PEANUT PRODUCERS' AWARENESS, PERCEPTIONS AND PRACTICES OF INTEGRATED PEST MANAGEMENT IN A FIVE-COUNTY AREA OF SOUTH-CENTRAL OKLAHOMA

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CHAPTER I

INTRODUCTION

Every human being has to deal with a variety of pest related concerns in daily life. Even producers whose farms are well kept and are perceived to have few problems can have weevils, thrips, web worms, grasshoppers, etc. Professional applicators may make several treatments, but problems may still persist. Presumably, few people receive training as pest control specialists. Chemicals often seem to be the best solution. However, application of chemical substances by many users sometimes results in excessive use, resulting in chronic poisoning and development of pest populations resistant to the applied pesticides.

A growing awareness of health and environmental risks associated with pesticide use has sharpened public interest concerning safer alternatives. Based on current problems associated with pest control, seeking alternatives to pesticide application alone was inescapable in order to provide more effective control of pest populations.

A more integrated method for controlling pest populations seemed to be an alternative which combined a combination of strategies including biological and chemical controls based on climatic conditions, stages in both plant growth and the life cycle of the insect counts. Recent integrated pest management research has resulted in practices showing reduced risks from pests, while minimizing human exposure to the application associated with toxic materials (Cooper, 1990). Integrated Pest Management (IPM) is a process involving making decisions based on the best information available and deciding if pest suppression treatments are needed, what chemicals to use, when it should be applied, what natural enemies to release, and what strategies to use with regard to method of application.

As the name Integrated Pest Management (IPM) implies, this system combines a variety of approaches with which the agriculture producers can minimize the pest populations and reduce cost of treatment. These approaches include human behavioral changes, habitat modification, physical controls, biological control agents and least-toxic chemical control. The amount of toxic material put into the environment is kept as small as possible. According to Frisbie et. al. (1989), IPM is a pest management system of seventeen different technologies, including cultural, chemical, biological, climatic, etc. , methods used to reduce pest populations and minimize economic damage.

Bottler (1979) and El-Zik et. al. (1989) stated that the objectives for using these techniques were to suppress pest populations below the injury level, not an attempt to eradicate them. Generally, it is considered desirable to allow the pests to survive at some low level in order to maintain the presence of its natural enemies. Several researchers believe that IPM is a simple, common-sense approach to pest control. One does not need to be a professional to understand it or to teach it. However, the IPM process does need to be taught. Producers should learn to manage pests safely and effectively.

Commercial peanut producers in the U.S. especially in Virginia and Georgia, have practiced pest management out of practical necessity for many years before the term become widely known and used. Organized pest management programs involving peanuts were initiated under the auspices of the USDA/State Cooperative Pest Management Program in Comanche County, Texas and three counties in Oklahoma in 1973.

PROBLEM STATEMENT

Integrated Pest Management (IPM) seeks the advantage of naturally occurring pest controls, including weather, disease, mechanical and chemical controls. The use of natural controls as an alternative usually gives the producer an opportunity to at least minimize cost over conventional approaches. Even though IPM allows the producer to employ a combination of pest control strategies to curtail a wide variety of peanut pests, growers must also be cognizant of many physical, environmental and economic factors affecting its success. In addition, many times the success of IPM will be determined by the producer's commitment to making IPM work and the self-discipline, to act at a specific time with a specific strategy. Therefore, awareness of the problem impacting peanut production, nature of the crop, environmental and soil conditions of how to control a specific pest will determine, to a great extent, what approach will be utilized as well as where and how the grower will access information. As a result many peanut producers may need the assistance of a trained professional in making decisions concerning practical solutions for the particular pest damaging the crop. Awareness, perceptions and cultural practices of growers often combine to determine the level of success. Therefore, to convey the needed professional help, an in-depth study concerning the awareness of peanut producers toward IPM would be worthwhile and important.

RATIONALE FOR THE STUDY

Since peanuts are grown primarily by growers who participate in government programs and since it is a crop that requires intensive management and capital, it seems rather safe to assume that these producers may be very knowledgeable about the crop they produce, allotments, marketing, and the necessity for positive net returns to land, labor, and capital. While, on the other hand, producers may have little experience or knowledge of the pest(s) attacking the crop or strategies and/or techniques to control them. Therefore, it is important to conduct a study which ascertains producers' awareness and perceptions of IPM -what it is, how it works, and to what extent, as well as the contemporary cultural practices. Another consideration for such a study as this was to examine the variation of pest control strategies used by producer respondents.

PURPOSE OF THE STUDY

The purpose of this study was to determine the awareness, perceptions and Integrated Pest Management (IPM) practices conducted by peanut producers in a selected five-county area of South-central Oklahoma.

SPECIFIC OBJECTIVES

In order to accomplish the purpose of the study, the following specific objectives were outlined:

1. To describe the extent of awareness of Integrated Pest Management (IPM) practices among peanut producers in a selected five-county area of Oklahoma.
2. To describe the Integrated Pest Management practices currently being conducted by selected peanut producers in South-central Oklahoma.
3. To describe producers' perceptions of Integrated Pest Management; 1) advantages and disadvantages of IPM, 2) effectiveness of IPM, 3) sources of information concerning IPM, 4) major pest problems and 5) plant nutrient deficiencies.
4. To describe personal and production characteristics of peanut producers and their operations in the selected five-county area.

SCOPE OF THE STUDY

The scope of the study included peanut producers in a selected five-county area of South-central Oklahoma.

ASSUMPTIONS OF THE STUDY

With regard to this research study, the following assumption is made:

The peanut producers honestly identified and related their peanut production experiences and problems.

DEFINITIONS OF TERMS

In order to better understand the technical terms presented in the study, the following terms were defined.

Integrated Pest Management (IPM) is a pest management system that utilizes all suitable techniques (and information) either to reduce pest populations and/or maintain them at levels below those causing economic injury, or to manipulate the populations so that they are prevented from causing such injury, by utilizing and blending cultural, biological, and chemical controls as a last resort.

Pest comprises organisms that diminish the value of resources on which humans depend for their livelihood such as the interference with production and utilization of crops, livestock, food products, and the transmission of disease.

Awareness implies the state of being alert which indicates that the person (a peanut producer) has the ability to observe and to draw inferences based on their observations.

Peanut Producers in this study refers to any farmer who produces peanuts, regardless of his/her farming status (works full-time or part-time, or the acreage under cultivation, etc.) and who also reside in any one of the five Oklahoma counties of Bryan, Caddo, Grady, Hughes, or Love.

IPM Practice is combining and utilization of IPM theory and techniques into the production process. It begins with careful and regular field observations in order to keep the number of pests in check. IPM practice utilizes a combination of controls including chemicals, crop rotations, resistant varieties, cultural practices, and natural controls, such as predators and parasites to manage/produce a crop.

Perception is the intellectual process through which a person understands what s/he has observed, experienced, or heard.

Scouting refers to a routine checking of fields on a systematic basis by trained personnel who have knowledge of crop pests and their characteristics as well as familiarity with IPM practices to control pest problems.

CHAPTER II

REVIEW OF LITERATURE

INTRODUCTION

To accomplish the purpose and development of an effective literature review, this chapter is designed to orient and inform the reader concerning the crop being produced and how integrated strategies of pest control have been used. As a result of this examination this overview is divided into six major areas and a summary. The predominant sections studied include:

1) History of peanuts and associated pests, 2) The chronological record of IPM, 3) IPM -A composite of biological, chemical and timing controls, 4) Perceived effectiveness of Integrated Pest Management, 5) The adoption process, 6) The Oklahoma Cooperative Extension Service: Its role in Integrated Pest Management.

HISTORY OF PEANUT AND ASSOCIATED PESTS AND DISEASES

ORIGINS OF PEANUT

The peanut's origin is not exactly known. Recent archaeological discoveries show that peanut history goes back to 2,800 years ago. Higgins (1951) argued that peanuts were known as early as 950 BC.

Many centuries ago wild food gathering South American people regarded peanuts as "Mr. Odd Nut". The wild plant that produced delicious fruit in the semiarid sand beyond the trampling feet in the great jungle trees (Higgins, 1951).

Possibly several thousand years later after it became known as "Mr. Tramp Nut"; it sprang up around the various camp sites of semi-nomadic agriculturists who inadvertently had dropped its seed, tamed, pampered and given choice spots in rich river valleys on both sides of the Andes in Peru. It could have also been thought of as "Mr. Great Nut", because the Incas barred their esteem by offering it as feed for their goats (ibid.).

Sixteenth century Incas called it "ynchic" apparently the same as "inchis" later used by Quechua Indians of Inca land. But the two names that grew into common usage in Spanish-speaking countries are "cacahuate" which is used in Spain and Mexico, is derived from the Nahuatlan name "tlalcacaluate", meaning earth cocoa. "mani" the other name heard by the Spaniards in Hispaniola, now Haiti-Santo Domingo, is thalail and is used throughout Spanish America except Mexico (ibid.).

Around 1630, when early explorers and Spanish traders came to South America seeking gold, peanuts were discovered. They carried peanuts to Africa, India and Asia. The Spanish took peanuts to Africa to exchange for elephant tusks and were called "goober" by the Africans. During the 18th century slave traders en route to America with slaves bought peanuts, the cheapest food available in Africa. Upon disembarkation of the slaves to America, the leftover peanuts found their way ashore (ibid.).

Colonial Americans called the peanut the "ground nut", but antebellum agriculturists recognized its kinship to the pea and "ground peas" grew into common usage except by the blacks who clung to the African warrant of "goober" or adopted the name "pindar". Meanwhile, a variety of names followed the peanut from country to country. They include African nut, Chinese nut, Manila nut, Kipper nut, ground almond, hawk nut, jar nut, jur nut, earth nut, money nut, goober pea, ground pea, and ground bean.

During the days of the War Between the States in the America, the Union and the Confederate solders alike, came to appreciate the peanut as a valuable source of food. From the fields of battle the solders returned to their scattered homes with the taste for peanuts, and in some cases with a pocketful of peanuts.

By the last half of the 19th century, peanuts were eaten as snacks, sold freshly roasted by street vendors, at baseball games and at circuses. However, widespread demand for peanuts was not evident until about 1900 when planting and harvesting equipment was invented to improve efficiency in planting, harvesting, and processing. With this new mechanization, peanuts became a valuable commodity for oil, roasted peanuts, peanut butter, and peanut candy.

Nowadays, peanuts are grown in Georgia, Alabama, Texas, North Carolina, Virginia, Oklahoma, and Florida. Some other states also produce peanuts, but these seven states produce about 98 percent of the U.S. crop.

Peanut production in Oklahoma largely began commercially in the late 1930's and early 1940's. Initially the World War II effort and the need for the oil encouraged expansion of peanut production. In 1940, peanut plantation in Oklahoma covered only 82,000 acres of farmlands. The high mark for plantings came in 1947 when 325,000 acres were planted to peanuts (Sholar, et. al; 1993).

In the early years, 750 pounds of peanut pods per acre was considered as a good yield. Today, average yield in Oklahoma is near 2,200 pounds per acre. Oklahoma farmers plant about 100,000 acres each year and produce about six percent of the total U.S. peanut production (ibid., 1993).

Peanuts are produced in more than 30 of Oklahoma's 77 counties. Of those, twenty counties have at least 1,000 acres. Over 2,000 farm families in Oklahoma are directly involved in the production of peanuts. Oklahoma peanuts are sold all over the U.S. for domestic consumption, and during years of abundant production, sizable quantities are exported to foreign countries (ibid., 1993).

Worldwide, more than 40 million acres of peanuts are grown each year. The major peanut producing countries, other than U.S. are India, main land China, Senegal and Nigeria. Cultivation of peanuts has also increased considerably in Australia, Japan, and South America. U.S. peanut plantations cover less than 2 million acres, making U.S. acreage less than five percent of the world's peanut production. However, since average world peanut yields are only about 800-900 pounds per acre, and U.S. yields average 2,500-2,600 pounds per acre, U.S. production is about 10-12 percent of total world peanut production each year (ibid., 1993).

While in other countries peanuts are produced primarily for their oil and meal; in the United States, peanuts are recognized for their nutritional value and are grown almost exclusively for the edible food market.

PEANUT PESTS

Peanuts are liable to a variety of pest problems. The 1975 edition of Evaluation of Pest Management Programs for cotton, peanuts and tobacco in the United States, described peanut pests as follows: Insect pests of peanuts include the lesser cornstalk borer (elasmopalpus lignosellus), the red-neck peanut worm (stegasta bosquella), the burrowing bug (pangers bilineatus), and several foliage-feeding insects. Economically important fungus diseases of peanuts include cercospora leafspot (cercospora arachidicola and c. personata), southern blight (sclerotium rolfsii), and several soil-borne pathogens including pythium, rhizoctonia, and fusarium species. In addition, peanuts are attacked by several species of nematodes including the root-knot nematode (meloidogyne sp.) and the root lesion nematode (pratylenchus brachyurus). A variety of weeds can also be a problem, especially in irrigated peanuts. The occurrence and severity of these pests vary considerably between different peanut growing areas.

PEANUT DISEASES

The peanut crop is affected by several diseases causing large losses in both yield and quality of seeds. The most important peanut diseases are as follows:

Seed rot and seedling blight: These diseases occur throughout the peanut growing areas of the world. After the seed is planted, a number of distinct fungi affect peanut seed and seedlings and cause seed rot and seedling blight diseases, either in the pre-emergence or post-emergence phase of seedling growth. This results in low yields because of the poor stand under field conditions. In order to control these diseases, care should be taken to avoid injury to seeds during shelling and the planting process. Prior to planting, seeds should be treated with effective fungicides (Coolbear, 1994). According to S. J. Kolte (1985) hand-shelled seeds, if sown without injury to the seed coat, give a better stand of the crop even without any fungicide treatment.

Early and late leafspot: These peanut diseases are considered to be the most important diseases of the crop. They have been reported throughout the world wherever peanuts are grown. According to Gibbons (1980) the two diseases though they occur simultaneously in the same area, may differ considerably in their relative preponderance from one region to another depending upon the prevailing weather conditions and type of peanut varieties under cultivation. Reduction in yield is largely due to damage caused to the leaves as a result of intense spotting and consequent loss in photosynthetic tissue (Middleton, et. al.).

Rust: Peanut rust has been known since 1884, (S. J. Kolte, 1985) from specimens on cultivated peanut plants. Peanut rust has now become a disease of major economic importance in almost all peanut growing areas of the world. Since the appearance of the rust coincides with the appearance of early and late leafspot, rust can be controlled by controlling leafspotting.

Southern blight or schlerotium rot: The disease occurs throughout peanut growing areas of the world in the tropics and in warmer parts of the temperate zone. The temperature relation in the development of the disease and growth of the fungus seems to be the limiting factor in geographic distribution of the disease. The disease has a considerable economic importance in the southern U. S. Losses from 25 to 50 percent of the peanut crop have been reported in southern U. S. by peanut growers.

THE CHRONOLOGICAL RECORD OF IPM

Long before the term Integrated Pest Management (IPM) was coined, human beings developed biological, cultural, and physical methods for the protection of crops, animals, and themselves. The earliest reference to the use of chemicals for pest control dates back to Cira 2,500 B.C. McCaral (1981) emphasized the use of pest control should be limited if pests did not cause important damage. McCaral (1981) further stated:

> Numerous reasons underline the recent arrival of integrated pest management as a prominent topic of interest among agricultural scientists. The principal reasons hypothesized include: a) the existence and magnitude of pest damage, b) the complexity with which pests interact with the farming system, c) the diversity of available pest control measures, d)the existence of spillover effects from controls, e) the predominance of controls relying heavily on pesticides along with the evidence pointing toward overuse, f) the evidence for benefits from pest control, g) the uncertainty as to best pest control measure, h) the recent growth and current prominence of the anti-pesticide movement, I) the existence of institutions concerned with pesticide use, j) the governmental

> interactions with pesticide use, and k) the general food and income situation (p. 4).

Several definitions of Integrated Pest Management have been offered by Geier (1966); Smith and Reynolds (1966); Smith and Van den Bosch (1967), and Rabb (1972). The Council on Environmental Quality (1972) described IPM as:

> ... an approach that employs a combination of techniques to control a wide variety of potential pests that may threaten crops. It involves maximum reliance on natural pest population controls, along with a combination of techniques that may contribute to suppression cultural methods, pest-specific diseases, resistant crop varieties, sterile insects, attractants, augmentation of parasites or predators, or chemical pesticides as needed. A pest management system is not simply biological control or the use of any single technique. Rather, it is an integrated and comprehensive approach to the use of various control methods that takes into account the role of all kinds of pests in their environment, possible interrelationships among the pests, and other factors (p. 11).

As many have witnessed, the latter half of the 19th century and the first half of 20th century significant changes have occurred in pest control. President Jimmy Carter (1977) acknowledged in his environmental message to Congress, that chemical pesticides have been the foundation of agricultural, public health, and residential pest control for several decades. He, however, expressed concern that many pesticide products posed an unacceptable risk to human health and the environment. The President instructed the Council on Environmental Quality to review Integrated Pest Management as a viable approach and recommended action to encourage the development and application of pest management techniques which emphasized biological control and limited reliance on chemical agents. As a result, a national study was designed to obtain information from three groups participating in the IPM program: Extension personnel, Extension clientele, and Private pest management consultants.

Internationally, scientists from six Asian nations have formed the International Rice Integrated Pest Management Research Network, coordinated by the Philippines and based at the International Rice Research Institute (IRRI) near Los Banos (United Nations Economic and Social Commission for Asia and the Pacific, p. 9).

IPM: A COMPOSITE OF BIOLOGICAL, CHEMICAL, AND TIMING STRATEGIES

Huffaker (1970) described Integrated Pest Management as the system of pest management that will bring the most benefit, at a reasonable cost on a long term basis to the farmer and society. The goal was to bring the best of all available control techniques to bear against pest problems, other than blind reliance on chemical pesticides.

According to Ward (1970) the full sense of the term integrated pest management encompasses all pest control measures, including the use of fungicides and herbicides. Minnick (1976) stated that the total reliance on chemical pesticides to combat insects outbreaks results in further disruption of the natural balance maintained by natural parasites, predators and other biotic factors. The use of insecticides over the past several decades, in fact, has produced incalculable benefits to society, and will continue to control strategies be essential in the future.

The IPM system has four general guidelines: 1) To analyze the pest status of each potentially damaging organism to establish economic thresholds for real pests; 2) To devise strategies to increase biotic factors to control pest reproduction; 3) To use the best combination of natural enemies, resistant plant varieties, and environmental modification to control pest outbreaks with minimum ecological disruption; and 4) To systematically and regularly check for insects, diseases, and weeds (Bottrell 1979; El-Zik et. al. 1989).

An understanding of the various methods employed in managing pests is essential in obtaining a perspectives of integrated pest management. Based on several studies the most prominent tactics include the following:

Chemical control: The use of chemicals following World War II was thought by many to be the best solution to insect and pest problems. But, it became evident because of the undesirable side effects of these pesticides, other remedies were devised. In spite of these side effects, however, chemical control does have numerous advantages: availability for immediate use, rapid action in suppressing large pest outbreaks, ease of application, option of individual rather than group action, and selectivity in some pesticides, e.g. herbicides (Ennis, 1975).

Biological control: Biological controls involve the manipulation of parasites, predators, and photo genes to control pest populations. These include conservation of the pests' natural enemies through proper selection, timing and application of toxic materials and through habitat modification; augmentation through the introduction of additional numbers of the pest's natural enemies or photo genes; inoculation by repeated reintroduction of effective natural enemies that can not become established on their own; and importation of host-specific natural enemies of exotic pests (Pratt and Brown, 1976).

Human behavior changes: This includes encouraging producers to reevaluate conventional management practices; modification of cultural and resource management practices such as irrigating, fertilizing, pruning, mulching, cultivating, waste management, modification of aesthetic judgments regarding cosmetic damage to food, manicuring of landscapes, and more visual presence of certain animals such as insects (Olkowski, 1980).

Physical controls: such as manual picking and weeding barriers traps and mechanical action.

Despite the fact that IPM has received widespread acceptance in the agricultural industry among professionals, some of its technologies have not been widely accepted by growers (Wearing, 1988). A major factor hindering acceptance and adoption is the ongoing debate regarding IPM efficacy (e.g. the value of forgoing early crop planting to preserve beneficial insects). In addition, growers seem unwilling to change traditional plow-plant-spray-harvest production methods for more intensive IPM methods and, therefore, continue to depend on pesticides to control pests (Hartley, 1987; Bottrell, 1979). IPM is less conducive to this "chemical routinism".

Growers accepting and adopting IPM must conduct more periodic assessments of their plant pest conditions, change time tables for applying pesticides, and attempt to reduce the number of applications to minimize the development of pesticide resistance (Gutierrez and Wilson, 1989).

THE PSYCHOLOGY OF PERCEPTION

The act of awareness and adoption is based on perception, selection, and arrangement in time and space concerning what is observed. How the world is seen depends on experience, memory and sensibility, discriminative powers, sexual identity, and cultural and historical contexts (Wittler, 1983). People can learn to understand how their personality affects what they see by maintaining private journals, establishing friendships, contacts with the external world, observing news events, visiting with other people, etc. in which they learn to observe and accurately measure their perception, develop and build awareness, and build a bank of experiences from the natural data inherent in their lives.

Observation and interaction can improve our perception and awareness of outside realities. For instance, it is believed that visual literacy can improve verbal literacy and fluency; people can focus on an image in a slide photograph, write about what they see and know, and in such a way they discover how reality can possibly differ according to the perceiver and how choices can be made about what is seen and how it is seen. As Thoreau so aptly phrased it: "The question is not what you look at, but what you see. No one can say more than what he sees. Each sees differently" (Thoreau, 1874).

Pest experience, cultural predisposition, preoccupation, tradition, expectations, orientation, peer groups, and so on have an impact on our attitude towards the thing that we see or observe. Seeing differently is not the sign of incompatibility, rather an indicator of different circumstantial factors which contributes to the perception process. For example, discrepancies in a particular farmer's perception of IPM might encourage him to sharpen his vision, to consider what it means and includes, and to consider the discrepancies. When they see it clearly, they communicate with greater accuracy. Researchers on the psychology of perception (Wittler, 1983; Dees, 1985) revealed that in the process of perception, the influence of past experience, expectations (often regional or cultural or ethnic), of selective attention, as well as the degree of preoccupation have their roles.

Selection is a key, as is arrangement in time and space to structuring the world. Maps give us selective information about the physical world. Pictures, like mirrors, convey an aspect of that world as it varies with the conditions of light. Awareness of IPM would shed light on how to control pests without damaging the environment. Thus, it appeared that the farmer's adoption of the IPM program is the function of their psychology of perception. To disseminate the notion of the IPM programs to the farmers in the community, the researcher and/or the educator has to consider the selection process of their psychology of perception. According to Smith and Quentin (1979) and as noted by Finley (1981), today's farmer is essentially a businessman and a manager of resources. His survival depends on his ability to compete. He is not necessarily a good ecologist and he is usually unwilling to trust his own judgment in technical matters of pest control. Therefore, he often seeks outside assistance because past experience with his farm and yield expectations become too important for the implementation of IPM programs.

PERCEIVED EFFECTIVENESS OF IPM

Studies concerning effectiveness and feasibility are an essential step in the development phase of a new product or technology. What is the effectiveness of IPM?

Scott (1974) pointed out Extension pest management programs are designed to teach farmers to adopt integrated biological, cultural, and chemical technology to control agricultural pests, and that these programs have both economic and environmental objectives... to help maximize incomes of producers and reduce potential adverse environmental effects of pesticides.

In 1975, Evaluation of Pest Management Programs for Cotton, Peanuts, and Tobacco in the United States (Von-Rumker, 1975) resulted in 25 programs being studied which indicated that:

> Cotton yield increases in 1973 were reported in 11 of 13 programs for which yield data are available; fourteen of the 17 pest management programs for which insecticide use data available reported decreases in the quantities of insecticides used on cotton under pest management; among the pest management programs evaluated, 7 of 9 Texas programs and 6 others experienced net decreases in production cost; and 15 of the 16 programs for which adequate data are available resulted in increased

> profits to growers. Generally, crop yield actually increased in 72 percent of the programs. Pesticide use was decreased in 86 percent of the programs. Production costs decreased in 85 percent of the programs. Profits increased in 95 percent of the programs (p. 5).

Carlson and Castle (1972) pointed out that further evidence of the benefits of pest control comes from people first being willing to pay for the controls and control research; and second, increased crop yields, and the value of resources released for use elsewhere in the economy. On the other hand, in California, as estimated by Debach (1974), a leading IPM figure, producers and consumers of agricultural products have saved over 300 million dollars since 1923. Therefore, evaluation of IPM programs consistently verify its financial payoff and economic feasibility. Besides prolonging pesticide effectiveness and reducing pesticide impacts on human health, another stated objective of IPM programs was increasing farmer's profits by decreasing the amount of pesticides used. Decreased pesticide use would then theoretically lead to reduced pest control costs and lower total costs.

In a comparative study between users and non-users of IPM programs, it was reported in a National Evaluation of Extension's Integrated Pest Management Program (Virginia Cooperative Extension Service, 1987), the gross revenues of IPM users were higher than non-users. The main reason for these increased revenues was increased yields, although for crops in which quality was important, the price received per unit was also higher for IPM users. The overall trend in most studies was for gross revenues and net returns to be higher for IPM users than for non-users.

Huffaker (1971) cited the effectiveness of IPM on cotton, apples, alfalfa, corn, pine forests, cereals, and citrus. Gutierrez (1978) further supports the benefits of IPM stating: "Integrated pest control, by whatever method is already proving itself" (p. 11). And according to numerous others, as quoted by Goldstein and Goldstein (1978): "Programs backed by field scouting have already saved growers in some areas thousands of dollars" (p. 14).

THE ADOPTION PROCESS

Research reveals that a farmer as a decision maker, his rate of adoption and adoption behavior are influenced by personal characteristics such as level of attained education (Bultena and Hoinberg, 1983; Carlson and Dillman, 1988) and age (Ashby, 1982; Coughenour and Chamala, 1989; Heffernan and Green, 1986) and by farm organizational characteristics such as number of acres farmed, amount of gross farm sales (Albrecht and Ladewig, 1983; Carlson and Dillman, 1988; Heaton and Brown, 1982). In addition, younger and better educated farmers with larger farm incomes are more likely than others to have longer planning horizons, greater ability or surplus resources to acquire new technologies, and more willing to take risks (Anoskie and Coughenour, 1990; Norris and Batie, 1987). The younger and better educated farmers also seem to have more access than other farmers with information sources and strategies for change (Rogers, 1983; Nowak, 1987).

Moreover, better educated farmers have enhanced their information processing abilities allowing them to use complex technologies (Anoskie and Coughenour 1990). Findings regarding the effect of information on adoption behavior are not full-fledged, however, some researchers reported a positive correlation between information and adoption (Nowak, 1987; Gould et. al. 1989).

Some of the difficulty sorting out informational effects on adoption behavior is due to the multitude of information sources and researcher's use of too few types of information sources or their lumping of informational sources into a single construct. However, what is generally evident from past findings is that farmers of different backgrounds appear to rely on different informational sources for particular types of new technology. For instance, farmers may get information regarding pest management from school, neighbors, consultants, pesticide sales people, newspapers, group meetings, printed materials, personal contacts, etc.

According to Kogan (1980) and Hooks, et. al. (1983), favorable beliefs and cognitive information about a particular technology accelerate adoption decision-making. Conclusively, levels of education, age, access to information, the extent of certainty and uncertainty involved in adopting a new technology, etc. inhibit or promote adoption decision making.

THE OKLAHOMA COOPERATIVE EXTENSION SERVICE: ITS ROLE IN THE IPM

Beginning in 1973, Oklahoma State University has been successfully involved in several IPM programs (Sholar, 1993). Previous pilot projects in IPM have included wheat, cotton, peanuts, alfalfa, and a multicorp project involving soybeans, grain sorghum, corn, and a limited acreage of vegetables. The relative success of the OSU IPM program has been primarily determined by previous studies which elicited, evaluative responses from producers and Extension personnel who participated in OSU IPM programs.

Although OSU has been instrumental in the implementation and adoption of IPM practices in many crops throughout the state, a comprehensive research study to determine peanut producers' awareness of an IPM program has never been conducted. However, the study committee believed the IPM program would benefit from base-line research conducted to determine the awareness peanut producers have of IPM programs in the top-five producing counties in Central and Southern Oklahoma.

SUMMARY

In this chapter the history of peanuts and associated pests and diseases were studied. According to historical record, peanuts were first cultivated by the Incas in the Andes Mountains of Peru. Since then, the peanut has been cultivated in many countries, while a variety of names have been given it by the people of each country.

Peanut pests include a variety of insects such as red-neck peanut worm and burrowing bug, fungus problems such as cercospora leafspot and several types of diseases such as pythium and rhizoctonia, nematodes, and weeds.

A brief history of IPM disclosed its characteristics, perceived effectiveness and adoption process in preceding studies. Finally, in the last section, the role of the Oklahoma Cooperative Extension Service and its success in developing an awareness of IPM was briefly reviewed.

A brief review of the history accounts of IPM revealed that long before the term IPM become popular, biological, cultural, and physical methods of crop protection were developed by early day producers. During the past few decades, the debate over pest control and its spillover effects such as public health and environmental poisoning were emphasized and so IPM became a prominent topic of interest among agricultural scientists.

From the IPM related literature, it was learned that IPM was a system of pest management that includes four strategies: chemical control, biological control, human behavior changes and physical control.

Several studies have shown that the implementation of IPM has effectively increased the yields of producers and lowered their costs, both resulting in higher gross revenues.

The adoption process of IPM by farmers has been influenced by personal characteristics as well as organizational characteristics of the "family farm". They include age, level of education, number of acres farmed, amount of gross farm sales, etc.

A brief review of the role of the Oklahoma Cooperative Extension Service in the diffusion of IPM practices among Oklahoma farmers revealed, since 1973, OSU has been successfully involved in IPM programs which included wheat, cotton, peanuts, alfalfa, soybeans grain, sorghum, corn, and vegetables. But it has never conducted a comprehensive research study to determine peanut producers' awareness of Integrated Pest Management (IPM).

CHAPTER III

DESIGN AND METHODOLOGY

INTRODUCTION

The purpose of this chapter is to describe the methods used and the procedures followed in conducting this study. In order to collect data which would provide information relating to the purpose and objectives of this study, a population was determined, a sample was selected, and an instrument was designed for data collection. Procedures and methods were also established for collecting and analyzing the data.

Information was gathered during the month of August, 1995. This study was coordinated with the assistance and cooperation of the OSU Extension Integrated Pest Management Specialists (IPM Agents) in Bryan, Caddo, Grady, Hughes, and Love counties, two extension peanut specialists and the researcher's committee members.

The telephone survey instrument developed for this study was designed to elicit information concerning peanut producers' awareness, perceptions, and cultural practices of integrated pest management in a selected five-county area of South-central Oklahoma.

In order to accomplish the purpose of this study, the researcher established the following specific objectives:

1. To determine extent of awareness of IPM among peanut producers in the selected five-county area.
2. To determine the Integrated Pest Management practices currently being conducted by selected peanut producers in South-central Oklahoma.
3. To determine producers' perceptions of 1) Integrated Pest Management, 2) advantages and disadvantages of IPM, 3) effectiveness of IPM 4) sources of information concerning IPM, 5) major pest problems and 6) plant nutrient deficiencies.
4. To determine personal and production characteristics of peanut producers and their operations in the selected area.

INSTITUTIONAL REVIEW BOARD (IRB) APPROVAL

Federal regulations and Oklahoma State University policy require review and approval of all research projects that involve human subjects before investigators can begin their research. The Oklahoma State University Research Services and the IRB conduct this review to protect rights and welfare of human subjects involved in biomedical and behavioral research. In compliance with this policy, the current study received the proper surveillance and was granted permission to continue, under the following number: AG-93-021 (See Appendix B).

POPULATION

A large portion of the state's peanut production was in the five-county area of Bryan, Caddo, Grady, Hughes and Love located in South-central Oklahoma. Peanut production of these five counties represents almost 85 percent of all the harvested peanut acreage in the State of Oklahoma.

Therefore, it was decided to concentrate the efforts of identifying a target population of peanut producers residing in the five-county area of South-central Oklahoma. The population of this study was identified through the use of "Extension Producers Lists" from the five selected peanut producing counties in the state.

The population consisted of both part-time and full-time farmers who produce peanuts and who also live in any of the five counties of Bryan, Caddo, Grady, Hughes, and Love, in Central and Southern Oklahoma. As a result, a target population of 1000 producers were identified of all peanut producers who were at least 18 years of age, having their own phone and their name listed in the latest published telephone directory or Extension producers list. After determining the target population (1000), it was decided to pursue the study utilizing a purposive sample consisting of 284 producers which were representative of peanut growers in the five-county area. Kerlinger (1986), stated "purposive sampling, a form of non-probability sampling, is characterized by the use of judgment and a deliberate effort to obtain a representative sample by including presumably typical areas or groups in the sample" (p. 120).

The researcher asked and received assistance from OSU Extension Peanut Specialists and OSU Extension Integrated Pest Management specialists in identifying the target population through the telephone directories of each county. Telephone directories were provided by each of the five County Cooperative Extension offices to identify phone numbers and addresses for potential respondents in the five-county area. As a result, the study sample consisted of 57 (20.07%) self-selected peanut producers who responded from the five-county area in Central and Southern Oklahoma.

Table I

A Distribution of Counties And Number of Producers
Identified By County

County	N= Producers
Bryan	273
Caddo	414
Grady	44
Hughes	136
Love	133
Total	1000

DEVELOPMENT OF THE INSTRUMENT

After reviewing previous studies, the researcher designed an instrument that would fulfill the objectives of the study. Specifically, the researcher reviewed instruments from previous studies conducted by Finley (1981), Shelton (1991), Wollenberg (1991), and Dickey (1993). These instruments were evaluated concerning format, number of items, content, and methods of data collection.

Development of the instrument included dividing the survey into an introduction and six sections with a total of 28 items. Section one consisted of introductory questions concerning characteristics of the peanut producers' operations. Section two was concerned with determining producers perceptions of (a) the description of IPM, (b) producer's level of awareness of IPM, (c) current involvement in IPM as a practice, (d) IPM practices producers are using to control specific pests, (e) scouting frequencies, (f) determining factors pertaining to weed and disease problems and (g) frequency of unfamiliar pest problems. Section three consisted of questions dealing with a) pest management practices and frequency of use, b) producer perceptions of IPM, c) the importance of selected advantages concerning IPM as a practice, d) perceived disadvantages of IPM as a practice, e) perceived cost effectiveness of IPM, and f) perceived sources of awareness/ information concerning IPM. Section four consisted of a) major production

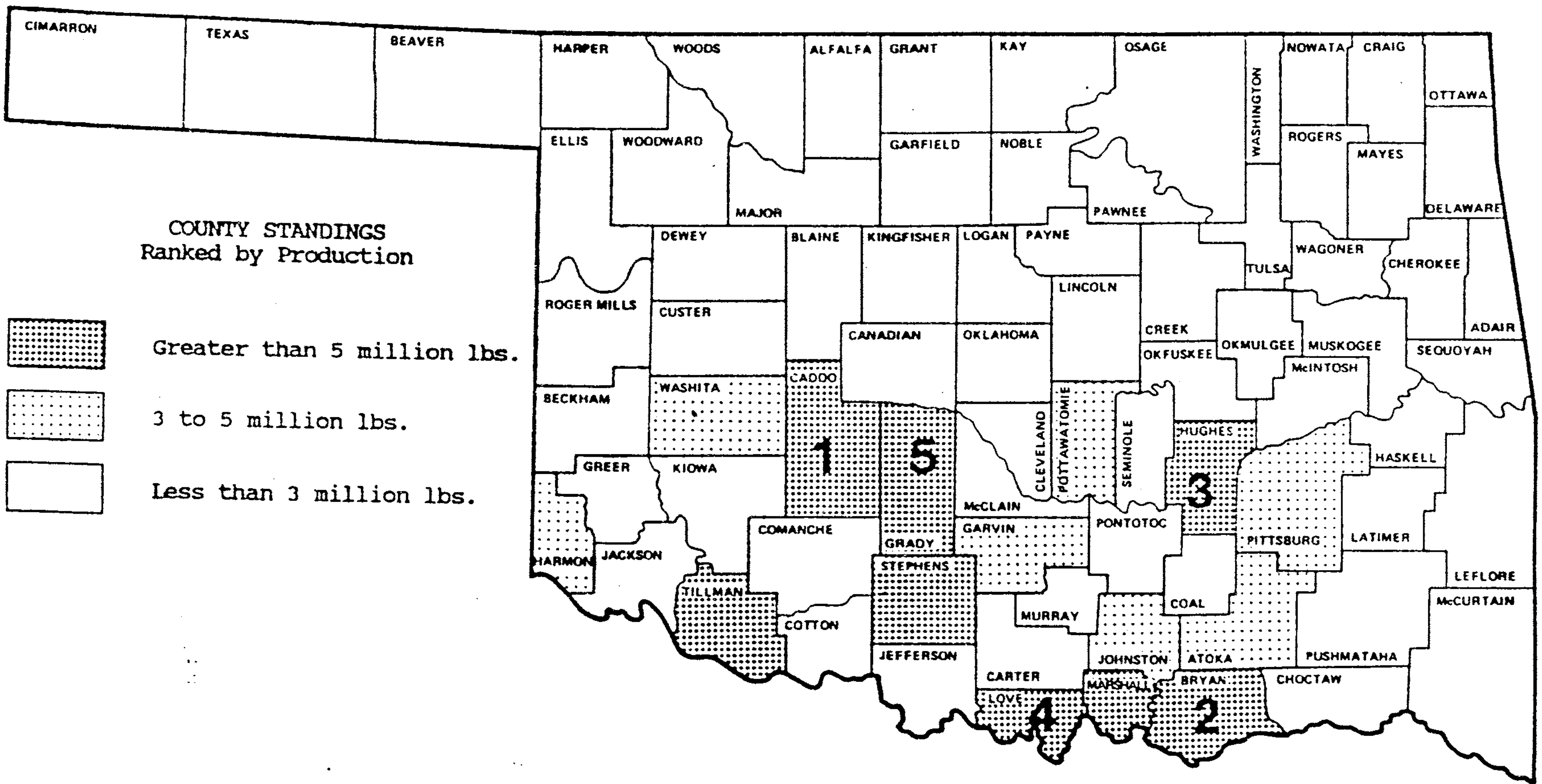

Figure 1. Geographical Location of Study Area

problems, b) diseases, c) weed problems, d) nutrient deficiencies, e) decisions influencing the application of plant nutrients, and f) application rate of plant nutrients. Section five brought closure to the instrument in addressing personal issues involving a) sprayer calibration, b) disposal of pesticide containers, while section six addressed peanut yields and personal characteristics of producers such as a) age, b) highest level of formal education and c) percent of family income derived from peanut production.

The questionnaire included (1) nominal items which were designed to gather factual information about respondents and/or practices which they utilized in their peanut production operations, and (2) Likert-type scales which were utilized to determine value and the extent of the peanut growers' perceptions concerning IPM and production practices.

The questions were primarily forced response items where potential participants gave specific answers or selected a response from several possible alternatives. The survey instrument was designed in such a manner that the participants responded via telephone.

COLLECTION OF DATA

After analyzing various methods of data collection, telephone survey was considered the most efficient method to obtain information from the peanut producers. Wollenberg (1991) and Paret (1990) both utilized telephone surveys as an efficient and practical means of collecting data and involving the participants in order to acquire more accurate responses of their perceptions and awareness toward specific issues. Three callers from the Entomology Department assisted the researcher. The calls for the survey were conducted during the evening hours between 6:00 and 9:00 p.m. during the month of July, 1995.

The telephone interview was designed to take no more than twenty minutes of the producer's time. Two hundred and eighty-four peanut producers in the five-county area were targeted to participate in the survey. Useable responses were received from 57 (20.07%) producers.

ANALYSIS OF DATA

The data and information gathered through the telephone survey involved producers' awareness, perceptions, and practices of integrated pest management in the five-county area of South-central Oklahoma.

Frequency distributions, percentages, means, and standard deviations were the descriptive statistics utilized to describe and interpret the quantitative data. An SAS computer program was used to analyze the data. Key (1981) pointed out, "The characteristics of groups of numbers representing information or data are called descriptive statistics. The primary use of descriptive statistics is to describe information or data through the use of numbers" (p. 175).

Considering the statistical tools used in treatment of the data and the level of response (20.07%) to the study, the responses contained herein can only be generalized back to the responses provided by the study participants.

To determine a mean score from the information ascertained in question 14 of the survey using the Likert-type scale, numerical values and real limits were established. The numerical values were: 4="very effective", 3="effective", 2="somewhat effective", 1="not effective", while the value for "unknown" was not determined. Therefore, real limits and corresponding interpretations for the specific categories were: 1.0 to 1.49 (not effective), 1.5 to 2.49 (somewhat effective), 2.5 to 2.49 (effective), and 3.5 to 4.49 (very effective). In addition, to determine mean scores for the information acquired from questions 10 through 13, and 15 through 20 of the survey a Likert-type scale was used which measured value and the extent of producers perceptions. Numerical values were also established. The numerical values in item 10 dealt with frequency of management practices with ranged from 1 which was described as "most often" to 10 described as "least often", while item 12 treated the advantages of IPM ranging from 1 described as "most important" to 10 which was described as "least important". Item 16 addressed sources of IPM information ranging from 1 which described the "best source" to 10 describing the "poorest source", while item 17 related to major problems influencing peanut production which ranged from 1 which indicated "most influential" to 10 being identified as "least influential". Items 18 and 19 were associated with disease and weed problems respectfully which ranged in seriousness from 1 indicating the "least problem" to 10 which indicated the "greatest problem". The value scales used for items 10, 12, and 16 through 19 had assigned numerical values which ranged from one to 10. However, the value scales used for items 13, 15, and 20 varied in the numerical values assigned to each. Item 13 addressed the disadvantages of IPM which ranged from 1 the "least" to 6 revealing the "greatest disadvantage". Numerical values ranged from one to six.

Item 15 dealt with the selection of pesticides concerning "effectiveness" to "cost" to "personal safety" to "environmental safety" and "other". The rating scale concerning item 15 ranged from 1 which was described as being the "greatest" to 5 being "least" on the rating scale. Item 20 concerned nutrient deficiencies of six nutrients from boron to potassium and other. The value scale ranged from 1 being "least deficient" to 8 identified as being the "greatest deficiency".

CHAPTER IV

PRESENTATION AND ANALYSIS OF DATA

INTRODUCTION

The purpose of this chapter is to describe and analyze the data collected through the survey in order to fulfill the objectives of the study outlined in chapter one. This study was designed and carried out with the purpose of determining the perceptions and the practices of peanut producers toward Integrated Pest Management in five south-central Oklahoma counties (Bryan, Caddo, Grady, Hughes and Love) as shown in Figure I (page 32). The analysis of the data were presented in the following sections: 1) Demographic Characteristics of Respondents, 2) Peanut Producers Operations and Problems, and 3) Perceptions and Practices concerning Integrated Pest Management.

In order to accomplish the specific objectives of the study, responses were collected and the data were analyzed. In this chapter, analysis of the data was presented in tables and figures to facilitate the presentation.

ANALYSIS OF THE FINDINGS

DEMOGRAPHIC CHARACTERISTICS OF RESPONDENTS

This section presents the analysis of the age distribution of the peanut producers, their level of formal education, farming status, production experience, and the estimated percentage of gross family income derived from peanut production.

The age distribution of the peanut producers presented in Table II revealed fourteen (26.9%) peanut producer respondents were in the age range of 46 to 50 years, while twelve (23.1%) respondents were in the 51 to 55 year old range. However, ten (19.2%) respondents were in the 61 to 65 year old age group, followed by six (11.5%) respondents who were in the 66 to 70 year old range. There were also six (11.5%) respondents in the 41 to 45 year age group and two (3.8%) respondents were in the 56 to 60 year age group, while one (1.9%) of the respondents was in the 36 to 40 year age group as well as the 71 years and over age group.

Table II

A Distribution of Peanut Producer Respondents by Age

Age Ranges	Frequency (n)	Percentage (%)
36-40	1	1.9
41-45	6	11.5
46-50	14	26.9
51-55	12	23.1
56-60	2	3.9
61-65	10	19.2
66-70	6	11.5
71+	1	1.9
Total	52	100.0

The average age of the respondents was 54.25 years. The most frequent (mode) age reported among peanut producers was 46 years, while the median age was 53.

The data in Table III described the distribution of the peanut producer respondents' level of formal education. Twenty-six (47.3%) respondents had completed high school, while 22 (40%) respondents had attended some college. Five (9.1%) respondents had a Bachelors degree, while one (1.8%) respondent had a Master's degree. One respondent had less than a high school education.

Table III

A Distribution of Respondents By Level of Formal Education

Level of formal education	Frequency (n)	Percentage (%)
Less than High School	1	1.8
High School	26	47.3
Attended College	22	40.0
Bachelors Degree	5	9.1
Masters Degree	1	1.8
Total	55	100.0

The data shown in Table IV revealed the distribution of respondents by farming status. Over eighty-four percent (48 respondents) were full-time farmers, while nearly sixteen percent (9 respondents) were farming part-time.

Table IV

A Distribution of Respondents By Farming Status

Farming Status	Frequency (n)	Percentage (%)
Full-time	48	84.2
Part-time	9	15.8
Total	57	100.0

The data shown in Table V concerns the distribution of respondents by years of peanut producing experience. As the data in the table revealed, only one (1.8%) producer had 10 years or less experience, while at the opposite extreme, two (3.5%) producers indicated that they had between 46 to 50 years of peanut production experience. However, the largest group, sixteen (28.1%) respondents indicated that they had 16 to 20 years of production experience, while fifteen (26.4%) producers reported they had from 31 to 35 years experience, closely followed by eleven (19.3%) producers with 21 to 25 years of peanut production experience.

The typical respondent from the five-county area in this study had an average of 26.32 years of production experience, While median years of peanut production experience was 25 and the most frequent response (mode) reported by the respondents was 20 years.

Table V

A Distribution of Respondents By Years of Peanut Producing Experience

Years of experience	Frequency (n)	Percentage (%)
< 10	1	1.8
11 - 15	4	7.1
16 - 20	16	28.1
21 - 25	11	19.3
26 - 30	3	5.3
31 - 35	15	26.4
36 - 40	5	8.8
41 - 45	_	_
46 - 50	2	3.5
Total	57	100.0

The estimated distribution of the peanut producers' family income derived from their peanut production was presented in Table VI. Sixteen (29.6%) peanut producing respondents estimated that approximately 31 to 40 percent of their family income was derived from producing peanuts, followed by 14 (25.9%) respondents with 41 to 50 percent of their family income derived from peanut production. Ten (18.5%) respondents revealed between 21-30 percent of their family income derived from peanut production, followed by five (9.3%) respondents who had 11 to 20 percent of their family income derived from peanut farming, while four (7.4%) respondents estimated between 51 to 60 percent of their family's income was derived from peanut production. However, two (3.7%) respondents reported 61 to 70 percent of their gross family income was derived from peanut production while one (1.9%) respondent indicated 71 to 80 percent of their family income came from peanut production. One (1.9%) respondent indicated almost all (91 to 100 percent) of their family's income was derived from peanut production.

Table VI

A Distribution of Gross Receipts from Peanut Production as a Percentage of Family Income

Percent of Family Income from Peanut Production	Frequency (n)	Percentage (%)
5 - 10	1	1.9
11-20	5	9.3
21-30	10	18.5
31-40	16	29.6
41-50	14	25.9
51-60	4	7.4
61-70	2	3.7
71-80	1	1.9
81-90	–	–
91-100	1	1.9
Total	54	100.0

The average family's income reported among the respondents revealed 39.4 percent was derived from peanut production, while the mode with regard to the estimated percentage of family income derived from peanut product was 40 percent as well as the median income.

PEANUT PRODUCERS OPERATIONS AND PROBLEMS

This section was devoted to the analysis of peanut producers' operations and problems based on the information gathered in the survey. Tables VII through XXI present a summary of the findings.

Table VII presents the distribution of participants peanut operations according to the type of cultivar produced and irrigation whether or not was used. Based on the data in Table VII, Florunners, Spanco and Tamspan were the most popular cultivar used in peanut production, while Spanhoma was the least. Almost all peanut production in the five-county area occurred on irrigated land.

Table VII

A Distribution of Respondents' Peanut Operations By Cultivar Produced and Whether or Not They Were Irrigated or Dryland

Cultivar	Irrigation		Dryland		Total	
Produced	n	% Acres	n	% Acres	n	% Acres
Florunner	21	36.8	_	_	21	36.8
Okrun	10	17.5	_	_	10	17.5
Spanco	20	35.1	6	10.5	26	45.6
Spanhoma	2	3.5	_	_	2	3.5
Tamspan 90	18	31.6	_	_	18	31.6

As the Table VIII revealed, yield per acre was much higher on the irrigated lands than dryland. According to Table VIII average yields per producer were 3443.96 lbs on irrigated land, while average dryland yields per acre were only 1163 lbs per producer.

Table VIII

A Distribution of Respondents' Yields By Type of Peanut Operation

Type of Operation	Frequency (n)	Percentage (%)
Irrigated:		
less than 1200 lbs per Ac.	1	1.9
1200 - 2000 lbs	1	1.9
2001 - 3000 lbs	11	21.2
3001 - 4000 lbs	33	63.5
4001 - 5000 lbs	5	9.6
9000 lbs or more	1	1.9
Total	52	100.0
Dryland:		
less than 1600 lbs per Ac.	2	40.0
16600 - 2000 lbs	2	40.0
2001 lbs or more	1	20.0
Total	5	100.0

Average yield per producer/acre = 3443.96 lbs for irrigated operations.
Average yield per producer/acre = 1163 lbs for dryland operations.

The distribution of peanut producer respondents' perceived production problems reported in Table IX showed for most producers , peanut diseases were the most serious problem (35.1%) followed by weeds (14.0%). However, the least serious problems indicated by peanut producers included nematodes and inadequate water supplies which were rated to be the least influential production problems by 40.4 percent and 26.3 percent of the study respondents respectively.

Table IX

A Distribution of Respondents' Ratings of Production Problems Affecting Peanut Production on a Scale Ranging from Most Influential To Least Influential By Source of Selected Problems

Source of Selected Production Problems	Most	Influential																	Least	Influential
	1	%	2	%	3	%	4	%	5	%	6	%	7	%	8	%	9	%	10	%
Nematodes	–	–	–	–	1	1.8	3	5.3	1	1.8	1	1.8	1	1.8	2	3.5	22	38.6	23	40.4
Insects	6	10.5	6	10.5	24	42.1	15	26.3	2	3.5	1	1.8	–	–	–	–	–	–	–	–
Weeds	8	14.0	28	49.1	12	21.1	3	5.3	2	3.5	–	–	–	–	–	–	1	1.8	–	–
Diseases	20	35.1	28	49.1	2	3.5	2	3.5	–	–	1	1.8	–	–	1	1.8	–	–	–	–
Soil Fertility	–	–	2	3.5	–	–	9	15.8	18	31.6	17	29.8	–	–	1	1.8	3	5.3	4	7.0
Lack of Organic matter	1	1.8	2	3.5	–	–	3	5.3	13	22.8	9	15.8	21	36.8	–	–	2	3.5	3	5.3
Tillage Practices	–	–	1	1.8	2	3.5	1	1.8	3	5.3	19	33.3	21	36.8	2	3.5	3	5.3	2	3.5
Erosion	–	–	–	–	–	–	3	5.3	2	3.5	1	1.8	9	15.8	33	57.9	4	7.0	2	3.5
Inadequate Water Supply	–	–	1	1.8	1	1.8	2	3.5	6	10.5	–	–	2	3.5	15	26.3	12	21.1	15	26.3

Among the diseases affecting peanut production, cercospora leafspot was ranked as the greatest problem by 36.9 percent of the respondents as shown in Table X followed by 31.6 percent of the participants indicating southern blight as being a serious problem. However, asperuilius crown rot was considered by the respondents in this study to be among their least concerns overall with 28.1 percent of the study participants indicating it was their least problem, while 57.9 percent, rated fusarium as their next to least problem. The data in Table X also showed the study participants rated Fusarium wilt as their second least concern overall with 22.8 percent of the participants responding to this part of the question stating it was their least concern, while 61.4 percent revealed it rated second or next to their least concern. Overall, the study respondents in disclosing Asperuilius Crown Rot and Fusarium wilt as their least problems followed by Sclerotina and Vercillian wilt.

Table X

A Distribution of Respondents' Ratings concerning Major Disease Problems of Peanut Producers from Least to Greatest by Source of Selected Problems

Source of Selected Disease Problems	Least 1		Problem 2		3		4		5		6		7		8		Greatest 9		Problem 10	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Cercospora Leafspot	_	_	_	_	1	1.8	_	_	1	1.8	2	3.5	7	12.3	16	28.1	9	15.8	12	21
Asperuilius Crown Rot	16	28.1	33	57.9	2	3.5	1	1.8	2	3.5	_	_	_	_	_	_	_	_	_	_
Anthracnose	9	15.8	2	3.5	10	17.5	22	38.6	6	10.5	3	5.3	1	1.8	1	1.8	_	_	_	_
Fusarium	13	22.8	35	61.4	1	1.8	1	1.8	1	1.8	1	1.8	2	3.5	_	_	_	_	_	_
Pod Rot	9	15.8	15	26.3	21	36.8	4	7.0	1	1.8	2	3.5	1	1.8	1	1.8	_	_	_	_
Seedling Diseases	6	10.5	6	10.5	24	42.1	11	19.3	2	3.5	1	1.8	2	3.5	1	1.8	1	1.8	_	_
Schlerotina	27	47.4	16	28.1	5	8.8	1	1.8	1	1.8	2	3.5	1	1.8	_	_	_	_	1	1.8
Verticillium	30	52.6	11	19.3	7	12.3	3	5.3	2	3.5	1	1.8	_	_	_	_	_	_	_	_
Southern Blight	1	1.8	1	1.8	_	_	_	_	3	5.3	4	7.0	11	19.3	11	19.3	9	15.8	9	15.8
Other	_	_	_	_	_	_	1	1.8	_	_	_	_	1	1.8	_	_	_	_	_	_

The data in Table XI showed various treatments peanut producers in the survey used in controlling selected diseases. As the data indicates, Bravo was the fungicide most often utilized to control both cercospora leafspot and southern blight as indicated by 77.2 percent and 63.16 percent of the producers respectively. Crop rotation was also used as cultural practice in controlling most peanut diseases as well.

Among the weed problems as shown in Table XII, 52.6 percent of the respondents ranked Copperleaf as their major weed problem while curton was considered the least serious problem for most peanut producers.

Table XI
A Distribution of Producer Respondents Using Various Treatments By Selected Disease

Selected Disease	Treatment	No. of Producers Using Treatment	Percent %
Cercospora Leafspot	Bravo	44	77.2
	Bravo (Dithome M)	1	1.8
	Bravo, Benlate	1	1.8
	Crop Rotation	1	1.8
	Did Nothing	1	1.8
Asperuilius Crown Rot	Crop Rotation	2	3.5
Pod Rot	Gypsum	2	3.5
	Pre-Treated Seed	3	5.3
	Resistant Variety	1	1.8
	Crop Rotation	2	3.5
Seedling Disease	Gypsum	1	1.8
	Pre-Treated Seed	4	7.0
	Crop Rotation	2	3.5
	Terrachlor	2	3.5
Schlerotina	Crop Rotation	2	3.5
	Rotation & Fallow	1	1.8
	Terrachlor	1	1.8
Verticillium	Crop Rotation	2	3.5
	Rotation & Fallow	1	1.8
	Terrachlor	1	1.8
Southern Blight	Bravo	36	63.16
	PCNB	2	3.5
	Crop Rotation	1	1.8
	Terrachlor	7	12.3
Anthracnose	Crop Rotation	2	3.5
Fusarium	Crop Rotation	2	3.5

Table XII

A Distribution Of Respondents' Ratings Of Major Weed Problems From Least Problem To Greatest Problem By Source Of Selected Weed Problems

Source of Selected Weed Problems	Least 1		Problem 2		3		4		5		6		7		8		Greatest 9		Problem 10	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Copperleaf	7	12.3	1	1.8	_	_	3	5.3	3	5.3	4	7.0	5	8.8	15	26.3	11	19.3	4	7.0
Pigweed	3	5.3	1	1.8	2	3.5	4	7.0	17	29.8	4	7.0	11	19.3	7	12.3	3	5.3	1	1.8
Yellow Nut Sedge	6	10.5	11	19.3	17	29.8	10	17.5	2	3.5	1	1.8	3	5.3	2	3.5	_	_	_	_
Curton	36	63.2	11	19.3	2	3.5	1	1.8	1	1.8	_	_	_	_	_	_	_	_	_	_
Prickly Sida	24	42.1	21	36.8	6	10.5	1	1.8	1	1.8	_	_	_	_	_	_	_	_	_	_
Texas Panicum	20	35.1	20	35.1	8	14.0	3	5.3	1	1.8	1	1.8	_	_	_	_	_	_	_	_
Morning Glory	2	3.5	_	_	9	15.8	18	31.6	7	12.3	9	15.8	4	7.0	1	1.8	1	1.8	1	1.8
Johnson Grass	16	28.1	4	7.0	12	21.1	11	19.5	4	7.0	3	5.3	2	3.5	_	_	1	1.8	_	_
Crabgrass	9	15.8	19	33.3	14	24.6	3	5.3	2	3.5	1	1.8	1	1.8	_	_	1	1.8	2	3.5
Other	_	_	_	_	2	3.5	_	_	_	_	_	_	_	_	_	_	_	_	_	_
No Weed Problem	1	1.8	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_

The treatments used to remove weed problems were listed in Table XIII. As shown in Table XIII, many respondents used Pursuit for treatment of several weed problems except for cockleburrs and sunflowers. The second most popular herbicide for weed problems seemed to be Prowl followed by 2,4-DB, and Blazer.

Table XIII

A Distribution of Study Participants By Treatments Used By Selected Weed Problems

Selected Weed Problems	Treatment	Distribution (n)	Percent %
Copperleaf	2,4-DB	1	2.7
	Dual	1	2.7
	Prowl	15	40.5
	Pursuit	20	54.1
Pigweed	2,4-DB	2	6.0
	Boylan	1	3.0
	Prowl	15	45.5
	Prowl & Baylan	1	3.0
	Prowl & Pursuit	1	3.0
	Pursuit	12	36.4
	Pursuit & Dinitro	1	3.0
Yellow Nut Sedge	Dual	1	14.3
	Dual & Pursuit	1	14.3
	Prowl	1	14.3
	Pursuit	3	42.9
	Pursuit & Dinitro	1	14.3
Croton	Blazer	1	33.3
	Pursuit	2	66.7
Prickly Sida	Pursuit	1	100.0
Texas Panicum	2,4-DB	1	33.3
	Pursuit	1	33.3
	Pursuit Dinitro	1	33.3

Table XIII cont.

Morning Glory	2,4-DB	2	7.6
	Blazer	2	7.6
	Prowl	10	38.5
	Pursuit	11	42.3
	Pursuit & Dinitro	1	3.8
Johnson grass	Post plus	1	25.0
	Prowl	1	25.0
	Pursuit	2	50.0
Crabgrass	Dinitrodheline TR	1	16.7
	Prowl	2	33.3
	Pursuit	1	16.7
	Roundup	1	16.7
	Treflon	1	16.7
Cockleburr	2,4-DB	1	100.0
Sunflower	Blazer	1	50.0
	Prowl	1	50.0

The distribution of study respondents in Tale XIV with unfamiliar pest problems revealed that 26 (92.8%) of the respondents seemed to have no problems. Only one (3.6%) farmer observed unfamiliar pests every growing season and another (3.6%) noticed them less than once per year.

Table XIV

A Distribution of Producer Responses Concerning Unfamiliar Pest By Frequency of Observations

Frequency of Observation	Distribution (n)	Percentage (%)
Every Growing Season	1	3.6
More Than Once Per Year	_	_
Less Than Once Per Year	1	3.6
No Problem	26	92.8
Total	28	100.0

The determining factors for peanut producers to start treatment of weed and disease problems reported in Table XV indicated only one (3.7%) used "visible crop damage" as a determining factor, while 10 (37%) began treatments based on their consultants recommendations. However, 14 (51.8%) farmers used determinants other than those listed in the table but chose not indicate the specific treatments used. Two (7.4%) respondents, however, revealed they used the calendar as a guide to begin treatment of weed and disease problems in their operations.

Table XV

A Distribution of Respondents' Weed and Disease Problems Associated with Peanut Production By Determining Factors Of When To Begin Treatment

Determining Factor(s)	Weeds & Disease Frequency (n)	Weeds & Disease Percent (%)
Visible Crop Damage	1	3.7
Scouting Report	—	—
Consultant's Recommendation	10	37.0
Calendar	2	7.40
Other	14	51.8
Total	27	100.0

The data in Table XVI indicated that most (97.6%) peanut producer respondents participating in this study calibrated their sprayers once a year, while only one (2.4%) respondent calibrated his sprayer twice a year.

Table XVI

A Summary of Respondents' Perceptions Concerning the Frequency of Ground Sprayer Calibration By Number of times Per Year

Number of Times Sprayer Calibrated During A Year	Perceived Frequency (n)	Percentage (%)
Once A Year	41	97.6
Twice A Year	1	2.4
Total	42	100.0

Table XVII describes the determining factors in the selection of pesticides by peanut producer respondents. According to the data in Table XVII effectiveness of the pesticide is the most important factor in their selection followed by the cost of pesticide and environmental safety.

Table XVII

A Distribution of Respondents' Ratings Determining Pesticide Use Ranging From Greatest To Least Advantage By Factors of Selection

Factors of Selection	Greatest 1		2		3		4		Least 5	
	n	%	n	%	n	%	n	%	n	%
Effectiveness	50	87.7	3	5.3	_	_	_	_	1	1.8
Cost	34	59.6	13	22.8	4	7.0	2	3.5	1	1.8
Personal Safety	23	40.4	21	36.8	4	7.0	3	5.3	3	5.3
Environmental Safety	32	56.1	1	1.8	1	1.8	5	5.8	1	1.8

The distribution of participants according to their method of handling or disposal of pesticide containers was presented in Table XVIII. As the data showed, most (63.6%) respondents returned the pesticide containers to the dealers. Eight (14.5%) peanut farmers burned the containers, two (3.6%) rinsed them three times and dumped them, one (1.8%) person turned them over to EPA. Nine (16.4%) peanut producers used other methods of handling of their pesticide containers.

Table XVIII

A Distribution of Respondents By Method of Handling or Disposal Of Pesticide Containers

Method of Handling or Disposal of Pesticide Containers	Frequency (n)	Percentage (%)
Return to Dealer	35	63.6
Turn Over to EPA	1	1.8
Place in Plastic-Lined Landfill	–	–
Burn	8	14.5
Rinse 3 Times & Dump	2	3.6
Other	9	16.4
Total	55	100.0

A summary of the respondents' perception concerning plant nutrient deficiencies was reported in Table XIX. Based on the data presented in Table XIX, Phosphorous deficiencies were ranked as the top nutrient deficiency ranked as the greatest deficiency by fifteen (26.4%) farmers, while Boron deficiency was found as the least nutrient problem and ranked it the least deficient nutrient by 31 (54.4%) peanut producer respondents. Fourteen (24.6%) farmer participants reported no nutrient deficiency problems at all.

Plant nutrients used by the respondents to treat deficiencies were presented in Table XX. The data showed that among the plant nutrients, lime (calcium) was used the most with an average 2000 lbs of Lime per acre being applied by each producer, while some other nutrients such as copper or molybdenum were not used at all.

Table XIX

A Distribution of Respondents' Ratings of Perceived Plant Nutrient Deficiencies on a Scale Ranging From Least To Greatest Deficiency By Selected Nutrient Deficiency

Selected Nutrient Deficiency	Least 1		Deficiency 2		3		4		5		6		Greatest 7		Deficiency 8	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Boron	17	29.8	14	24.6	3	5.3	2	3.5	1	1.8	_	_	_	_	_	_
Manganese	16	28.1	11	19.3	7	12.3	1	1.8	1	1.8	1	1.8	_	_	_	_
Phosphorous	1	1.8	5	8.8	7	12.3	9	15.8	12	21.1	2	3.5	_	_	1	1.8
Nitrogen	13	22.8	13	22.8	4	7.0	4	7.0	_	_	2	3.5	1	1.8	_	_
Potassium	3	5.3	13	22.8	6	10.5	10	17.5	2	3.5	2	3.5	_	_	1	1.8
Other	1	1.8	1	1.8	_	_	_	_	1	1.8	_	_	_	_	_	_
No Deficiency	14	24.6	_	_	_	_	_	_	_	_	_	_	_	_	_	_

Table XX

A Summary of the Respondents' Estimated Rate of Fertilizer Application By Selected Sources of Plant Nutrients

Plant Nutrient(s)	n	Percent (%)	Average Pounds Applied Per Acre Per Producer
Nitrogen	9	15.8	66.11
Phosphorous	28	49.1	48.25
Potassium	14	24.6	74.64
Zinc	1	1.8	–
Magnesium	2	3.5	27.5
Sulfur	3	5.3	11.0
Gypsum (Calcium)	6	10.5	1720.0
Iron	1	1.8	–
Manganese	3	5.3	32.5
Copper	–	–	NA*
Molybdenum	–	–	NA
Boron	4	7.0	–
Lime (Calcium)	43	75.4	2000.0

*Not applicable

In determining what plant nutrients to use and how much to apply; the data in Table XXI indicated most (61.2%) respondents followed soil test recommendations. Fifteen (30.6%) producers indicated that they do what they have always done and four (8.2%) followed consultant's recommendations.

Table XXI

A Distribution of Respondents' Perceptions Based On Plant Nutrients and Application Rates By Selected Producer Practices

Selected Practices	Frequency (n)	Percentage (%)
Soil Test Recommendations	30	61.2
Consultant's Recommendations	4	8.2
"Doing What I have always done"	15	30.6
Self interpretation of "fact sheet" recommendations	–	–
Don't Apply "small"	1	2.0
Total	49	100.0

PERCEPTIONS AND PRACTICES OF INTEGRATED PEST MANAGEMENT

In this section the data concerning peanut producer respondents' perceptions and practices of IPM were analyzed. Tables XXII through XXXIII present a summary of the findings.

The distribution of respondents according to their awareness of IPM as presented in Table XXII revealed only nine (15.8%) respondents were aware of IPM. A large (47.4%) number of participants indicated they were not knowledgeable about IPM while 21 (36.8%) respondents had some awareness.

Table XXII

A Distribution of Respondents By Whether or Not They Had an Awareness of Integrated Pest Management

Awareness of IPM	Frequency (n)	Percentage (%)
Yes	9	15.8
Somewhat	21	36.8
No	27	47.4
Total	57	100.0

The data in Table XXIII revealed only three (5.3%) peanut producers ranked themselves as having a "high level" of awareness concerning IPM, while 26 (45.6%) producers indicated "no" awareness.

Table XXIII

A Summary of Respondents Self-Assessment By Their Perceived Level of Awareness of IPM

Perceived Level of Awareness		Frequency (n)	Percentage %
High	4	3	5.3
	3	8	14.0
	2	17	29.8
	1	3	5.3
None	0	26	45.6
Total		57	100.0

The respondents were then asked about their perceptions of IPM which were summarized in Table XXIV. As it was shown in the Table XXIV, most (48.3%) respondents perceived IPM as a combination of biological and chemical controls, while eleven (37.9%) respondents viewed it as a chemical control, when economic thresholds were reached.

Table XXIV

A Distribution of Respondents' Perceptions of IPM As Illustrated By Their Selected Descriptions

Selected Descriptions of IPM	Frequency (n)	Percentage (%)
Biological Control of Pests	1	3.4
Chemical Control	1	3.4
Chemical Control when Economic Threshold is Reached	11	37.9
A Combination of Biological &Chemical Controls	14	48.3
Doing Nothing	_	_
Crop Rotation	1	3.4
"Have No Idea"	1	3.4
Total	29	100.0

The sources from which the respondents obtained their information about IPM were summarized in Table XXV. According to the data, IPM specialists were rated as the best source of information followed by crop consultants. "Extension Fact Sheets" and "farm neighbors/ other farmers" were rated as the poorest sources of IPM awareness.

Table XXV

A Summary of Respondents' Ratings Concerning Their Perceived Awareness of Integrated Pest Management by Selected Source of Information

Selected Sources of Awareness Regarding IPM Information	Range (1-10)	Mean Score	SD	Overall Rating
Pesticide Dealers/Applicators	9	2.96	1.87	3
Crop Consultants	7	2.39	1.6	2
Extension Newsletters & Publications	4	3.28	1.72	5
County Extension	7	3.82	1.93	6
Farm Magazines	5	3.21	1.68	4
IPM Specialists	8	1.71	1.88	1
Personal Experiences	8	4.35	2.62	7
Extension Fact Sheets	8	4.47	2.58	8
Farm Neighbors/Other Farmers	9	4.59	2.50	9

The data in Table XXVI indicates the number of respondents conducting IPM as practice. As the data indicates nine (30%) producer respondents actually conducted IPM practices, while twenty-one (70%) respondents did not.

Table XXVI

A Distribution of Respondents By Whether or Not They Are Currently Conducting Integrated Pest Management Practices in Their Peanut Operations

Currently Conducting IPM Practices	Frequency (n)	Percentage (%)
Yes	9	30
No	21	70
Total	30	100

The participants who were currently conducting IPM practices were also asked why they used IPM as a cultural practice. The results shown in Table XXVII revealed four(26.67%) respondents used IPM practice for controlling seedling disease, while two (13.33%) respondents conducted IPM to control Pod Rot. Furthermore, two (13.33%) respondents indicated attempted to control southern blight with the use of IPM practices, while over 46 percent of the respondents each practiced IPM to control an array of seven other problems reported in Table XXVII.

Table XXVII

A Distribution of Respondents Indicating The Use Of IPM As A Cultural Practice By Selected Peanut Pest

Selected Peanut Pest(s)	Distribution Reported(n)	Percentage(%)
Early & Late Leafspot	1	6.67
Leafspot	1	6.67
Pod Rot & Seedling Disease	1	6.67
Pod Rot	2	13.33
Nematodes	1	6.67
Schlerotina	1	6.67
Southern Blight	2	13.33
Thrips	1	6.67
Weeds	1	6.67
Seedling Disease	4	26.67

The types of cultural practices conducted by study respondents were shown in Table XXVIII. As the data in the table revealed five (35.71%) respondents used pre-treated seed, three (21.43%) acquired the recommendations of a crop consultant and two (14.29%) reported spraying as practice to control problems in their crop. Two (14.29%) respondents indicated they practiced IPM in the form of crop rotation. Application of pursuit, 2,4-DB, Fusible, Poost, and TR were used by two (14.29%) respondents to control pest problems.

Table XXVIII

A Distribution of Cultural Practices Reported By Respondents As Peanut Pest Controls By Practice Conducted

Practice Conducted	Distribution Reported (n)	Percentage (%)
Crop Consultant	3	21.43
Spraying	2	14.29
Pretreated Seed	5	35.71
Crop Rotation	2	14.29
Pursuit, 2,4-DB	1	7.14
Fusible, Poost, TR	1	7.14

The frequency of the pest management practices used by respondents was reported in Table XXIX. The data revealed sanitation/hoeing were the practices most often employed for pest management followed by crop rotation. The least used pest control practices included crop residue and biological controls.

Table XXIX

A Summary of Pest Management Practices Used By Respondents Concerning Their Perceived Effectiveness Ratings By Selected Practice Employed

Selected Practice(s) Employed	Range (1-10)	Mean Score	SD	Rating
Sanitation/hoeing	5	.67	.91	1
Pesticides	9	1.49	1.92	3
Biological	9	2.28	2.75	9
Crop Residue	8	2.42	2.72	8
Natural Predators	9	1.93	2.39	5
Host Plant Resistance	9	1.91	2.41	7
Harvest Time	5	1.91	2.38	4
Tillage/Cultivation	8	1.79	2.40	6
Crop Rotation	2	.87	1.02	2
Other (Not Specific)	1	.04	.26	NA

Conducting IPM practices requires a definite time commitment by producers or other interested parties as shown in Table XXX. Ten (71.4%) respondents reporting checking their own crops, while one (7.1%) peanut producer relied on the recommendations of consultants. Three (21.4%) respondents asked other individuals to check their peanut crops other than those listed in Table XXX.

Table XXX

A Distribution of Crop Checks Scouting Reports Indicated By Respondents By Individuals Conducting Checks

Individuals Conducting Checks	Distribution Reported (n)	Percentage (%)
Producer (him/herself)	10	71.4
Son/Daughter	_	_
Spouse	_	
Employee	_	
Consultant	1	7.1
IPM Scout	_	
None	_	
Other	3	21.4
Total	14	100

Tables XXXI and XXXII present the respondents' perceived advantages and disadvantages of IPM respectively. The data in Table XXXI indicates increased profitability ranked as the most important advantage of IPM, followed by increased yields. The least important advantages of IPM reported included the opportunity to use alternative pest controls and the decision to use pest controls based on analysis and recommendations of a specialist.

Table XXXI

A Summary of Respondents' Perceived Ratings Concerning Primary Advantage of Integrated Pest Management By Importance of Selected Advantage

Selected Advantages of IPM	Mean Rating	Range (1-10)	SD	Overall Rating
Increased Profitability	1.16	4	.82	1
Decreased Chemical Use	3.56	9	1.66	7
Allows for a quick response	2.89	8	1.41	5
Increased Yields	1.23	4	.78	2
Allows for planning the use of resources	2.96	6	1.35	6
Minimizes Costs	1.56	4	1.07	3
Environmental Friendly	2.49	5	1.27	4
Use of Alternative Pest Controls	3.95	5	1.47	8
Use pest control based on Analysis & Recommendations of specialist	4.30	8	1.87	9
Other (Not Specific)	.18	4	.93	NA

The greatest disadvantage of IPM shown in Table XXXII was perceived by respondents as time constraints, followed by shortage of qualified consultants. The least disadvantage of IPM was identified as the ability of scouts to recognize pest problems.

Table XXXII

A Summary of Respondents' Ratings Concerning Perceived Disadvantages of Integrated Pest Management As Contrasted from Least Disadvantage to Greatest By Selected Disadvantage

Selected Disadvantage of IPM	Range (1-6)	Mean Score	SD	Overall Rating
Shortage of Qualified Consultant	5	4.49	1.66	4
Time Constraints	5	4.67	1.70	5
Ability of Scouts to Recognize Problems	5	3.12	1.46	1
Lack of Understanding of the IPM	5	4.47	1.55	3
Reliability of Information	4	3.40	1.25	2

The cost-effectiveness of IPM from the respondents' point of view was summarized in Table XXXIII. According to the data, forty-three (75.4%) peanut producers did not or could not evaluate the cost-effectiveness of IPM. Eight (14%) respondents indicated IPM was somewhat cost-effective, while five (8.8%) peanut producers found IPM to be a cost-effective cultural practice. One (1.8%) producer perceived IPM as not being cost-effective practice.

Table XXXIII

A Summary of Respondents' Impressions Regarding
The Cost-Effectiveness of IPM Practice
By Perceived Category of Effectiveness

Category of Perceive Effectiveness	Frequency (n)	Percentage (%)
Very Effective	_	_
Effective	5	8.8
Somewhat Effective	8	14.0
Not Effective	1	1.8
Unknown	43	75.4
Total	57	100.0

mean score = .5614 ("Not Effective" Category)

CHAPTER V

SUMMARY, CONCLUSIONS, AND PERSPECTIVES

INTRODUCTION

Integrated pest management (IPM) programs have recently expanded to include a multitude of agricultural crops. IPM programs may be used to optimally manage pest populations while producers minimize cost or enhance profits with minimal environmental damage.

This study attempted to assess the awareness, perceptions, and practices of peanut producers residing in a five-county area of Central and Southern Oklahoma with regard to IPM programs.

PURPOSE OF THE STUDY

The purpose of this study was to determine the awareness, perceptions and IPM practices conducted by peanut producers residing in a selected five-county area of Central and Southern Oklahoma.

OBJECTIVES OF THE STUDY

The following specific objectives were outlined in this study:

1. To identify the extent of awareness of Integrated Pest Management (IPM) practices among peanut producers in a selected five-county area of Oklahoma.
2. To determine the Integrated Pest Management (IPM practices currently being conducted by selected peanut producers in the five-county area of South-

Central Oklahoma.

3. To determine producers' perceptions of Integrated Pest Management, including: 1) advantages and disadvantages, 2) effectiveness, 3) sources of information concerning IPM, 4) major pest problems, and 5) plant nutrient deficiencies.

4. To determine personal and production characteristics of peanut producers and their operations in the selected five-county area.

SCOPE OF THE STUDY

The scope of the study included peanut producers in a selected five-county area of South-central Oklahoma.

PROCEDURES OF THE STUDY

To attain the objectives of the study, procedures were established and specific methods of data analysis were selected. This study concentrated on the five-county area in Central and Southern Oklahoma which consisted of Bryan, Caddo, Grady, Hughes, and Love counties. The population included peanut producers identified as Extension cooperators by their respective County Extension Office and listed in the county's telephone book.

Peanut producers in these five counties produce approximately 85 Percent of the total peanut production in the State of Oklahoma. The number of peanut farmers identified in each county were: Bryan 273; Caddo 414; Grady 44; Hughes 136; and Love 133. The total population of peanut producers identified as residing in the selected five-county area was 1000. A random sample of 284 potential participants were identified. As a result, the study sample consisted of 57 (20.07%) self-selected peanut producers who responded from the five-county area in Central and Southern Oklahoma.

To collect the necessary data, an instrument was developed which included an introduction and six sections with a total of 28 forced-response questions. The six sections included: 1) Producer's farming status and self-awareness of IPM, 2) IPM practices conducted among farmers, 3) Peanut farmers perceptions and awareness of IPM, 4) Production problems, 5) Production and environmental practices conducted, and 6) Personal characteristics among the peanut producers in the five-county area.

The necessary data were collected through a telephone survey-interview. Calls concerning the survey were conducted during the month of July 1995. Fifty-seven (20.07%) peanut producers cooperated and provided useable information. However, a rather sizeable number indicated no desire to be interviewed either because they were not interested or didn't have time. In addition, several potential respondents stated retirement, leasing out their land, not growing peanuts anymore, going out of business, producer deceased, or the number was out of service, or they had been called three times and nobody answered the phone as reasons for not responding.

The data/information gathered from the telephone survey were analyzed using SAS computer program. Descriptive statistics were used to analyze the data.

MAJOR FINDINGS OF THE STUDY

Following the objectives of the study, the major findings were divided into four sections. The four objectives of the study and discussion of the major findings were as follows:

IPM AWARENESS AMONG PEANUT PRODUCERS

To determine the awareness and the extent of awareness of IPM among peanut producers in the five-county area, the participants were asked if they were aware of IPM and how they would rate themselves concerning their level of awareness. Almost 16 percent of the respondents indicated an awareness of IPM while slightly over five percent of the producer respondents disclosed a high level of awareness. Over 47 percent of the respondents, revealed they had no awareness of IPM and almost 37 percent of participants stated they were only somewhat aware of IPM.

PRODUCER INVOLVEMENT IN IPM PRACTICES:

A summary of the data regarding the respondents' involvement in IPM practices revealed about 16 percent of the respondents were currently conducting IPM practices in their peanut operations. Furthermore, it was apparent from the data that over 80 percent of the respondents don't utilize IPM as a cultural practice or don't understand the process.

The IPM practices currently being utilized by the respondents primarily consists of using pretreated seed and crop consultants.

The data revealed that almost six percent of the respondents check their crop themselves.

About 46 percent of respondents indicated they didn't recognize any unfamiliar pest problems in their operations. Almost 18 percent of the respondents revealed they begin treatment of pest problems only on the recommendation of their consultant, while over 24 percent used "other" factors. Over 50% of the participants didn't reveal the frequency of unfamiliar pest they observed, or the factors they consider to begin treatment.

PRODUCERS PERCEPTIONS OF RELATED IPM ISSUES AND PRODUCTION PROBLEMS

More than 24 percent of the respondents perceived IPM as "a combination of biological and chemical controls", while the second most popular description of IPM was "chemical control when economic thresholds are reached". The most important advantages of IPM perceived by the respondents were "increased profitability" and "increased yields" which were rated first and second respectively. The greatest disadvantages of IPM according to the respondents' perceptions were "time constraints" and "shortage of qualified consultants", while 'the ability of scouts to recognize problems" was ranked as the least disadvantage utilizing IPM as a practice.

EFFECTIVENESS OF IPM

Over 75 percent of the respondents couldn't evaluate the cost-effectiveness of IPM, while about 24 percent of the study participants perceived IPM as either "effective" or "somewhat effective". The best source of information for peanut growers about IPM were "IPM specialists", while "crop consultants" and "pesticide dealers" ranked second and third respectively.

Among the respondents who were incorporating IPM as a practice in their production process; seedling disease was recognized as a serious and most important pest problem followed by southern blight and pod rot.

Peanut producer respondents were asked to rank their perceived nutrient deficiencies on a scale of one -least deficiency to eight -greatest deficiency. Fifteen (26.4%) of the participants ranked phosphorous as the 5th, 6th, and 8th, greatest deficiency while Boron was ranked as the least nutrient deficiency by over 54 percent of the participants.

PRODUCERS PERSONAL AND PRODUCTION CHARACTERISTICS

The major findings revealed that 56 percent of the peanut producer respondents were between the ages of 41 to 55 years while 48 percent had some type of formal education beyond a High School education. Eighty-four percent of the respondents indicated they were full time farmers and over 54 percent revealed they had 11 to 25 years of experience as a peanut producer. Despite the fact that approximately 84 percent of respondents were full time farmers, 70 percent of the participants 70 percent stated only between 21 to 50 percent of their family income was derived from peanut production. Only one farmer stated that peanut production revenue constituted between 91 to 100 percent of his family's income.

Most respondents grew either runner or Spanish types of peanuts with most production coming from irrigated operations. Production on irrigated lands was much higher than dryland yields. Average production per respondent was 3,444 lbs/acre on irrigated land while dryland yields averaged 1,163 lbs/acre.

IPM PRACTICES CONDUCTED BY PEANUT GROWERS

IPM cultural practices conducted by the respondents included sanitation/hoeing as the most frequent IPM practices conducted by the participants followed by crop rotation and biological controls being the least used methods.

PRODUCTION CHARACTERISTICS/FACTORS OF PEANUT PRODUCERS

Among the selected peanut production problems diseases, weeds, and insects ranked as the most serious production problems facing peanut growers in South-central Oklahoma. Selected diseases which participants indicated as major problems were cercospora leafspot and southern blight, while copperleaf and pigweed were the major weed problems affecting production.

A majority of producers used Bravo to chemically treat cercospora leafspot and southern blight problems, while crop rotation was also a popular method used in controlling disease. However, proul and pursuit were the two herbicides most often used as revealed by growers for the treatment of copperleaf and pigweed and other selected weed problems. More than 50 percent of the study participants indicated they used "soil test recommendations" prior to applying fertilizer. Lime seemed to be the most common plant nutrient applied. Over 75 percent of the producers indicated using lime. The respondents in this study revealed that the average application was 2000 lbs per acre. Fifty percent of the respondents also indicated they used phosphorous in their operations. However, with regard to pesticide usage, the determining factors in their selection were effectiveness, cost, environmental safety, and personal safety. Concerning sprayer calibration, seventy-two percent of the participants reported they calibrated their sprayers only once a year. However, concerns regarding the handling or disposal of pesticide containers revealed more than 66 percent of the respondents in this study chose to return them to the dealers, while others indicated they either burn containers, rinse three times, or dump them.

CONCLUSIONS

The following conclusions were drawn based on the major findings of the study:

1. A large number of producer respondents have little or no awareness of Integrated Pest Management (IPM).

2. Few respondents were currently conducting Integrated Pest Management practices in their operations.

3. Based on the findings, it may be concluded that IPM was primarily perceived as a combination of biological and chemical controls, while the greatest advantage of conducting IPM practices was increased profitability. However, viewing IPM from the stand point of a disadvantage, the respondents seemed convinced that time itself was the most limiting constraint.

4. Furthermore, it seemed quite evident that respondents in this study chose not to indicate their capabilities in evaluating the cost-effectiveness of using IPM as a practice.

5. It was also evident, respondents conducting IPM relied primarily on crop consultants for advice concerning practices they should follow.

6. In addition, it was readily apparent that calcium and phosphorous were the primary concerns of respondents in this study with regard to soil nutrients.

7. Respondents in this study were full-time farmers, who were middle aged, and had more than a high school education.

8. Furthermore, it was apparent that the respondents in this study derived one-fifth to half of their total family income from peanut production.

9. As a group the respondents primarily produced Spanco and Florunner varieties under irrigation.

10. Cultural practices involving Integrated Pest Management primarily consisted of sanitation/hoeing and crop rotation.

11. It was further evident from the findings that cercospora leafspot and southern

blight were primarily the diseases causing concern among producers, while copperleaf and pigweed seemed to be the major weed problems.

12. Treatment of pest problems revealed that respondents in this study primarily used bravo and crop rotation to control diseases, while proul and pursuit were applied to handle weed problems.

13. It was also readily apparent that respondents in this study were conscientious concerning the manner in which they handled/ disposed of pesticide containers by returning them to their respective dealers.

RECOMMENDATIONS

As a result of interpretation of the findings and conclusions of this study, the following recommendations were outlined.

1. Can the farmers' slow adoption rate of IPM as a practice be explained as their response to risk. Binswanger (1980), Dillon, et. al. (1978), and other researchers have acknowledged risk aversion among farmers. Does this impede adoption of new practices, or was the slow rate of adoption concerning IPM related to a lack of knowledge, education and/or encouragement and support? In any case, IPM specialists and county extension agents should be aware and identify the rationalization among farmers concerning their reluctance to adopt IPM practices. As a result IPM specialists and Extension educators at the county should be better able to provide educational programs and on-farm demonstrations to enhance the producers perceptions of IPM.

2. It has been obvious in this study that the planning and successful implementation of IPM will not become reality unless farmers are willing to cooperate and provide the necessary information concerning their operations. Therefore, IPM specialists and agricultural extension agents should work to develop positive working relationships with producers prior to initiating training activities

3. From the findings of the study, it was apparent that the peanut producers respondents' source of information regarding IPM, was the IPM specialist. They also pointed out that shortage of qualified consultants as one of the most important disadvantages of IPM. Therefore, it was recommended in each county, some of the peanut producers receive extensive training to become Extension paraprofessionals in order to assist in the diffusion of information concerning IPM practices.

4. In addition, it was recommended to use any means of communications available to fit the potential audience and expedite the transfer of information to producers and enhance their acceptance of Integrated Pest Management as a cultural practice.

5. County extension agents, experiment station scientists, and peanut producers should cooperate to develop peanut lines with more disease resistance and drought tolerance to increase yields, reduce cost, and maximize profits.

RECOMMENDATIONS FOR FURTHER STUDY

Further effort and research are needed in order to determine why peanut producers are reluctant to adopt IPM in their operations, even though several studies have indicated producers who practice IPM have higher profits and lower pesticide cost compared to conventional pest control practices.

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APPENDIXES

APPENDIX A:

QUESTIONNAIRE

PEANUT INTEGRATED PEST MANAGEMENT (IPM) SURVEY

Hello, may I speak to (use name)? Thank you. My name is _________, I am with Oklahoma State University Cooperative Extension. (pause) Would you mind helping us by answering a few questions concerning your peanut operation? (pause) Thank you. We plan to use your information along with other peanut producers in the state to develop extension programming for producers and determine how they might best utilize IPM in their operations. This should take approximately _____ minutes.

1. How many years have you produced peanuts? ______

2. What is your farming status?

   Full-time ________
   Part-time ________

3. Please indicate the number of acres of each variety you have in production? Are these varieties irrigated or dryland?

Irrigated		**Dryland**	
Variety	Acres	Variety	Acres
________	________	________	________
________	________	________	________
________	________	________	________

Definition of IPM: Integrated Pest Management is an approach that employs a combination of techniques to reduce pests before their damaging numbers become economically important. These techniques may include regular crop checks, chemicals, crop rotations, resistant varieties, and natural controls such as predators or parasites of destructive insects.

4. Are you aware of what Integrated Pest Management (IPM) is?

   Yes ________
   No ________ **(If no, go to Question 12)**
   Somewhat ________

5. How would you rate yourself concerning your level of awareness on a scale of 0 to 4 being the highest level of awareness and 0 being no awareness.

0 1 2 3 4

6. Are you currently conducting Integrated Pest Management practices in your peanut operation?

Yes ____________
No ____________

If yes, what IPM Practices are you conducting? What pest(s) are you attempting to control?

Major Pest(s)	Practice Conducted
________________	________________
________________	________________
________________	________________

7. Who conducts these checks?

Individual(s)	Frequency Checked (# of times)
Yourself	______________
Son/Daughter	______________
Spouse	______________
Employee	______________
Consultant	______________
IPM Scout	______________
No one	______________
Other (specify)	______________

8. How do you determine when to treat weed and disease problems in your peanut operation?

Determining Factor(s)	Weeds	Diseases
Visible crop damage	___________	____________
Scouting Report	___________	____________
Consultant's Recommendation	___________	____________
Calendar	___________	____________
Other (Specify)	___________	____________

9. How often do you find pest problems with which you are not familiar?

Every growing season	______________
More than once a year (Specify)	______________
Less than once a year (Specify	______________
No problem	______________

10. Please rate the pest management practices you most often utilize on a 1 to 10 scale, with **10** being **least often** utilized and **1** the **most often**?

	SCALE OF PRACTICES									
	MOST OFTEN									LEAST OFTEN
Sanitation/hoeing	1	2	3	4	5	6	7	8	9	10
Pesticides	1	2	3	4	5	6	7	8	9	10
Biological	1	2	3	4	5	6	7	8	9	10
Crop Residue	1	2	3	4	5	6	7	8	9	10
Natural Predators	1	2	3	4	5	6	7	8	9	10
Host Plant Resistance	1	2	3	4	5	6	7	8	9	10
Harvest Time	1	2	3	4	5	6	7	8	9	10
Tillage/Cultivation	1	2	3	4	5	6	7	8	9	10
Crop Rotation	1	2	3	4	5	6	7	8	9	10
Other (Specify) __________	1	2	3	4	5	6	7	8	9	10

M.O. = MOST OFTEN & L.O. = LEAST OFTEN

11. What perception do you have of IPM?

Biological control of pests	____________
Chemical control	____________
Chemical control when the economic threshold is reached	____________
A combination of biological and chemical controls	____________
Doing nothing	____________
Other (Please specify)	____________

12. What do you perceive as the primary advantage of IPM? Would you care to rate those advantages on a scale of importance from 1 to 10, with **1** = **Most Important**, and **10** = **Least Important**.

	SCALE OF IMPORTANCE									
	MOST IMPORTANT									LEAST IMPORTANT
Increased profitability	1	2	3	4	5	6	7	8	9	10
Decreased chemical use	1	2	3	4	5	6	7	8	9	10
Allows for quick response to the problem(s)	1	2	3	4	5	6	7	8	9	10
Increased yields	1	2	3	4	5	6	7	8	9	10
Allows for planning the use of inputs & resources	1	2	3	4	5	6	7	8	9	10
Minimizes Cost	1	2	3	4	5	6	7	8	9	10
Environmental friendly	1	2	3	4	5	6	7	8	9	10
Opportunity to use alternative pest controls	1	2	3	4	5	6	7	8	9	10
Decision to use is based on analysis and recommendations of specialist	1	2	3	4	5	6	7	8	9	10
Other (Specify) ________________	1	2	3	4	5	6	7	8	9	10

13. What are your perceived disadvantages of IPM? Would you care to rate those disadvantages on a scale of contrast from 1 to 6, with 1 being the **least disadvantage** and 6 the **greatest disadvantage**.

	SCALE OF PERCEIVED DISADVANTAGES					
	LEAST DISADVANTAGE			GREATEST DISADVANTAGE		
Shortage of qualified consultants	1	2	3	4	5	6
Time constraints	1	2	3	4	5	6
Ability of scouts to recognize problems	1	2	3	4	5	6
Lack of understanding concerning IPM	1	2	3	4	5	6
Reliability of information	1	2	3	4	5	6
Other (Specify) ________________	1	2	3	4	5	6

L.D. = LEAST DISADVANTAGE & G.D. = GREATEST DISADVANTAGE.

14. How cost effective has Integrated Pest Management been for you in your operation? (Circle the appropriate response, ie. **4**, **3**, **2**, **1**.)

Very Effective	**4**
Effective	**3**
Somewhat Effective	**2**
Not Effective	**1**
Unknown	**0**

15. In selecting pesticides to treat pest problems, you probably consider several factors. On a scale of 1 to 5, with **1** being **the greatest**, **5 being the least**, how would you rate with regard to...

			RATING SCALE		
Effectiveness	1	2	3	4	5
Cost	1	2	3	4	5
Personal Safety	1	2	3	4	5
Environmental safety	1	2	3	4	5
Other (Specify) ________	1	2	3	4	5

16. How have you developed your awareness of IPM? Would you care to share those sources of awareness and rate them on a scale of 1 to 10, with **1** being the **best source** of IPM information and **10** the **poorest source**?

	SCALE OF AWARENESS									
	BEST SOURCE								POOREST SOURCE	
Pesticides Dealers/Applicators	1	2	3	4	5	6	7	8	9	10
Crop Consultants	1	2	3	4	5	6	7	8	9	10
Extension Newsletters/Publications	1	2	3	4	5	6	7	8	9	10
County Extension	1	2	3	4	5	6	7	8	9	10
Farm magazine	1	2	3	4	5	6	7	8	9	10
IPM specialist	1	2	3	4	5	6	7	8	9	10
Personal experience	1	2	3	4	5	6	7	8	9	10
Extension Fact Sheets	1	2	3	4	5	6	7	8	9	10
Farm neighbors/other farmers	1	2	3	4	5	6	7	8	9	10
Other (Specify)	1	2	3	4	5	6	7	8	9	10

17. Please rate the major problems influencing peanut production on your farm on a scale of one to 10, with **1** = **Most Influential** and **10** = **Least Influential**, etc.)

	SCALE OF INFLUENCE									
	MOST INFLUENTIAL									LEAST INFLUENTIAL
Nematodes	1	2	3	4	5	6	7	8	9	10
Insects	1	2	3	4	5	6	7	8	9	10
Weeds	1	2	3	4	5	6	7	8	9	10
Diseases	1	2	3	4	5	6	7	8	9	10
Soil fertility	1	2	3	4	5	6	7	8	9	10
Lack of organic matter	1	2	3	4	5	6	7	8	9	10
Tillage practices	1	2	3	4	5	6	7	8	9	10
Erosion	1	2	3	4	5	6	7	8	9	10
Inadequate water supply	1	2	3	4	5	6	7	8	9	10
Other (Specify) ________	1	2	3	4	5	6	7	8	9	10

M.I. = MOST INFLUENTIAL & L.I. = LEAST INFLUENTIAL

18. Please rate your major disease problems, on a scale of 1 to 10, **with 10 being the greatest problem and 1 being the least problem.** (Pause) What type of fungicides do you utilize to treat the problem? And how often are they applied?

	SCALE OF DISEASE PROBLEM										FUNGICIDE UTILIZED	CIRCLE NO. OF APPLICATION(S)			
	LEAST PROBLEM						GREATEST PROBLEM								
Cercospora Leafspot	1	2	3	4	5	6	7	8	9	10	________	1	2	3	4
Aspergillus Crown Rot	1	2	3	4	5	6	7	8	9	10	________	1	2	3	4
Anthracnose	1	2	3	4	5	6	7	8	9	10	________	1	2	3	4
Fusarium	1	2	3	4	5	6	7	8	9	10	________	1	2	3	4
Pod Rot	1	2	3	4	5	6	7	8	9	10	________	1	2	3	4
Seedling Diseases	1	2	3	4	5	6	7	8	9	10	________	1	2	3	4
Sclerotina	1	2	3	4	5	6	7	8	9	10	________	1	2	3	4
Verticillium	1	2	3	4	5	6	7	8	9	10	________	1	2	3	4
Southern Blight	1	2	3	4	5	6	7	8	9	10	________	1	2	3	4
Other (Specify) ______	1	2	3	4	5	6	7	8	9	10	________	1	2	3	4
No Disease Problem ___	1	2	3	4	5	6	7	8	9	10	________	1	2	3	4

19. Please rate your major weed problems on a scale of 1 to 10, **with 10 being the greatest problem and 1 the least problem**. (Pause) What type of herbicide(s) is used for control? How often do you apply the herbicide(s)?

	SCALE OF WEED PROBLEM										HERBICIDE(S) UTILIZED	CIRCLE NO. OF APPLICATION(S)			
	LEAST PROBLEM						GREATEST PROBLEM								
Cooperleaf	1	2	3	4	5	6	7	8	9	10	________	1	2	3	4
Pigweed	1	2	3	4	5	6	7	8	9	10	________	1	2	3	4
Yellow Nut Sedge	1	2	3	4	5	6	7	8	9	10	________	1	2	3	4
Croton	1	2	3	4	5	6	7	8	9	10	________	1	2	3	4
Prickly sida	1	2	3	4	5	6	7	8	9	10	________	1	2	3	4
Texas Panicum	1	2	3	4	5	6	7	8	9	10	________	1	2	3	4
Morning Glory	1	2	3	4	5	6	7	8	9	10	________	1	2	3	4
Johnsongrass	1	2	3	4	5	6	7	8	9	10	________	1	2	3	4
Crabgrass	1	2	3	4	5	6	7	8	9	10	________	1	2	3	4
Other (Specify) ________	1	2	3	4	5	6	7	8	9	10	________	1	2	3	4
No Weed Problem ________	1	2	3	4	5	6	7	8	9	10	________	1	2	3	4

L.P. = LEAST PROBLEM & G.P. = GREATEST PROBLEM

20. What nutrient deficiency do you most often experience relative to soil fertility? Please rate deficiencies on a scale of 1 to 8, with **8** being the **greatest deficiency** and **1** the **least deficient**.

	SCALE OF DEFICIENCIES							
	LEAST DEFICIENT					GREATEST DEFICIENCY		
Boron Deficiencies	1	2	3	4	5	6	7	8
Manganese Deficiencies	1	2	3	4	5	6	7	8
Phosphorous Deficiencies	1	2	3	4	5	6	7	8
Nitrogen	1	2	3	4	5	6	7	8
Potassium	1	2	3	4	5	6	7	8
Other (Specify)	1	2	3	4	5	6	7	8
No Deficiencies ________								

L.D. = LEAST DEFICIENT & G.D. GREATEST DEFICIENCY.

21. How do you decide what **(plant nutrients)** and how much to apply?

Soil test recommendations ____________
Consultant's recommendations ____________
Doing what I have always done ____________
Self interpretation of fact sheet recommendations ____________
Other (Specify) ____________

22. What plant nutrients do you apply annually to your peanut crop? (Pause) What is the rate of application **(Tons/Acre)**?

		RATE
_____	**Nitrogen**	__________
_____	**Phosphorous**	__________
_____	**Potassium**	__________
_____	**Zinc**	__________
_____	**Magnesium**	__________
_____	**Sulphur**	__________
_____	**Gypsum (Calcium)**	__________
_____	**Iron**	__________
_____	**Manganese**	__________
_____	**Copper**	__________
_____	**Molybdenum**	__________
_____	**Boron**	__________
_____	**Lime (Calcium)**	__________
_____	**Other (Specify)**	__________

23. How often do you calibrate your ground sprayer?

__________ **# times per year**

24. How do you handle or dispose of your pesticide containers?

Return to dealer	__________
Turn over to EPA	__________
Place in plastic lined landfill	__________
Other (Specify)	__________

25. What was your average yield/per acre last year?

Irrigated	__________ (lbs/Ac)
Dryland	__________ (lbs/Ac)

26. Age: __________

27. Highest level of formal education:

High School	__________
Attended College	__________
B.S. Degree	__________
Master's Degree	__________
Doctorate	__________
Other	__________

28. What **percent** of your family income comes from the peanut operation?

5 10 15 20 25 30 35 40 45 50 55

60 65 70 75 80 85 90 95 100 ________

THANK YOU FOR YOUR TIME,
WE APPRECIATE YOUR WILLINGNESS TO BE A PART OF THIS STUDY.

APPENDIX B:

Institutional Review Board Approval Statement

OKLAHOMA STATE UNIVERSITY
INSTITUTIONAL REVIEW BOARD
FOR HUMAN SUBJECTS RESEARCH

Date: 04-26-93 IRB#: AG-93-021

Proposal Title: PEANUT PRODUCERS' AWARENESS, PERCEPTION AND PRACTICE OF INTEGRATED PEST MANAGEMENT IN A SELECTED FIVE COUNTY AREA OF SOUTHERN OKLAHOMA

Principal Investigator(s): James D. White, S.M. Hossein Katebi

Reviewed and Processed as: Exempt

Approval Status Recommended by Reviewer(s): Approved

APPROVAL STATUS SUBJECT TO REVIEW BY FULL INSTITUTIONAL REVIEW BOARD AT NEXT MEETING.
APPROVAL STATUS PERIOD VALID FOR ONE CALENDAR YEAR AFTER WHICH A CONTINUATION OR RENEWAL REQUEST IS REQUIRED TO BE SUBMITTED FOR BOARD APPROVAL. ANY MODIFICATIONS TO APPROVED PROJECT MUST ALSO BE SUBMITTED FOR APPROVAL.

Comments, Modifications/Conditions for Approval or Reasons for Deferral or Disapproval are as follows:

Signature: Marcia L. Tilley Date: April 27, 1993

Chair of Institutional Review Board

VITA

Seyed Mohammad Hossein Katebi

Candidate for the Degree of

Doctor of Philosophy

Thesis: PEANUT PRODUCERS' AWARENESS, PERCEPTIONS AND PRACTICES OF INTEGRATED PEST MANAGEMENT IN A FIVE-COUNTY AREA OF SOUTH-CENTRAL OKLAHOMA

Major Field: Agricultural Education

Biographical:

Education: Received Bachelor of Science degree in Economics from College of Economics and Social Sciences, Iran, in February 1975. Intensive English program, Nova University, Fort Lauderdale, Florida in 1978-79. Received Master of Science in Economics from Jackson State University, Jackson, Mississippi in 1981. Completed the requirements for the Doctor of Philosophy degree with a major in Agricultural Education at Oklahoma State University in May 1998.

Experience: In-Service Training in government administration, Administrative Excellence Training Center, Tehran, Iran; Director of Social Welfare Organization, Port of Bushehr, Iran; Counselor of Vice-Minister for Prime Minister's Office, Tehran, Iran; Researcher in the Ministry of Agriculture, preparing a report titled: "International Cotton Market", Tehran, Iran.