer attitudes and behavior.

To examine attitudes of respondents to pesticide residues and low-input agriculture (IPM) a series of five questions was included to further test attitudes for low-input agriculture. Only (26%) believed that conventional products (non-IPM) were generally safe to consume (Figure 6-5). Of the remaining 74 percent, half of them (52%) considered conventional products as unsafe and (22%) were not sure.

Figure (6-5)

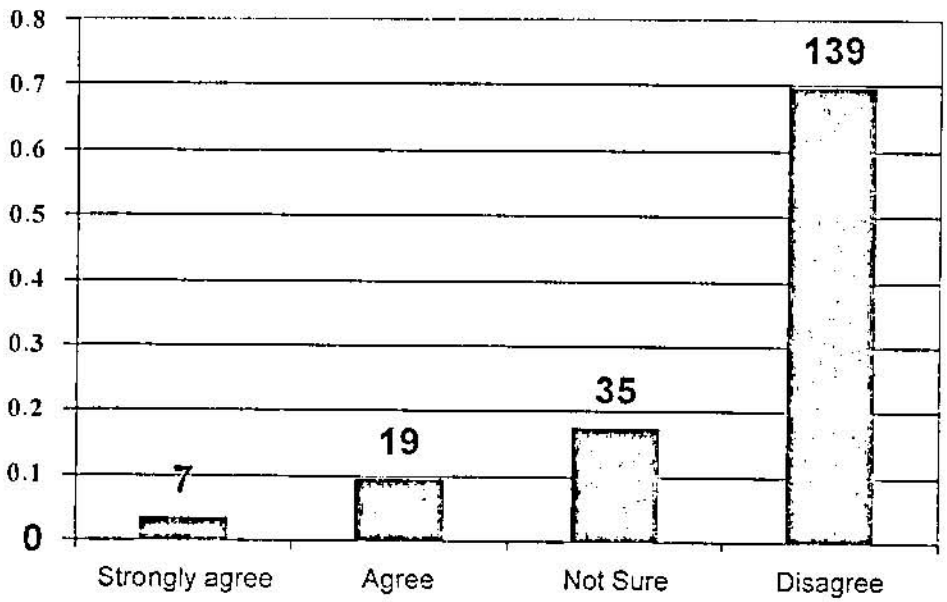


Distribution of the respondents by their considers that conventional products are generally safe to consume

Responses: 200 Mean: 3.21 Std.Dev.: 0.94 C.I.(95%): 3.0784-3.3416

A large portion of the sample (70.0%) believed that conventional products were unsafe to consume. Thus, the majority of respondents believed that a significant difference existed in the safety of consuming conventional and low-input agriculture (Figure 6-6). Only 13 percent were found to have the opinion that the conventional products are safe, while 18 percent were not sure about the safety of agricultural products.

Figure (6-6)



Distribution of the respondents according to their view point that there is basically no difference between the safety of conventional and IPM products

Responses: 200 Mean: 3.53 Std.Dev.: 0.81 C.I.(95%): 3.4174-3.6426

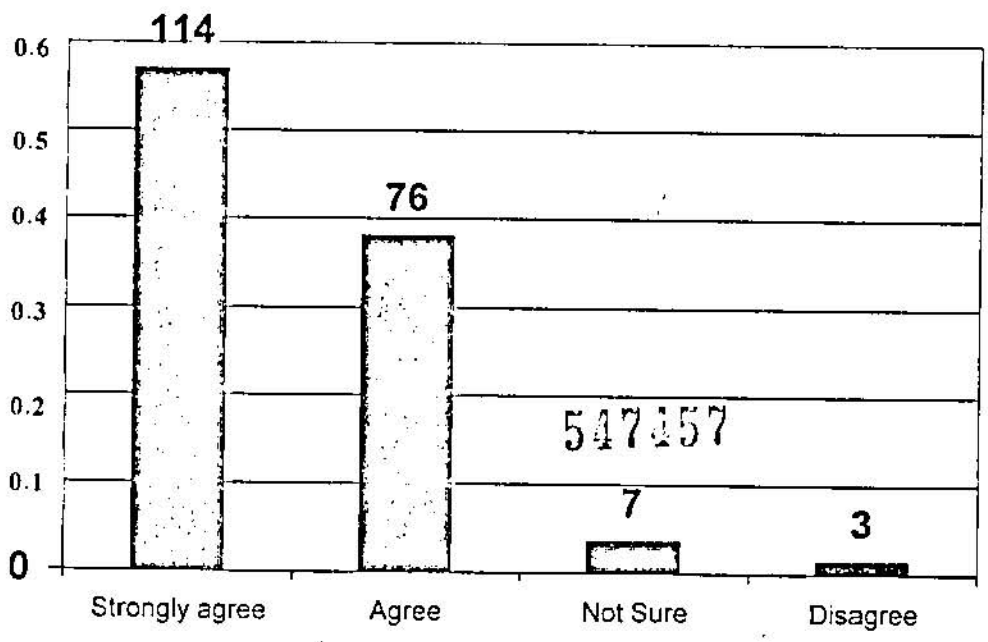
6.4.1 Attitudes toward the negative effect of chemicals on the environment

IPM methods of crop protection have received increased public and research attention. Even so, the majority of the growers still rely heavily on pesticides as their primary defense against insect, weed, and disease infections source. The concern of grocery shops that overuse of pesticide 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, 1992).

The majority of respondents exhibited a concern about the effects of synthetic pesticides toward the environment. About 95 percent of the overall respondents indicated that they believed that the use of synthetic pesticides have a negative effect on the environment, while 3.5 percent were not sure and only 1.5 percent disagreed (Figure 6-7).

Figure (6-7)



Distribution of the respondents according to their view point that the use of synthetic chemicals in agriculture has a negative effect on the environment

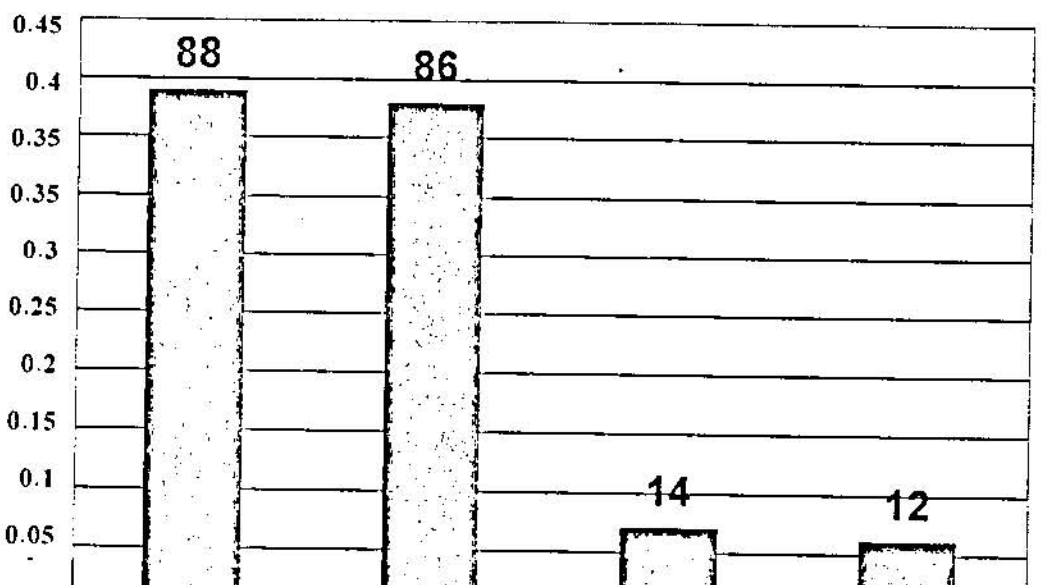
Responses: 200 Mean: 3.51 Std.Dev.: 0.64 C.I.(95%): 3.3962-3.5838

6.4.2 Willingness to purchase IPM products

Kidwell (1994) indicated that the success of IPM would depend on the retail price at which it is ultimately available to consumers. Also, he showed that most consumers have not significantly altered their purchase behavior by buying low-input products rather than conventional products because the biggest obstacle is undoubtedly the price.

When respondents in the sample were asked about the current prices of IPM products, 87 percent of the respondents indicated that they would purchase IPM products if it were less expensive (Figure 6-8).

Figure (6-8)



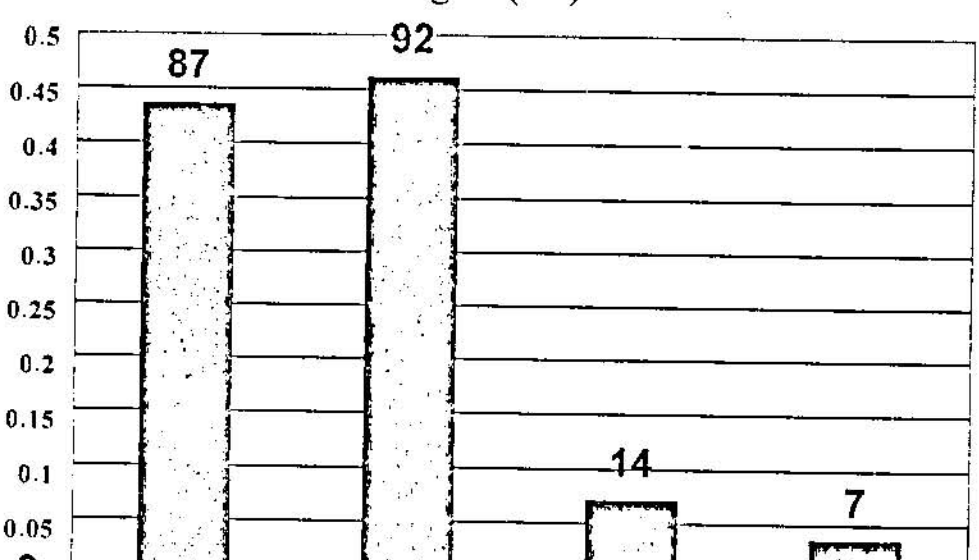
Distribution of the respondents according to their buying IPM products if it were less expensive

Responses: 200 Mean: 3.25 Std.Dev.: 0.83 C.I.(95%): 3.1293-3.3607

In Jordan, IPM products are only available in limited grocery shops. This makes most consumers tend to purchase available conventional products. The reason for that was that IPM products are not readily available.

When respondents were asked about their willingness-to-purchase IPM products, more than 89 percent of the respondents indicated that they would buy IPM products if it were more readily available. Only 3.5 percent from the sample size said that they would not purchase IPM products if it were more readily available (Figure 6-9).

Figure (6-9)



Distribution of the respondents according to their buying IPM products if it were more readily available.

Responses: 200 Mean: 3.3 Std.Dev.: 0.75 C.I. (95%): 3.1906-3.3994

Summary of the Non-Parametric Test Results

Results of the Non-Parametric tests are presented hereinafter in Table (6-3). The results in the awareness level supported the hypotheses that age, educational level, and income level, were related to the awareness level to the safety food issue. While, gender was not related with the awareness level. The results in consumption of the IPM products supported all the hypotheses that gender, age, educational level, and income level were related to the consumption of IPM products. The results in the switching supermarkets to purchase IPM products were in contrast to all the hypotheses that the socio-economic factors are related with switching supermarkets to purchase IPM products.

Table (6-3): Summary of the non-parametric test between some socio-economic factors and the awareness level, consumption of IPM products, switching of supermarket to purchase IPM products

Factor	Awareness level	P-Value	Consume IPM		P-Value	Switching Supermarkets		P-Value
			Yes	No		Yes	No	
Gender		0.197			0.016			0.085
(Male)	111		47	64		71	40	
(Female)	89		53	36		48	41	
Age		0.001			0.0001			0.321
(18-25)	33		3	30		14	19	
(26-35)	49		19	30		28	21	
(36-45)	54		35	19		28	26	
(46-55)	34		25	9		23	11	
over 55	30		18	12		26	4	
Marital Status		0.001			0.0001			0.490
(Single)	47		7	40		29	18	
(married)	153		93	60		90	63	
Income		0.0001			0.0001			0.724
(150-300)	33		3	30		19	14	
(300-450)	27		6	21		18	9	
(450-600)	24		5	19		15	9	
(600-750)	56		39	17		31	25	
over 750	60		47	21		36	24	
Education		0.004			0.002			0.57
(1)*	21		2	19		14	7	
(2)**	25		14	11		14	11	
(3)***	16		9	7		9	7	
(4)****	119		63	56		73	46	
(5)*****	19		12	7		9	10	

Note: *, **, ***, ****, and***** means some grade school, some high school, community college, B.Sc. degree, and graduate studies, respectively.

RESULTS OF THE WILLINGNESS- TO -PAY FOR IPM PRODUCTS

Results of the Willingness-to-Pay for IPM Products

Pesticide use is a normal practice by all farmers. Yet, little efforts were made by the state research and extension system to promote sustainable pesticide use. New policies are needed to encourage farmers to reduce pesticide use and to assure safe food supply to the consumers. Akgungor, (1995) suggested that a policy option is to ensure the consumers with food labels that would guarantee that the levels of pesticide residues in food supply do not cause health risks. The cost of such a policy should be compensated by the value of consumer benefits from reduced pesticide residues in food. A consumer benefit from reduced pesticide residues is through reduced probability of health impairment associated with pesticide residues in foods. Such benefits can be estimated by eliciting consumers' willingness to pay for reduced health risks from pesticide residues.

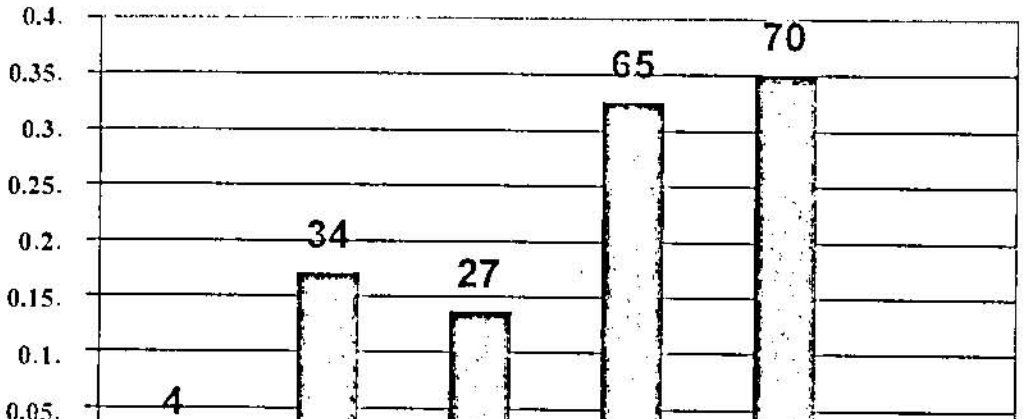
The aim of this chapter is to estimate the value that the consumers' health benefits from reduced pesticide residues in fresh fruits and vegetables. This part investigates the socio-economic characteristics of the consumers' willingness to pay for labels that guarantee the current levels of pesticide residues in foods, which do not cause health-related problems. Respondents were asked about their willingness-to-pay for IPM products, and to put a premium price to pay to obtain IPM products.

7.1 Premium for IPM Products

Ott *et al.*, (1991) found that while consumers in USA support for chemical residue testing in fresh products was strong, and 54% of those who indicated that pesticide usage was a food concern were willing to pay more to obtain pesticide free products. However, the premium to be paid was low, only about one tenth of the sample indicated they would be willing to pay more than an additional 10%. While, Weaver *et al.*, (1992) reported that 56% of consumers indicated a willingness to pay of at least a 10% premium to obtain pesticide free tomatoes. Only 19% of the sample indicated that they were unwilling to pay a premium at all.

Respondents were asked if they would be willing to pay a premium to purchase IPM products. Following a typical contingent valuation format, 5 possible choices were provided ranging from "no premium" to a premium of "over 20 percent". Of the 200 respondents who replied to the willingness-to pay questions, only 2 percent were unwilling to pay a premium for IPM products. As can been seen in Figure (7-1), a higher number of participants were willing- to- pay more than 15 percent for IPM products with a percentage of over 68%, and only 2 percent of respondents were not willing to pay for IPM products.

Figure (7-1)



Distribution of the respondents according to their willingness to pay premium for IPM products.

Note: Number of Respondents was 200

7.2 Results of Multivariate Analyses

A multivariate analyses consisted of econometric models Logit, Probit, and Tobit models regression. The contingent valuation questionnaire included questions about demographics such as monthly household income, age of the respondent and education. Table (7-1) classifies some of the explanatory variables used in this analysis. In brief, approximately 56% of the respondents were males and 60 %had completed at least B. Sc. Degree. About 68 % of the participants were 45 years of age or below, while approximately 30 percent of the respondents had monthly household income of less than JD 450. Approximately 62 % were parents

for families with children. Roughly 24 percent of the respondents were single. More than half of the respondents was breadwinners for their families. 60 percent of the respondents said that they would switch supermarkets to purchase IPM products.

Table (7-1): Descriptive tabulation of some explanatory variables

Variable	Explanation	Number	%
Gender	Male	111	55.5
	Female	89	44.5
Age Group	18-25	33	16.5
	26-35	49	24.5
	36-45	54	27
	46-55	24	12
	over 55	30	15
Marital status	Single	47	23.5
	Married	153	76.5
Having Children	Yes	123	61.5
	No	77	38.5
Education Level	Some grade school	22	11
	Some high school	26	13
	Community college	16	8
	B.Sc.	117	58.5
	Graduated studies	19	9.5
Monthly Income Level	150-300	32	16
	300-450	27	13.5
	450-600	23	11.5
	600-750	58	29
	over 750	60	30
Being a Breadwinner	Yes	109	54.5
	No	91	45.5
Switching Supermarkets	Yes	119	59.5
	No	81	40.5

The detailed results are displayed in Table (7-2), Table (7-3), and Table (7-4). As mentioned in the methodology of the study, the method that was used to assess the goodness of fit is the percentage of correct predications. Considering 1%, 5% and 10% levels of significance, the

developed to decrease the net quantity of chemical pesticides used in many types of agriculture. IPM products can reduce the amount of pesticide residues consumed by humans. In addition, IPM reduces the hazard to agricultural workers, wildlife, and to non-target organisms. The respondents in this study indicated a positively significant relation between willingness to pay for IPM and the risk aversions. Because they considered pesticide residues as a top food safety concern.

7. Paying a premium price for IPM products. The results showed that the price plays a significant role in the willingness to pay for IPM products. It had a positive significant sign, which means that as the price of IPM products increase the trust of consumers in the quality of IPM products will increase. Furthermore, the respondents indicated that they would even be willing to pay somewhat more for less chemical residue products. The results that were implied in this study were similar to those results of Misra (1991), Hollingsworth *et al.* (1993), and Morris *et al.* (1993). They found that the consumer support for chemical residue testing on fresh products was strong, and those who indicated that pesticide usage was a top food concern were willing to pay more to obtain pesticide free products, the premium they were willing to pay was very large.

Table (7-2): Results of the first Model "Logit" model for factors influencing the consumption of IPM products

Variables	Coefficient	Std. Error	t-Value
Consumption of IPM	Logit	Logit	
Gender	4.6303**	1.7254	2.6835
Age Group	0.4339*	0.2666	1.6273
Marital Status	1.2530	0.9711	1.2902
Being a Breadwinner	3.6894**	1.6801	2.1959
Hsize	-0.4652***	0.2623	-2.9260
Number of Kids	-0.5388**	0.2623	-2.0541
Having Child	1.0634	0.8428	1.2617
Education Level	0.2052	0.2736	0.7498
Switching Supermarkets	-0.6979	0.5081	-1.3733
Monthly Income Level	1.0124***	0.2400	4.2174
Paying a Premium Price	0.1571***	0.0470	3.3397
Risk1	0.1497	0.4777	0.3133
Risk2	0.0816	0.4704	0.1735
Risk3	0.5657*	0.3210	1.7621
Percent correct predications = 86% R^2= 0.60			

Source: Complied from Logit Model Solutions. The Data Collected from the Consumer Survey
Notes: (1) *, ** and *** indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Table (7-3): Results of the first model "Probit" Model for factors influencing the consumption of IPM products

Variables	Coefficient	Std. Error	P-Value
Consumption of IPM	Probit	Probit	
Gender	2.5923**	1.0161	0.011
Age Group	0.2617*	0.1469	0.075
Marital Status	0.7444	0.5517	0.177
Being a Breadwinner	2.008**	0.9941	0.043
Hsize	-0.2595***	0.08984	0.004
Number of Kids	-0.3250**	0.1488	0.029
Having Child	0.6674	0.4530	0.141
Education Level	0.1288	0.4530	0.413
Switching Supermarkets	-0.4336	0.2938	0.140
Monthly Income Level	0.5727***	0.13345	0.0001
Paying a Premium Price	0.0907***	0.0265	0.001
Risk1	-0.0701	0.2723	0.797
Risk2	0.0605	0.2689	0.822
Risk3	0.3129*	0.1807	0.083
Pseudo R^2= 0.56	Cragg & Uhler's R^2= 0.72		
McFadden's R^2= 0.56	Efron's R^2= 0.60		

Source: Compiled from Probit Model Solutions. The Data Collected from the Consumer Survey
Notes: (1) *, ** and *** indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

- **Second Model: Switching Supermarkets to Purchase IPM Products:**

The likelihood function estimated in the second model, Logit model was used in the regression analysis. The results of the factors affecting switching supermarkets to purchase IPM products were explained in Table (7-4).

The main findings of this model were the following:

1. Household size was hypothesized to influence switching supermarkets to purchase IPM products. The results of the study showed a positive significant relationship between the switch of supermarket to purchase IPM products and the household size. This finding has been supported by other studies. Guthrie *et al.*, (1995) found that households with more than one inhabitant were more likely to switch supermarkets to purchase IPM products.

2. Having child in the household was hypothesized to influence the switch of supermarkets positively. But contrary to what is expected, the results of the study showed a negative significant relationship between the switching of supermarkets to purchase IPM products and the number of kids in the household. It might be explained by that, the more the number of kids led to diminish availability of time to be concerned about food safety issues and therefore shall be negatively correlated with IPM usage. Also, as with large number of kids in the household the requirements to providing main goods is more important than provide the fresh vegetables especially with respondents who have a limited monthly income.

3.According to the aforementioned result on the consumption of IPM products, the pay variable, which is a premium price for IPM products, plays a significant role in the switch of supermarkets for IPM products. It had a positive significant sign, which means that as the price of IPM

products increases the switch of supermarkets will increase. The respondents spend part of their time to get IPM products from the supermarkets where the products are available. The results implied in this study were similar to those results of Misra (1991), Hollingsworth *et al.* (1993), and Morris *et al.* (1993). They found that the consumer support for chemical residue testing on fresh products was strong, and those who indicated that pesticide usage was a top food concern were willing to pay more to obtain pesticide free products, the premium they were willing to pay was very large.

4. The results supported the hypothesis that, the participants who have higher risk aversions toward pesticide usage are expected to switch supermarkets for IPM products. The results obtained by Sachs *et al.*, (1984), Burgress et al. (1989), and Zellner and Degner (1989) supported the result obtained in this study. They reported that the willingness to pay, switch of supermarkets, and the probability to purchase tested and certified food are dependent on the degree of consumers' perceived risk level due to pesticide residues. Also, they indicated that the consumer aversion toward synthetic pesticide residues has been a top safety concern since late 1960s. The respondents in this study indicated a positively significant relation between the switch of supermarkets to the purchase of IPM products and the risk aversions. Because they considered pesticide residues as a top food safety concern.

Table (7-4): Results of the second model "Logit" model for factors influencing the switch of supermarkets to purchase IPM products

Variables	Coefficient	Std. Error	t-Value	P>|Z|
Switching supermarkets	Logit	Logit		
Gender	-0.5970	0.4583827	-1.30256	0.193
Age Group	-0.0679	0.1676112	-0.40535	0.685
Marital Status	0.1851	0.9438922	0.19617	0.866
Being a Breadwinner	0.1318	0.3599265	0.36624	0.714
Hsize	0.1734**	0.0741505	2.33910	0.019
Having Child	-0.5588***	0.0965541	-5.76822	0.0001
Education Level	0.1030	0.1163612	0.88569	0.376
Monthly Income Level	-0.1135	0.3778831	-0.30044	0.746
Paying a Premium Price	0.0553837***	0.0225343	2.45775	0.014
Risk1	0.3380**	0.1437032	2.35225	0.019
Risk2	0.5902***	0.1632503	3.61579	0.0001
Risk3	0.1686***	0.0448793	3.75697	0.0001
Percent correct predications = 75% R^2= 0.25				

Source: Complied from Logit Model Solutions. The Data Collected from the Consumer Survey
Note: *, ** and *** indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

- **Third Model: Paying A Premium Price to Purchase IPM Products:**

The likelihood function estimated in the third model" Tobit model" was used in the regression analysis. The results of the factors affecting paying a premium price to purchase IPM products was explained in Table (7-5).

The main findings of this model were the following:

1. Residing of the children in the household was hypothesized to influence the willingness to pay positively. But contrary to what is expected and to the results of Govindasamy (1998), and Lai *et al.* (1997),

the results of the study showed a negative significant relationship between the willingness to pay for IPM products and the exist of children in the household. It might be explained by that, the large number of children in the household should lead to increased responsibilities borne by parents to insure basic food to their children rather than interest in providing safe meals for them; hence, this shall be negatively correlated with pay for IPM products.

2. The results supported the hypothesis that, the participants who have higher risk aversions toward pesticide usage are expected to pay more to get IPM products. The results obtained by Zellner and Degner (1989) supported the result obtained in this study. They reported that the willingness to pay, and the probability to purchase tested and certified food is dependent on the degree of consumers' perceived risk level due to pesticide residues. Furthermore, they indicated that the consumer aversion toward synthetic pesticide residues has been a top safety concern since late 1960s. The respondents in this study indicated a positively significant relation between paying for IPM products and the risk aversions. Because they considered pesticide residues as a top food safety concern.

3. In the Tobit model, the switching of supermarkets to purchase IPM products and consumption of IPM product variables were considered as explanatory one. Similar to what is expected, the switch of supermarkets to purchase IPM products and the consumption of IPM products showed a

highly positive significant effect on the paying for IPM products. This finding could be due to the fact that the respondents who are willing to spend 10% to 25% more for grown products using IPM techniques will be willing to switch supermarkets to get IPM products. Burgress *et al.* (1994) found that many respondents indicated that they would even be willing to switch supermarkets to obtain IPM products.

Table (7-5): Results of the third model "Tobit" model for paying premium price to IPM products

Variables	Coefficient	Std. Error	t-Value
Pay a Premium Price	Tobit	Tobit	
Gender	-0.690972	1.26750	-0.545145
Age Group	0.111569	0.443691	0.251456
Marital Status	0.953123	1.46930	0.648690
Being a Breadwinner	0.383143	1.30799	0.292926
Hsize	0.047587	0.225279	0.211235
Having Child	-3.53950***	1.25565	-2.84378
Education Level	0.134678	0.408674	0.332627
Switching Supermarkets	1.93302**	0.831774	2.32397
Monthly Income Level	-0.107046	0.408674	-0.261935
Consumption of IPM Products	3.63274***	1.13324	3.20564
Risk1	1.47795**	0.762623	1.93799
Risk2	-0.856486	0.780514	-1.09734
Risk3	-0.085209	0.491330	-0.173425

Source: Complied from Tobit Model Solutions. The Data Collected from the Consumer Survey
Note: *, ** and *** indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

In brief, in chapter five, and six there are no contrasts among the results of the univariate and multivariate analyses, except in three factors, which are the gender, marital status, education level of the respondents. Also, there was a contrast between the results of switch analysis in the univariate and multivariate analysis. It is worth noting that Mann-Whitney test and Kruskal-Wallis test are only used as methods to distinguish if there is a particular relationship between variables. But, they do not reflect the direction of the relationship (positive or negative). So, the multivariate analyses "the Logit, Probit, and Tobit models", were carried out to identify the socio-economic factors that influence the willingness to pay for the IPM products. The factors influencing the paying for IPM products were analyzed together. In such case, the multivariate analyses give more reasonable results to be taken into consideration as the main results of this study. Taking into consideration that the results of the Logit and Probit models were found to be very similar.

7.2.2 The marginal effect of the socio-economic factors

The multivariate analysis was used to quantify the marginal effects of some socio-economic factors on the probability of consuming IPM products.

Table (7-6) shows the marginal effect, which can provide the contributions of some factors to the probability of consuming IPM products. These factors are; gender, age, income, risk, pay a premium price, breadwinner to their family, number of kids in the household, and household size. It can be observed that "female respondents" lead to an increase in the probability of consumption decision by 0.800 per cent. However, an increase of one year of age, increase the probability of consuming IPM products by 0.100 per cent. If the respondents exhibit higher risk aversion toward pesticide usage, that increases the probability of willingness to pay for low-input agricultural products by 0.119 per cent. The result shows as the levels of monthly income increases by one unit that will lead to increase the demand on IPM products by 0.219 per cent. While, an increase of one kid residing in the household decreases the probability of consuming and purchasing IPM products by 0.124 per cent. Other factors such as paying a premium price, and being a breadwinner to the family would lead to an increase in the probability of the purchasing decision by 0.034 per cent, and 0.65 per cent, respectively.

Table (7-6): Result of the marginal effect of the Probit model to consuming IPM products

Variables	Marginal effect	Std. Error	P>|Z|
Gender	0.8006**	0.1761	0.011
Age Group	0.1002*	0.05654	0.075
Marital Status	0.2599	0.1636	0.177
Being a Breadwinner	0.6516**	0.2217	0.043
Hsize	-0.09944***	0.03366	0.004
Number of Kids	-0.1245**	0.05683	0.029
Having Child	0.2455	0.1578	0.141
Education Level	0.04938	0.05996	0.413
Switching supermarkets	-0.1667	0.1124	0.140
Monthly Income Level	0.2194***	0.0500	0.000
Paying a Premium Price	0.03477***	0.00993	0.001
Risk1	0.02687	0.1402	0.797
Risk2	0.02318	0.1032	0.822
Risk3	0.1199*	0.06903	0.083

Source: Complied from Probit Model Solutions. The Data Collected from the Consumer Survey
Notes: (1) *, ** and *** indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Part Three
Conclusions and Recommendations

8.1 Summary and Conclusions

From the study results, the following can be summarized and concluded:

1. IPM is an important production method that will inevitably play a major role in the future of agriculture. It couples the practical concerns of providing stable pest and disease control, with the protection of human health and environment. Also, it is ecologically conscious, better economically better and might become more acceptable socially. Thus, it is necessary to work on marketability and stability of IPM products into public consumption.
2. IPM products have the characteristics of high relative advantage to enable the consumers to compensate the cost of such technique by the value of consumer benefits from reduced pesticide residues in food. One consumption benefit from reduced pesticide residues is through reduced probability of health impairment associated with pesticide residues in foods.
3. In Jordan, up to this date, no studies have analyzed the marketability of consumers' attitude to IPM products. The focus of this study was to empirically evaluate consumers' preference and attitude to IPM products and the factor, which affect their attitudes. A consumer survey was administered and completed to explore the opinions and preferences of consumers of fresh products. The respondents indicated strong

support for IPM through both a high willingness to buy and paying a premium for IPM grown products.

4. The goal of this research was to provide food-marketing agents with better understanding of consumer behavior, preferences and beliefs that are relevant to IPM products. These findings may be especially encouraging to those developing marketing strategies for low-input products such as organic and IPM products.

5. The result indicates that IPM consumers are more likely to be younger in age, more educated, with higher level of monthly income, and risk averse. The consumers who are willing to both purchase and pay a premium to obtain the IPM products were more likely with higher level of income. One of the biggest obstacles to IPM products is largely the price.

6. The respondents indicated that prices of the IPM products are still high in Jordan, which reduces their demand for IPM products. But there has been a steady increase in the promotion of IPM products because of the increased public emphasis on public health and environmental safety.

7. The Mann-Whiteny, and Kruskal Wallis test were used to determine the relationship between some socio-economic factors and "the awareness level to food safety issues, the purchase of IPM products, and the possibility to switch supermarkets to purchase IPM products". Thus, the test could not identify the direction of that relation positively or negatively related. It particularly analyzed the relationship between two variables;

hence, it can be concluded that the non-parametric test may only provide a partial picture between the socio-economic variables and the awareness level of consumers. The multivariate analyses namely Logit, Probit, and Tobit models were used to examine the relationship between all independent variables, and to identify the direction. These analyses take into consideration the relationship between the consumption of IPM products and the socio-economic variables, as well as the possible interaction between the independent variables.

8. The findings of the multivariate analyses "Logit, Probit, and Tobit regression" show that, gender, age, level of income, risk aversion, being breadwinner to the family, paying a premium price to get IPM products, switching supermarkets to purchase IPM products, and consumption of IPM products have positive relationships with the purchase decision of IPM products. While, the household size, and the number of kids "less than 15 years", and children residing in the household have a negative effect upon the purchase of IPM products.

9. The results of the Probit analysis are used to quantify the marginal effect of the studied socio-economic factors on the probability of consuming IPM products. It was found that "female respondents" led to an increase in the probability of consumption decision by 0.800 per cent. However, an increase of one year of age, increases the probability of IPM purchase by 0.100per cent. If the respondents exhibit higher risk aversion toward

pesticide usage, this would increase the probability of willingness to pay for low-input agricultural products by 0.119 per cent. The result shows that the higher the monthly income is by one unit will lead to an increasing demand on IPM products by 0.219 per cent. While, an increase of one kid residing in the household decreases the probability of consuming and purchasing IPM products by 0.124 per cent. Other factors such as paying a premium price to get IPM products, and being a breadwinner to the family would lead to an increase in the probability of purchasing decision by 0.034 per cent, and 0.65 per cent, respectively.

10. Without exerting effort to create the awareness of the negative effect of the usage of pesticides in agriculture, consumption of IPM products will not become a reality, and an ordinary thing. But, in the long run, in case of implementing awareness programs through different sources of information, for consumers on IPM issues, will increase the accumulation of knowledge and know-how of IPM products. This will eventually lead to the production of products that are safe to consume, not only to the consumers' health but also the environment. It is expected that many consumers will make their decisions to purchase and pay more to obtain IPM products.

11. Unfortunately, there are still numerous constraints which prevent the dissemination of IPM products in Jordan, such as:

- The high price and the non-availability of IPM products in all supermarkets. But, this situation might become better with the passage of time, when the demand for such products increases due to the rising concerns over pesticide residues.
- The relatively high cost of IPM supervision and certification and high production cost.

8.2 Recommendations

1) Awareness campaigns have to be developed and implemented through some mechanism to educate the public about IPM products, and to promote the consumer's demand for the safe products. Mass media can play a significant role in supporting awareness campaigns and to disseminating the use of IPM products.

2) More efforts from the part of the state to direct and to promote the producers to adopt the environment friendly IPM production methods, provided that it is technically sound, and economically feasible.

3) It is recommended to take into consideration that the socio-economic factors which influence the purchasing and consumption of IPM products in developing extension programs, and adopting marketing strategies to encourage the consumption of IPM products.

4) Practical measures should be developed to provide assurance to the consumers of IPM products. This includes chemical residue testing of fresh

vegetables, labeling of the products, and monitoring of the safety of the production method.

5) As the price is the main limiting factor to the wide use of IPM products, more research is needed to reduce the cost of production of the IPM products.

6) An agriculture sector states that protection, preservation, and sustainability of the natural environment measures should be adopted to put the policy into action and IPM would be a part of this measure. Promoting production of IPM products one of such measures, and would be an effective tool to achieve the objective of agricultural policy.

9. References:

Akgunger, S. 1995. *Grape Producers' Pesticide Use Decisions in Turkey's Aegean Region.* Staff Paper no: 95-31, Michigan State University.

Akgunger, S., Canan A and Bulent M. 1999. *Consumer Willing to Pay for Reduced Pesticide Residues in Tomatoes: The Turkish Case.* Paper Prepared for Presentation at the Annual Meeting Economics Association. Nashville, Tennessee.

Aiken, Lewis, R. 1991. *Psychological Testing and Assessment, 7th ed.* Allyn and Bacon, Massachusetts, USA.

Amemiya, T. 1983. *Advanced Econometrics.* Cambridge, MA Harvard University Press.

Anderson, M. 1993. *Pesticides and Their Alternatives: Perspectives of New England Vegetable Growers.* Summer Report. School of Nutrition, Tufts University, Medford.

Baker, G. and Peter C. 1993. *Measuring Food Safety Preferences: Identifying Consumer Segments.* Journal of Agricultural and Resource Economics, Vol. 18 (2): PP. 277-287. Western Agricultural Economics Association.

Bealer, R.C. and Willitis, f. 1968. *Worries and non- Worries Among Consumer About Farmers' Use of Pesticides.* Journal of Consumer Affairs (2): 189-204.

Bender, M., and Derby, B. 1992. *Prevalence of Reading Nutrition Information and Ingredient Information on Food Labels Among Adult Americans: 1982-1988.* Journal of Nutrition Education. Vol. 36(5).

Bennett, P. 1988. *Marketing.* 2nd ed. McGRAW-Hill Book Company, New York.

Boyed, Jr. 1989. *Marketing Research: Text and Cases, 7th ed.* IRWIN. University of Arkansas at Little Rock.

Brester, G. W. and Schroeder, T. C. 1995. *The Impacts of Brand and Generic Advertising on Meat Demand.* American Journal of Agricultural Economics. Vol. 77(4).

Bruhn, C. Shirely, P., Phil, P. and Nick S. 1992. *Consumer Response to Information on Integrated Pest Management.* Journal of Food Safety (12): 315-326. Food and Nutrition Press, Inc., CT.

Burgess, R. L.1969 *Behavioral Sociology*: the experimental analysis of social process. New York.

Burgess, R., Kovach, J., Petzoldt, C., Shelton, A. and Tette, J. 1989. *Results of IPM Marketing Survey.* New York State IPM Program, NYS Dept. Ag. And Mkts., NYSAES Geneva, Cornell University, Fingerlakes Research, New York.

Burn, A., Coaker, T. and Jepson, P. 1987. *Integrated Pest Management.* Academic Press, New York.

Byrne, Jean, Richard R. and Jerry S. 1991. *An Evaluation of Consumer pesticides Residue Concerns and Risk Perceptions*. Southern Journal of Agricultural Economics, Vol. 23(2). Southern Agricultural Economics Association, GA.

Cate, James, and Maureen H. 1994. *Integrated Pest Management: The Path of a Paradigm*. The National Audubon Society, Washington Dc.

Chang, H.S. and Kinnucan. H. W. 1991. *Advertising, Information, and Product Quality: The Case of Butter*. American Journal of Agricultural Economics. Vol. 73(4).

Compton, J.L., 1984. *Extension Programme Development*, 2nd edition, Food and Agriculture Organization of the United Nations, Rome, p. 108-119.

Diaz-Knauf, K., Martha L., Carmen L., Fernando A., Christine B. and Howard S. 1995. *Hispanic Consumer Response to Information on Integrated Pest Management and Food Safety Concerns*. Journal of Sustainable Agricultural, Vol. 5(1/2). Hayworth Press, NY.

Dunlap, R., and Curtis B.1992. *Understanding Public Concerns about Pesticides: An Empirical Examination*. The Journal of Consumer affairs. Vol.2 page (12-25).

Edwards, C., Lal, R., Madden, R., Miller, R. and House, C. 1990. *Sustainable Agricultural Systems*. Soil and Water Conservation Society, Iowa.

Elnagheeb, A. and Jordan. 1992. *Public Perceptions of Food Safety: The Case of Pesticide Residues on Fresh Produce.* Unpublished Paper, NC: Resources and Environmental Economic Program, NC State University.

Eom, Y. S. 1994. *Pesticide Residue Risk and Food Safety Valuation: A Random Health Utility Approach.* American Journal of Agricultural Economics, Vol. 76(4), American Agricultural Economics Association.

Estes, E. and Kerry Smith. V. 1996. *Price, Quality, and Pesticide Related Health Risk Considerations in Fruits and Vegetable Purchases: A Hedonic Analysis of Tucson, Arizona supermarkets.* Journal of Food Distribution Research, Vol. 26(1).

Feick, L., Herrmann, R. and Warland., R. 1986. *Search of Nutrition Information: A Probit Analysis of the Use of Different Information Sources.* Journal of Consumer Affairs. Vol. (38).

Fernandes-Cornejo, J., Douglas Beach, E. and Wen- Yuan Huang. 1994. *The Adoption of IPM Techniques by Vegetables Growers in Florida, Michigan, and Texas.* Journal of Agricultural and Applied Economics, Vol. 28(1), Southern Agricultural Economics Association.

Fernandes-Cornejo, J. and Alan K. 1996. *The Diffusion of Integrated Pest Management Techniques.* Journal of Sustainable Agricultural, Vol. 26(1), The Haworth Press, Inc.

Goldman, Barbara and Katherine C. 1991. *A Survey of Organic Produce Purchases and related Attitudes of Food Cooperative Shoppers*. American Journal of Alternative Agriculture, Vol. 6(2).

Govindasamy, R. and Rodolof M. Nayga, Jr. 1995. *Visitations to Farmer-to-Consumer Direct Marketing Operations in New Jersey: A Logistic Analysis*. New Jersey Agricultural Experiment Station, P-02137-1-95.

Govindasamy, R., Italia, J. and Rabin, J. 1997. *Consumer Response and Perceptions of Integrated Pest Management Produce.* Journal of Extension, Vol. 36. No. 4.

Govindasamy, R., Italia, J. and Clair L. 1997. *Quality of Agricultural Produce: Consumer Preferences and Perceptions*. New Jersey Agricultural Experiment Station, P-02137-1-97.

Govindasamy, R., Italia, J. and Clair L. 1997. *Consumer Purchase Behavior: The Case of Fruits and Vegetables*. Journal of Farm Managers and Rural Appraisers, 72 (4): 997-1005.

Govindasamy, R., Italia, J. 1998. *Predicting the Influence of Demographic Characteristics on the Willing-to-Pay for Fresh Fruits and Vegetables.* Journal of Food Products Marketing, Vol. 4 (4).

Govindasamy, R., Italia, J. 1998. *Predicting Consumer Risk Perceptions Toward Pesticide Residue: A Logistic Analysis.* Applied Economics Letter, Departments of Agricultural Economics and Marketing, New Jersey.

Greene, C. 1991. *Environmental Concern Sparks Renewed Interest in IPM.* Food Review, United States Departments of Agricultural, Washing, DC.

Green, R. D., Carman, H. F. and McManus. K. 1991. *Some Empirical Methods of Estimating Advertising Effects in Demand Systems: An Application to Dried Fruits.* Western Journal of Agricultural Economics. Vol. 16(1).

Gujarati, D. 1992. *Essentials of Econometrics.* McGraw Hill, New York.

Guthrie, J., Fox, J. Cleveland, L. and Welsh. S. 1995. *Who Uses Nutritional Labeling, and What Effect Does Label Use Have on diet Quality?* Journal of Nutritional Education. VoL(3), P(52-65).

Hamdan, M., Salman, A. and El-Karaki, M. 1996. *The Economics Analysis of Producing Selected Vegetables under Certification Scheme for Integrated Pest Management Technology.* Preliminary Report, Promotion of sustainable Plant Protection systems, Amman, Jordan.

Hollingsworth, C., Pascall, M. Nancy C. and William C.1993. *Support in New England for Certification and Labeling of Produce Grown Using Integrated Pest Management.* American Journal of Alternative Agriculture, Vol. 8, n2.

Hollingsworth, P. B. 1997. *A Homeowner's Guide to Environmentally Sound Lawn Care: Maintaining a Healthy Lawn the IPM Way. First Edition.* Department of food and Agricultural, Lawn.

Huang, C. 1993. *A Simultaneous System Approach for Estimation of Consumer Risk Perceptions, Attitudes, and Willing to Pay for Residue-Free Produce.* Selected Paper Presented at the American Agricultural Economic Association Meeting, Orlando, Florida.

Khassawneh, Y.2000. *Adoption of Integrated Pest Management Technology by Farmers in Jordan.* M. Sc. Thesis, University of Jordan, Amman, Jordan.

Klonsky, K., Laura T. and David C. 1992. *Production Practices and Sample Costs for a Diversified Organic Vegetables Operation in the Central Coast.* University of California Cooperatives Extension.

Klopp, P. and MacDonald., M. 1981. *Nutrition Labels: An Exploratory Study of Consumer Reasons for Nonuse.* Journal of Consumer Affairs. Vol. 12.

Kidwell, Julia E. 1994. *An Empirical Analysis of Consumer Demand for Organic Produce in Tucson, Arizona.* University of Arizona, AZ.

Ladd, G. W., and Zober. M. 1982. *Survey of Promising Developments in Demand Analysis: Economics of Product Characteristics.* New Directions in Economics and Forecasting in U.S. Agriculture, rd. G. C. Rausser. Elsevier Science Publishing, New York.

Lai, Y., Florkwaski, M. Huang, C., Bruckner, P. and Schonhof. 1997. *Consumer Willingness to Pay for Improved Attitudes of Fresh Vegetables: A Comparison between Atlanta and Berlin.* Paper submitted to the WAEA Annual Meeting, Reno, NV.

Lynch, S. 1997. *Toward a Broader Assessment of Integrated Pest Management* Paper Presented (Resources & Environment) at Economic Research Service/USDA.

Maddala, G.S.1983.*Limited- Dependent and Qualitative Variable in Econometrics*. NY: Cambrige University Press, New York.

Maddala, G. 1992. *Introduction to Econometrics, 2nd edition.* Macmillan Publishing Company, New York.

Marta Z. 1998. Farmers Markets: *Consumer Trends, Preferences, and Characteristics*. New Jersey Agricultural Experiment Station, P-02137-7-98

McEnery, Mary A. 1996. *Organic Farming takes Root.* The Record Review of Agricultural Economics, 13 (1): 129-139.

Misra, S., Huang, C. and Ott. S. 1991. *Consumer Preferences for Certified Pesticide Residue Free Fresh Produce and Willingness to Pay for Testing and Certification*. Paper presented at the Southern Agricultural Economics Association meeting, Fort Worth, TX.

Misra, S., Huang, C. and Ott. S. 1991. *Consumer Willing to Pay for Pesticide-Free Fresh Produce.* Western Journal of Agricultural Economics. Western Agricultural Economics Association, V16 (2).

Morris, Patricia M., Allen R. and Mark B. 1993. *What American Think About Agrichemicals.* Public Voice for Food and Health Policy, Washington DC.

Naser, K. R. 1994. *Residues of Chlorinated Hydrocarbon Pesticides in Milk and Plasma of Jordanian Women.* M. Sc. Thesis, University of Jordan, Amman, Jordan.

Nayga, R. M. Jr., 1996. *Determinants of Consumers' Use of Nutritional Information on Food Packages.* Journal of Agricultural and Applied Economics. Vol. 6(2).

NFO Research, Inc. *Results of Pesticide attitude study conducted for the National Agricultural Chemicals Association by NFO Research,* Inc., Toledo, and Ohio. June, 1989.

Oppenheim, A. N. 1978. *Questionnaire Design and Attitude Measurement.* Heinemann Educational Books Ltd., London.

Ostiguy, N., Enrique F. and Carol B. 1990. *Improving Communication About Risks Associated with Residues of Agrichemicals on Produce.* Agricultural Economic Bulletin 90-20, Cornell University.

Ott, S., Chung Hung, and Sukant M. 1991. *Consumers' Perceptions of Risks from Pesticide Residues and Demand for Certification of Residue-Free Produce.* Economics for Food Safety ed. Julie Caswell. Elsevier, New York.

Robson, M., George H., Raymond S. and Eric P. 1995. *An Assessment of Regulatory, Market and Financial Obstacles to Integrated Pest Management in New Jersey.* Environmental and Occupational Health Sciences Institute, Rutgers University, NJ.

Sachs, C., Blair, D. and Richter, C. 1987. *Consumer Pesticides Concerns: A 1965 and 1984 Comparison*. The Journal of Consumer Affairs, V(21).

Schuenemann, P. and Arafat, B. 1992. *Farmer's Practices Regarding in the Use of Pesticides in Jordan*. Jordanian-German Pesticide Quality Control Project/Ministry of Agricultural. Amman, Jordan.

Scott M. Swinton and Esther D. 2000. *Economics in the Design, Assessment, Adoption, And Policy Analysis of IPM*. Staff Paper #00-02, Department of Agricultural Economics, Michigan State University.

Sekaran, Uma. 1984. *Research Methods for Managers; A Skill-building Approach*. John Wiley and Sons, New York, USA.

Senauer, B. 1991. *Major Consumer Trends Affecting the U.S. Food System*. Journal of Agricultural Economics, The British Agricultural Economics Association. Vol. 77(2).

Underhill, Sh. and Enrique F. 1996. *Consumer Preferences for Non-Conventional Grown Produce*. Journal of food Distribution Research, Vol.27 (5).

Van R., Elieen and John H. 1991. *The Impact of Health Risk Information on Food Demand: A Case Study of Alar and Apples*. Economics of Food Safety ed. Julie Caswell. Elsevier, New York.

Viscusi, W. K. 1989. *Prospective Reference Theory: Toward an Explanation of the Paradoxes*. Journal of Risk Uncertainty, Vol. 2.

Weaver, R., David E. and Luloff., A. E. 1992. *Pesticide Use in Tomato Production: Consumer Concerns and willingness to Pay.* Agribusiness, Vol. 8, No.2, John Wiley & Sons, I. nc., NY.

Zellner, J.A. and Degner., R.L.1989.*Consumer Willingness to pay for Food Safety.* Paper Presented at the Southern Agricultural Economics Association Meetings, Nashville TN.

Zind, T. 1990. *Fresh Trends 1990: A profile of Fresh Produce Consumers.* Vance Publishing Co., Overland Park, Kansas.

Appendix
The Questionnaire

10- Put X in right square

The statement	Always	Usually	Occasionally	Never
Check the ingredient label on the food you purchase				
Food advertisements in the newspapers help you in purchasing of food items				
Newspaper articles/television /radio report on food safety issues help you in decideing which food items to purchase				

11- Also as previous put X in right square

How do you feel about the following	Serious hazard	Some what hazard	Not sure	Not a hazard
Residues from pesticides or herbicides				
growth stimulants				
Artificial fertilizers				

12- Do you know and purchase IPM products before these survey?
□ Yes □ No

13- from where do you know and heard about IPM products?
□Newspaper articles □Television □Radio reports □ Special magazines □ Grocery shops □ Others (determine).

14-Suppose you're favorite vegetables that you purchase regularly costs0.5 JD per unit. Would you slightly pay more of IPM- certified produce?

□ No
□ Yes, I would pay between 5-10% more for IPM produce.
□ Yes, I would pay between 10-15% more for IPM produce.
□ Yes, I would pay between 15-20%more for IPM produce.
□Yes, I would pay over 20% more for IPM produce.

15- How do prefer to obtain IPM products?
□ Packed □Un-packed □ Other way (determine).

16- which institution you prefer to be assurance about production of IPM products and you have trust in it?
□MOA □MOH □CPS □EPS □NCARTT

□ AMAN Company □ Others (determine).

17- would you switch supermarkets to be able to purchase IPM products?
□ Yes □ No

8- put X in right square

How do you feel about the Following statements	Strongly agree	Agree	Not Sure	Disagree
Conventional produce is generally safe to consume				
There is basically no difference between the safety of conventional products and IPM products				
The use of synthetic chemicals in agricultural has a negative effect on the environment				
I would buy IPM produce if it was less expensive				
I would buy IPM produce if it was more readily available				

Please read carefully before proceeding

IPM: is a crop protection technique by which farmers typically reduce using of chemical pesticides and use different methods to protect their products and consequently the consumers.
Most of the current agricultural practices involve improper use of pesticides and chemical fertilizers. The hazards of using pesticides will eventually affect the human health. In Jordan many studies proved that the wide use of pesticides caused many problems to the human body, it has its effect on blood cells, fat cells, and nervous system in addition to sensitivity problems. So there are many negative effects of using chemicals on the family members' health. Moreover, they increase the possibility of cancer.

19- put x in the correct box.

How do you feel about the Following statements	Strongly agree	Agree	Not Sure	Disagree
Conventional produce is generally safe to consume				
There is basically no difference between the safety of conventional products and IPM products				
The use of synthetic chemicals in agricultural has a negative effect on the environment				
I would buy IPM produce even if it were Expensive				
I would buy IPM produce if it were more readily available				
Residues from pesticides or herbicides very hazardous				

الملخص

اتجاهات المستهلك و رغبته بالدفع لمنتجات المكافحة المتكاملة للآفات الزراعية في الأردن

إعداد

تالا حسام عبدالله قطيشات

إشراف

الدكتور احمد شكري الريماوي

إن ازديـــاد اســـتخدام المبيدات الحشرية الكيماوية من قبل المزارعين المنتجين للفواكه والخضـــراوات قد اصبح أمرا ذو أهمية بالغة للمستهلكين.وقد اقتصرت غالبية البحوث التي تم القيام بها حول موضوع منتجات المكافحة المتكاملة للآفات الزراعية على الإنتاج أي كانت فقط مـــن الناحية الإنتاجية. ولم تقم أي دراسة في الأردن بتحليل إمكانية التسويق أو معرفة اتجاهات المســـتهلكين بالنســـبة لهـــذه المنتجات. وقد استهدفت هذه الدراسة تقديم تقييم عملي لاتجاهات المستهلكين ومعرفة مستوى وعيهم أو إدراكهم وتفهمهم لأهمية استهلاك مثل هذه المنتجات. كما استهدفت الدراسة التعرف على الخصائص السكانية و الاجتماعية والاقتصادية للمستهلكين والتي تؤثر إيجابيا بحيث تزيد رغبتهم في الشراء والدفع لمنتجات المكافحة المتكاملة للآفات الزراعية. وقد استخدمت الباحثة مقياسا للوعي تجاه منتجات المكافحة المتكاملة للآفات الزراعية، وتم التأكد مـــن صدق المقياس وثباته . وقامت الباحثة بتطبيق المقياس على عينة الدراسة وذلك من خلال توزيـــع استبيان للمستهلكين لجمع البيانات الأولية عن اتجاهاتهم نحو منتجات المكافحة المتكاملة للآفـــات الزراعـــية. وبعد ذلك تم تفريغ البيانات الأولية وتحليلها باستخدام الإحصاء الوصفي ، الاختبارات غير المعلميه، ونماذج الانحدار.

هـــذا وقـــد أشـــارت نتائج الدراسة إلى أن مستوى الوعي نحو الخضار والفواكه الآمنة ضـــمن العيـــنة التـــي وزع عليها الاستبيان كانت عالية. وكانت غالبية الخصائص الاجتماعية والاقتصـــادية لهـــذه العيـــنة ذات معنوية إحصائية بالنسبة لمستوى الوعي. كما أظهرت عينة الدراســـة دعما كبيرا لمنتجات المكافحة المتكاملة للآفات الزراعية من خلال رغبة عالية للشراء والدفع للحصول على هذه المنتجات. كما أظهرت الدراسة أن مستوى الدخل الشهري هو المحدد الرئيســـي للرغـــبة فـــي الدفع لمنتجات المكافحة المتكاملة للآفات الزراعية؛ فالمشاركين ذوي

الدخـــول الشهرية المرتفعة اظهروا اهتماما بشراء منتجات المكافحة المتكاملة للآفات الزراعية، كما اظهروا رغبة اقل في شراء المنتجات التقليدية. كما بينت النتائج أن الإناث، صغار السن من المســـتهلكين وأولئك الذين لا يحبذون المخاطرة بشراء منتجات تقليدية هم الأكثر للدفع من اجل الحصول على هذه المنتجات.

وقـــد أوصت الدراسة بضرورة تطوير وتنفيذ حملات التوعية وتوظيف بعض الوسائل التـــي تساهم في تثقيف المواطنين بأهمية منتجات المكافحة المتكاملة للآفات الزراعية وترويجها لـــزيادة طلب المستهلك على المنتجات الآمنة بيئيا.كما توصي الدراسة ببذل جهود مضاعفة من قـــبل الدولة لتوجه وتشجع المنتجين لتبني طريقة المكافحة المتكاملة للآفات الزراعية في العملية الإنتاجـــية لإنـــتاج منتجات صديقة للبيئة شريطة أن تكون هذه الطرق سليمة فنياً وذات جدوى اقتصادية. وأوصت الدراسة بضرورة تطوير مقاييس عملية تعطي الضمان للمستهلكين بسلامة منتجات المكافحة المتكاملة للآفات الزراعية. وتشمل هذه المقاييس فحوصات للمتبقيات الكيماوية في الخضار الطازجة، ووضع ملصقات على هذه المنتجات، ومراقبة سلامة طريقة الإنتاج. وبما أن السعر هو العامل المحدد الرئيسي لاستخدام منتجات المكافحة المتكاملة للآفات الزراعية فان الدراســـة توصـــي بإجـــراء الـــبحوث التي تبحث في افضل السبل لتقليل تكلفة إنتاج مثل هذه المنتجات.