WHEAT PRODUCERS' AWARENESS, ATTITUDES, AND PRACTICES CONCERNING INTEGRATED PEST MANAGEMENT AND PRODUCTION PROBLEMS IN A FOUR-COUNTY AREA OF OKLAHOMA

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INTRODUCTION

Integrated Pest Management (IPM) is a relatively new approach to an old problem, "how to insure crop protection and maintain yield and quality through controlling pest populations while minimizing effects on people and environment" (An Integrated Pest Management Primer, 1980, p. 4). IPM attempts to make the most efficient use of strategies available to control pest populations (weeds, diseases, and insects) by taking action to prevent problems, suppress damage levels, and use chemical pesticides only when needed. Rather than seeking to eradicate all pests entirely, IPM strives to prevent their development or to suppress their population numbers below levels which would be economically damaging.

Oklahoma State University (OSU) has placed a very high priority on integrated pest management programs and in insuring that the concept of integrated pest management is delivered and understood by producers (Annual Evaluation--IPM Programs, 1979). To provide direction for IPM programs at OSU, an IPM Steering Committee was appointed in 1979. The Steering Committee was composed as follows: Chairman--James R. Sholar (Extension Pest Management Specialist), and Members--Dr. Howard Greer (Extension Weed Control Specialist), Dr. Stan Coppock (Extension Entomologist), Dr. R. V. Sturgeon (Extension Plant Pathologist), Dr. Norm Nesheim (Extension Pesticide Coordinator), and Ex Officio Member--Mr. Wendell Bowers (Agricultural Program Leader of the Oklahoma Cooperative

Extension Service). The Steering Committee was tasked with the responsibility for leadership in the development and conducting of current and future IPM programs at OSU.

One of the IPM programs the Steering Committee initiated in the fiscal year 1980 was a pilot project in wheat in a four-county area of north central Oklahoma. The counties included in the IPM pilot project were Kay, Grant, Garfield, and Noble Counties (Appendix A). These north central Oklahoma counties compose a major crop producing area. In 1978, the following crops and acreages were grown in the four-county area: wheat, 1,226,000 acres; grain sorghum, 32,000 acres; mungbeans, 50,000 acres; and alfalfa, 35,000 acres (Sholar, 1979).

According to Sholar (1979), the intensive production of crops in this area and attendant pest and production problems cause this area to be a naturally desirable area for introducing an IPM program in wheat. Wheat, which occupies the largest percentage of crop acres in this area, is routinely subjected to a variety of pest and production problems. Sholar further stated the pilot program began with field surveys made by a Field Technician. Weekly surveys of specific, predetermined fields and randomly selected fields in each of the four counties should provide important information on key pest and agronomic problems.

Since 1973, OSU has been successfully involved in IPM programs (Sholar, 1978). Previous pilot projects in IPM have included cotton, peanuts, alfalfa; and a multicrop project involving soybeans, grain sorghum, corn, and a limited acreage of vegetables. The relative success of the OSU IPM programs has in the past been determined by evaluative responses elicited from individuals who participated in the OSU IPM program.

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 the producers' awareness of an IPM program has never been conducted. The Steering Committee believed the IPM program would benefit from base-line research conducted to determine the awareness wheat producers have of the newly initiated IPM program in wheat in the four-county area of north central Oklahoma.

Statement of the Problem

The Steering Committee recognized that IPM programs are necessary to provide for and make available to wheat producers alternatives for their pest management problems. However, a primary concern of the Steering Committee was determining the awareness of the wheat producers in Kay, Noble, Grant, and Garfield Counties of north central Oklahoma of the IPM program in wheat. This concern of the Steering Committee was a concern shared by many others across the nation who are involved in IPM programs. One such person, a leading nationally recognized IPM figure, Edward H. Smith (1972), in a paper presented to the National Academy of Sciences, commented:

> We seem to have operated on the assumption that knowledge, once acquired, will flow to the site of need, but I believe this matter needs critical review. We need to establish base-lines and some reasonable expectations of the progress of IPM programs (p. 45).

According to Sholar (1978), at the conclusion of each growing season, the OSU IPM programs were evaluated by the Project Discipline Leaders to determine producer acceptance of the programs, their weak and strong points, and to modify and/or change thrusts in the programs. Gains in production efficiency were checked closely to evaluate success

of the program. Sholar further stated that questionnaires were sent to "grower/participators" in the IPM program and they were asked to evaluate the program.

Nevertheless, in light of the many "grower/participator" surveys conducted by the OSU Cooperative Extension Specialist involved with the IPM programs, it was evident that a comprehensive base-line research study had never been conducted. Therefore, this study was needed to provide base-line data to determine the awareness of wheat producers of the IPM program.

Purpose of the Study

The IPM program in wheat, which was recently initiated in a four-county area of north central Oklahoma, was a prime target for base-line awareness and impact research. Therefore, a two-phase project was implemented. The "first phase" (of which this study was of prime concern) was to determine the wheat producers' awareness of the IPM program in wheat at the near beginning of the IPM program. The "second phase" will involve a follow-up study to measure the change (increase or decrease) of the wheat producers' awareness of the IPM program in wheat after it has been in operation for some time (approximately three years), thus the impact of the IPM program in wheat will hopefully then be determined.

The purpose of this study, more specifically, was to determine the present awareness of the wheat producers in north central Oklahoma of the newly initiated IPM program in wheat. Also, an attempt was made to determine the specific major problems the wheat producers were confronted with in the production of their wheat crop.

Objectives of the Study

In order to accomplish the purpose of this study, the investigation was directed toward the following specific objectives:

1. To identify the important criteria which were appropriate for determining the awareness of the wheat producers of the IPM program.

2. To identify the extent of current IPM practices utilized by the wheat producers.

3. To identify wheat producers' sources of information concerning IPM programs and practices.

4. To identify the persons who influence the decisions reached by the wheat producers in their adoption process pertaining to wheat production practices.

5. To identify the major reason the wheat producers grow wheat.

6. To identify the major problems the wheat producers encounter in the production of their wheat (more specifically, pest problems).

7. To determine whether or not the wheat crop was regularly "checked or scouted" by anyone to detect major pest problems.

8. To determine the potential for private independent IPM consultants in the four-county area of north central Oklahoma.

9. To determine whether or not the wheat producers would pay for private independent IPM consultant services.

Rationale for the Study

One of the great educational resources that can be brought to bear on the pest control problem is the land-grant university. It grew out of the concept that its mission included the acquisition, transmission, and application of knowledge (Smith, 1972). This concept has been best

exemplified in agriculture where each component--teaching, research, and extension--provides a catalytic influence on the other two. This concept also brought farm families into a sense of partnership with the university. Knowledge from university laboratories flowed freely to problem-solving situations of the farm.

It is in the land-grant universities that much of the pest control research has been conducted and from this base recommendations have flowed through the extension arm for implementation in the field.

Cooperative Extension is the educational partnership between the United States Department of Agriculture (USDA), the land-grant university, and the local community (the county).

The "middlemen" in this successful educational enterprise between university and the farm have been the county cooperative extension agents, including those working in home economics and youth development (Smith, 1972). According to Smith, they have cultivated the capacity to be on the wavelength of the research scientist on the one hand and the producer on the other. It was the agent who was able to provide educational techniques for gaining almost immediate acceptance of recommendations developed from research findings. There are approximately 10,000 cooperative extension agents in the United States, serving in agriculture, youth development, and home economics. This provides an impressive nucleus through which to work in educational programs relating to pest control, environmental quality, and the quality of life.

The Oklahoma Cooperative Extension Service has determined to make IPM an integral part of all crop educational programs (Annual Evaluation--IPM Programs, 1979). This major task was being conducted by 230 full-time professionals (agents), located in county extension offices

in each of the 77 counties across the state. Thirty-four counties have two professionals and 30 counties have three. The remaining 13 counties have four or more professionals. There are 34 specialized agents in agriculture and five in rural development. The field staff is backed by 130 full-time extension specialists on campus in 15 departments in agriculture and home economics. Information is also provided by research facilities of the Oklahoma Agricultural Experiment Station. As OSU extension specialists conduct producer educational seminars, clinics, workshops, and field days each year, the principles of pest management are repeatedly and thoroughly covered. However, the question did arise--"Just how much of this information manages to find its way to all producers and are all producers aware of pest management practices and principles?" (Bowers, 1980).

OSU has provided training of scouts for growers associations, private scouts with small operations, cooperative fieldmen, and additionally, the farmer or producer himself. According to Sholar (1979), all opportunities have been used to emphasize the importance and applicability of pest management to the crops being grown.

In 1979, a fully integrated, interdisciplinary pest management research project was begun at OSU. That project was a cooperative effort of agronomy, weed control, entomology, and plant pathology. OSU has placed a very high priority on IPM programs and in insuring that the concept of IPM is delivered and understood by producers. Sholar (1979) stated:

> Producers regularly experience difficulty in early detection of pests, differentiating between pests and beneficial and/or harmless organisms, establishing economic threshold levels at which controls should be effected, and understanding and solving non-pest production problems (p. 1).

Despite an impressive record of success since Oklahoma began its involvement in IPM in 1970 (Sholar, 1979; Bowers, 1980), OSU needs to establish base-lines and determine the progress of the IPM program. It was strongly anticipated that the results of this investigation of the awareness of the wheat producers in the four-county area of north central Oklahoma of the IPM program in wheat would be highly beneficial in the delivery of pest management information. The findings should also provide an insight for future planning relating to the wheat producers' needs and/or problems in the production of wheat.

Assumptions of the Study

Concerning this research study, the following basic assumptions were made:

1. The responses made by the wheat producers were accurate and sincere.
2. The wheat producers could and/or would identify and relate their wheat production problems to the investigator.
3. The wheat producers had equal access to telephone services.

Scope of the Study

An attempt was made to provide equal opportunity for all wheat producers in the four-county area of north central Oklahoma to be included in this research study. The target population was defined as all wheat producers who reside in the four-county area of north central Oklahoma, 18 years or older in age, having access to a telephone, and having their telephone number listed in a published telephone directory.

In order to insure the most accurate and high yielding method of data collection, the telephone survey was used to gather information. This allowed the survey population to include all adult wheat producers having a telephone and having their telephone number listed in the published telephone directories in the four-county area of north central Oklahoma.

Although an attempt was made to provide equal opportunity for all wheat producers in the four-county area of north central Oklahoma to be included in this research study, there were some wheat producers who were not included. Those who were not included in this study were as follows: (1) those producers whose names were not furnished to the investigator by the county extension directors (agents) of Kay, Grant, Garfield, and Noble Counties in north central Oklahoma; (2) those producers who resided outside the county-line of the four-county area of north central Oklahoma, but who produced wheat in the study area; (3) those producers who had recently moved within the four-county area of north central Oklahoma, or those producers whose telephone service had been interrupted in their service area for any given length of time; and (4) those producers who either had no telephone or had an unlisted number.

Also, the study was limited to the degree that the wheat producers interpreted, understood, and responded to the survey instrument (particularly understanding terms such as "checking," "scouting," and "IPM"). In addition, the study was limited to some degree by the information obtained from the wheat producers which presented a forced choice answer to some of the statements prepared by the writer.

Definition of Terms

For better understanding of certain items presented in the study, the following terms were defined:

1. Integrated Pest Management (IPM): A practical method for keeping pests in check begins with careful and regular field observations. These field checks allow for controlling pests before their numbers or damage becomes economically important. This practice of close field monitoring for pests and their damage before control is attempted is known as Integrated Pest Management (IPM). IPM utilizes a combination of controls which may include chemicals, crop rotations, resistant varities, cultural practices, and natural controls such as predators and parasites. IPM is not an alternative to chemical control, but rather sets as a goal the combining of all available pest control strategies in a good crop management/production system.

2. Pests: Includes all weeds, diseases, and insects which are considered to be non-beneficial and economically damaging to the quality and yield of a crop.

3. Trained scouts: Persons who have received training and have a knowledge of IPM programs and crop pests. These trained scouts (or sometimes referred to as checkers) routinely sample fields to detect major pest problems.

4. Cooperative Extension Service: The organization was created by the Smith-Lever Act of 1914 and is a cooperative function between the United States Department of Agriculture (USDA), the land-grant university of each state, and local county governments.

5. Awareness: The term which implies an ~~alterness~~ alertness in observing or in drawing inferences from what one sees, hears, or does.

6. Wheat producers: Refers to any part- or full-time farmer who plants wheat for any reason regardless of the number of acres planted in wheat and who also resides in either Kay, Grant, Garfield, or Noble Counties of north central Oklahoma.

CHAPTER II

REVIEW OF LITERATURE

Introduction

The purpose of this chapter was to present for the reader an overview of material which was related to the subject of this study. The presentation of this background information was divided into five major areas and a summary. The areas of concern were the history of IPM, the role of the USDA to IPM, the role of OSU in IPM, the efficacy of IPM, and a review of related literature.

To better understand IPM, a basic knowledge of the goals of IPM was determined to be pertinent. The goals of IPM are as follows:

1. To provide more effective pest control to maintain and sometimes improve quality and yield of crops.

2. To supply a more efficient and sensible approach to pesticides, thus increasing their effectiveness and useful life span and decreasing possible adverse effects.

3. To control pest populations more economically.

4. To better safeguard people's health and environment from possible side effects associated with pesticides.

History of IPM

Although IPM is a relatively new approach to an old problem (crop

pests), the history of IPM goes back much farther than the mere coining of the term in the early fifties and the subsequent elaboration and clarification of the concept. The origins are deeply rooted in the evolution of pest control practices as developed by entomologists and plant pathologists in the nineteenth century (Smith, 1978; Goldstein, 1978).

Human history is a series of attempts to gain increasing control over the environment. At first this control was minimal to the degree that poor shelter and unstable food supplies imposed severe population constraints. According to Smith (1978), the gradual gain in man's capacity to control his environment parallels the gradual rise of civilization. As man aggregated into villages near rivers and planted crops nearby, he encountered increasingly severe attacks by pests on crops. For thousands of years, man could do nothing about these pests but appeal to the power of magic and a variety of gods. For the most part, early humans had to live with and tolerate the ravages of plant diseases and insects, but gradually they learned how to improve their condition through "trial and error" experiences (Smith, 1978). These improvements included the beginnings of pest control or pest management, the preferred term today.

Cutler (1978) indicated chemical technology revolutionized agriculture in the past generation.

Since World War II, U.S. farmers have sought to increase yields in relation to costs. To accomplish this, hundreds of chemicals were used to increase productivity, protect crops, and decrease labor requirements.

In the beginning, at least, too little thought was given to the eventual consequences of chemical use to the environment and to people.

Side-effects and long-term impacts of the chemicals were unknown or ignored.

It did not take long before the inevitable controversy occurred, and the push-and-shove between farmers and chemical suppliers and environmentalists often became bitter.

Clearly, chemicals were and are essential to the maintenance and increase of agricultural production (Cutler, 1978). The problem was then: How are farmers to use chemicals with least adverse impact on the environment? According to Cutler, the solution largely resided in the regulation of the use and application of chemicals.

As the pest problems intensified in crop protection, the debate over the matter also intensified (Smith, 1978; Cutler, 1978). These pest problems, combined with increased awareness of a world food crisis, motivated government and institutional actions supportive of the development of integrated pest management systems for major agroecosystems in the United States.

According to Smith (1978), a major step toward development of IPM programs was taken by the federal government in 1972. In his message on environmental protection, the President of the United States directed the cognizant agencies of government to take immediate action toward development of pest management programs in order to protect: (1) the nation's food supply against the ravages of pests, (2) the health of the population, and (3) the environment (Smith, 1978). The President's directive prompted funding of a national research project involving 19 universities and various federal agencies entitled "The Principles, Strategies, and Tactics of Pest Population Regulation and Control in Major Crop Ecosystems." Also, according to Smith, other programs initiated in 1972

were pilot projects for implementing pest management programs in the various states, curriculum development for training and certification of crop protection specialists by the land-grant universities, and pilot pest management research projects within the USDA's Agricultural Research Service in collaboration with state groups. These actions were paralleled with an intensification of pest management research within state agricultural experiment stations and federal agencies financed by both state and federal sources.

Corbet and Smith (1976) indicated integrated control has received increasing attention during the last 10 to 15 years largely because of two related circumstances: (1) man has become increasingly reliant on chemical pesticides for crop protection and (2) at the same time, he has become increasingly aware that such pesticides can have harmful effects. They further stated:

> Most pests that man attempts to control consciously are today suppressed solely by chemicals, many of which are administered as preventative sprays, that is by the application of pesticides according to the calendar and without reference to current pest density (p. 672).

Muir (1978, p. 4) stated: "During the past decade, the most dramatic pesticide increase has been in the use of herbicides to replace hand labor and machine cultivation in controlling weeds in agricultural crops."

The problems producers and the general public encounter with pests are not at an end or even near end in spite of the over-use of chemicals. Pimentel (1978) indicated that currently, an estimated 33 percent of all crops in the United States is lost to pests (13 percent to insects, 12 percent to pathogens, and 8 percent to weeds), in spite of all pesticides and bioenvironmental controls used.

Such problems with pests combined with chemical over-use gave cause for national concern (Muir, 1978; Goldstein, 1978; Smith, 1978; vonRumker, 1974; Beal, 1965; Smith, 1978; Corbet and Smith, 1976; Smith and Pimentel, 1978). National leaders were also concerned with pest related problems and chemical over-use. President of the United States, Jimmy Carter, stated:

> I am instructing the council on Environmental Quality, at the conclusion of its ongoing review of IPM in the United States, to recommend actions which the federal government can take to encourage the development and application of pest management techniques which emphasize the use of natural biological controls like predators, pest-specific diseases, pest-resistant plant varieties and hormones, relying on chemical agents only as needed (cited by Goldstein, 1978, p. 57).

Another prominent figure, the Secretary of the United States Department of Agriculture, Bob Bergland, stated: "It is the policy of the United States Department of Agriculture to develop, practice, and encourage the use of IPM methods, systems and strategies that are practical, effective and energy efficient" (cited by Goldstein, 1978, p. 57). Also, the Assistant Secretary for Conservation, Research, and Education, United States Department of Agriculture, Rupert M. Cutler stated:

> We need to develop and use alternative tactics in IPM systems. We need to make sure that pesticides used in our programs meet the criteria of appropriateness and safety. And we need to constantly keep in mind that we serve all segments of the public--gardeners, small farmers, commercial farmers, forestry, households, food and fiber handling, storage and marketing enterprises. . . . The full support of our research efforts will be behind IPM strategies (cited by Goldstein, 1978, p. 57).

Based upon this type of support, agriculture is moving to replace routine spraying with treat-when-necessary programs (IPM programs) that are based on monitoring of pest and parasite/predator populations (Smith and Pimentel, 1978). At the same time, some research is now being

focused on integrating pest control in total agricultural systems management. With this approach, maximum benefits with minimum risks should be possible for agriculture and society. In sum, according to Adkisson (1978) and numerous others, IPM, while confronting controversial issues in the past, gained rapid acceptance by farmers and the general public as the best way to control pests that were devouring their crops no matter how much pesticide they used.

The Role of the USDA in IPM

Over the years, the USDA has strived to maintain a balanced program on pests and on the management of pest problems in its research, development, education, regulatory, and action programs (Cutler, 1978). Research efforts included such things as research on pest biology and ecology; alternative methods and systems of pest management; new use patterns of pesticides with reduced hazard to humans and nontarget species; toxicology, behavior, and fate of pesticides in the environmental impact of pest management.

According to Cutler (1978), one of the Department's most progressive moves in recent years in the area of pest management was the Extension Integrated Pest Management Program which was initiated in 1971. The objectives of this program were to develop and implement an effective, integrated program to prevent or mitigate losses caused by pests through the use of biological, cultural, chemicals, and varietal methods of control; to develop methods for monitoring pest populations in farmers' fields; and to provide producers, consulting firms, and farmers' cooperatives with information and training in the principles of Integrated Pest Mangement (IPM).

The goal of the Extension education pilot project was to teach farmers, ranchers, and homeowners how to carry out more effective pest controls; protect natural enemies; implement, where feasible, nonchemical means of controlling pests; and apply pesticides on an "as-needed" basis (Cutler, 1978).

The USDA has a major role in IPM, not only as a governing agency responsible to the farmers and the general public of the United States, but also because the USDA has oversight responsibility for over 70 million acres of federal forests and 350 million acres of cropland.

However, the role of the USDA is broader than research, development, technology transfer, and action programs. It also includes the obligation of providing responsible leadership in the use of IPM strategies in all areas of agriculture and natural resources.

Another obligation of the USDA is that of working closely and cooperatively with the Environmental Protection Agency, other agencies, states, industries, groups, and associations to accomplish natural goals of IPM.

The Role of OSU in IPM

Farmers, university researchers, and extension people learned early that it is virtually impossible to eradicate any crop pest (Sholar, 1978). Although the tools for controlling crop pests (weeds, diseases, and insects) have been vastly improved, Oklahoma crops are still subject to pest outbreaks which can seriously damage or even totally destroy crops. Intensive control efforts such as multiple sprayings are frequently needed for controlling these pest outbreaks (Sholar, 1978). A more practical method for keeping these pests in check begins by careful

and regular observation of fields. These field checks allow for controlling pests before their numbers or damage become economically important.

Some farmers in Oklahoma do a good job of checking their fields for pests while others do an inadequate job. The OSU Extension Service is involved in programs to aid farmers in all phases of production, but particularly in the areas of pest detection and control, or IPM. The IPM program is a cooperative effort of several departments within the Division of Agriculture at OSU. The IPM program is designed to assist farmers with a plan for keeping pest numbers or damage within acceptable levels (Sholar, 1978). The IPM program encourages a combination of pest controls including chemicals, crop rotations, resistant varieties, and natural controls.

The essential element of IPM at OSU is a field monitoring or scouting program. In this program, trained scouts or growers themselves check fields to determine pest infestations and the need for and timing of pesticide applications.

The field scouting program helps accomplish the following:

1. Unnecessary, 'insurance' type pesticide applications are eliminated.

2. Grower profit margins are increased through elimination of unnecessary pesticide applications, and

3. Efficiency is gained in proper timing of pesticide applications resulting in better pest control and less abuse of the environment by unneeded pesticides (Sholar, 1978, p. 2).

Some of the services provided by the field scout include: (1) insect identification and recommendations for control, (2) disease identification, (3) weed identification and mapping recommendations for

control, and (4) soil sampling. Other pests may be equally important and the scout will leave a field report to inform the grower on any pest problems and need for control.

OSU supports IPM strategies in important crops in Oklahoma including alfalfa, cotton, wheat, grain sorghums, peanuts, and soybeans. According to Sholar (1978), OSU does so in two ways:

1. Strong continued support to existing farmer organizations and commercial concerns currently involved in IPM, and;

2. Educational emphasis for IPM in all Cooperative Extension Service on-going educational programs. It is OSU's strong belief that an intensive educational effort is a prerequisite to a successful IPM program (p. 2).

OSU recognizes that crops and pests may be mismanaged when appropriate information is unavailable or does not reach producers. Therefore, OSU suggests an organized pest management program holds excellent potential for providing guidance to producers (Sholar, 1980).

According to Sholar (1980), the delivery system for providing appropriate pest and production information is already in place. County Extension Directors and Area Specialized Agents conduct educational meetings, prepare news articles and newsletters, conduct radio programs, and make numerous personal contacts with growers. In addition to providing information through traditional Extension Service programs, farm service companies (i.e., applicators, dealers) serve as multipliers of information provided to them. In light of the educational efforts of OSU regarding IPM, the question remains, "Just how much of this information is actually getting to how many producers?" (Bowers, 1980).

The Efficacy of IPM

Today's farmer has never been confronted with more management

decisions. He routinely selects land, seed variety, planting dates and rates, pest control measures, fertility programs, equipment, and a multitude of other factors affecting his crop production. Today's agriculture requires precision for a producer to be able to remain competitive within narrow profit margins. The producer must take advantage of all available resources to make proper decisions and selections in his crop production program (Sholar, 1979). The IPM program offers the producer an additional resource in the decision making process by providing him with regular information and recommendations on pest problems.

According to Smith (1978), 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 judgement in technical matters of pest control. Therefore, he often seeks outside advice.

In a typical year, any number of problems can befall a crop. And more often than not, these problems strike without much warning. However, according to Syd (1980), farmers are improving their ability to monitor crop progress and predict problems before they occur.

Riedl and Allen (1978, p. 8) stated: "Farmers have become more willing to accept integrated control strategies because of past difficulties with total reliance on chemical control."

The USDA estimates that approximately seven million acres of cropland in the United States were under some form of IPM treatment in 1977 (Goldstein, 1978). The most significant use has been on cotton. The list of crops on which IPM has worked is seemingly endless. Huffaker (1971), of the University of California, cites its effectiveness on cotton, apples, alfalfa, corn, pine forests, cereals, and citrus.

Gutierrez (1978, p. 11) further supports IPM's benefits by stating, "Integrated pest control, by whatever method is already proving itself." And, according to numerous others, as quoted by Goldstein (1978, p. 14), "Programs backed by field scouting have already saved growers in some areas thousands of dollars."

IPM has been implemented and analyzed and, according to many reports, it works well on many crops. IPM principles are now being applied to many others. Since 1972, the USDA Extension Service has funded more than 40 pilot programs in 33 states, involving 16 commodities (An Integrated Pest Management Primer, 1980).

Many farmers in IPM programs have reduced pesticide use and cost by 30 to 50 percent compared to conventional approaches. Some examples are as follows:

> The IPM program brought a decline in insecticide use in one area from 12 to 6.4 pounds per acre, while cotton yields increased greatly.
>
> In Washington, integrated programs have a reduced pesticide use by 50 percent. In the Midwest and the East a reduction of 20 to 30 percent has already been realized by a program which started only recently (Kendrick, 1978, p. 5).

Other examples of crops with which IPM has been successful includes: grapes (Peacock et al., 1978), pears (Barnett et al., 1978), walnut orchards (Barnes et al., 1978), olives (Shoemaker et al., 1978), almonds (Rice et al., 1978), and cotton (Adkisson, 1980) just to mention a few.

In a 1975 Evaluation of Pest Management Programs for Cotton, Peanuts, and Tobacco in the U.S., 25 programs were studied indicating that:

> Crop yield actually increased in 72% of the programs. No farmers reported any decreases. Pesticide use was decreased in 86% of the programs. It increased in only 14%. Production costs decreased in 85% of the programs. Costs increased in only 14%. Profit increased in 95% of the programs. There was a slight decrease (5.0%) in only one program--and this was

attributed to weather factors (cited in An Integrated Pest Management Primer, 1980, p. 4).

Many similar experiences and studies show that farmers reduced pesticide use between one-third and two-thirds, using IPM methods, with negligible profit differential between IPM and conventional pest control (Goldstein, 1978). Many farmers, in fact, reported increased profit by using less pesticides. Yields were maintained with IPM methods and total pest management expenditures were reduced, with more outlay going for services of commercial scouts and entomologists. The United States can still be the world's largest food producer without relying so totally upon agricultural chemicals.

According to Carlson and Castle (1972), further evidence of the benefits of pest control come from: (1) people's willingness to pay for the controls and control research, (2) increased crop yields, or (3) value of resources released for use elsewhere in the economy.

Also, the economics of IPM get glowing marks. In California alone, estimated DeBach (1974), a leading IPM figure, producers and consumers of agricultural products have saved almost $300 million since 1923. Evaluation of IPM programs consistently verify its financial payoff.

Smith and van den Bosch (1967, p. 334) stated, "The remark is frequently made that there is nothing unique about integrated control; it is simply good pest control."

At OSU, and across the nation, grower surveys indicate that growers have accepted IPM practices in many crops. Growers have proven to be willing to accept that IPM is a tool that fits into a total crop production system and is not just a separate program. From feedback provided by growers in Oklahoma and across the nation, it has been indicated that

they feel that pest management does provide a good return on their investment.

Even though the support for IPM comes from many growers across the nation, there remain a few persons (although not many) who question IPM's success and particularly question some of the people's motives who are involved with IPM programs. Goldstein (1978, p. 12) stated, "The farmer is not stupid. He will not buy and apply more pesticide than he needs for maximum profits and crop yields." According to Goldstein, words to that effect seem to be spoken whenever the topic of a commercial "support system" for IPM comes up. The debate arises over the question of a conflict of interest when members of the pesticide industry--salesmen or applicators--are at the same time offering their services as advisors in IPM programs. Also, since IPM represents a strategy for reducing pesticide use, the incentives for independent IPM consultants and pesticide salesmen are vastly different. Hall (1978, p. 10) seemed to agree; however, he implied, "The profitability depends upon the particular consultant hired."

According to Smith and van den Bosch (1967):

> The grower wants quick, effective, uncomplicated, low-cost pest control. The chemical industry desires inexpensive, widely effective highly competitive products that will be at an advantage in the battle for markets. The consumer wants high qaulity inexpensive produce unmarred by pest damage and uncontaminated by insect pests (p. 336).

More recently, Kendrick (1979) stated:

> I am concerned that serious disappointments will arise in the years ahead among some of the present proponents unless there is a clearer understanding of what is meant by the IPM approach. It is important that the potential achievements of IPM not be oversold or misunderstood (p. 3).

Kendrick further stated:

> There are further degrees of validity in each group's (growers, chemical industry, and consumers) expectations about the benefits of IPM, but those close to the program recognize clearly that it is still in its infancy and does not offer a panacea for pest control. It will take time and much dedicated work to accumulate and analyze new data before we can expect to see the adoption of IPM across the entire spectrum of crop and livestock production (p. 3).

Review of Related Literature

Research funds have yielded significant data on specific methods and benefits of IPM programs; however, scarcely any projects have addressed questions related to information delivery systems of IPM, or specifically, for which reasons producers decide to use (or not use) IPM practices, and for that matter, no projects have addressed questions related to the producer's awareness of IPM. There are, however, two studies, both of midwestern Corn Belt farmers, which offer relevant data. One is "Farmers' Pesticide Use Decisions and Attitudes on Alternate Crop Protection Methods" (von Rumker, 1974) and the other is "Motivations and Practices of Organic Farmers" (Beal et al., 1965).

von Rumker (1974) investigated 297 farmers in Iowa and Illinois who supplied comprehensive answers about their farming, crop protection practices, and information services. The investigation yielded the following information: (1) farmers receive information on pesticides primarily from pesticide sellers, labels, and other farmers; (2) pesticide industry representatives and sellers outnumbered extension personnel by such wide margins that extension messages about IPM do not reach a significant number of growers directly; and (3) farmers are generally unaware of how current crop protection decisions may entail hidden future costs. von Rumker further stated, "Chemical herbicides,

insecticides, fungicides and fertilizers are often applied to the same land year after year by the farmers interviewed" (n.p.).

Beal, Bohlen, and Lingren (1965) conducted personal interviews of 229 farmers who farmed at least 70 acres and personally made the major management decisions. The farmers were asked to indicate which of the 29 specified sources of information on pesticides they were then using. Some of the responses are included as follows in rank order: (1) farm magazines and farm papers, 94.3 percent; (2) pesticide label, 90.4 percent; (3) other farmers in the community, 67.7 percent; (4) local agricultural chemical dealers, 60.7 percent; (5) radio, 48.9 percent; (6) county extension personnel, 47.6 percent; and last in the list of 29 specified sources--Iowa Farm Science Publication, 10.0 percent.

von Rumker (1974) and Beal, Bohlen, and Lingren (1965) further implied there is a need for greater attention toward encouraging private sector development of the IPM program, if the strategy of IPM is to be effectively implemented by the farmers. von Rumker stated:

> Most (but not all) extension workers believe that it is beyond the scope of the federal/state cooperative extension service to furnish specific crop protection advice to individual growers on a regular basis. They point out that the extension service does not have the personnel to check more than a limited number of fields on an irregular basis and suggests that there may be a need for independent private enterprise crop protection consultants (n.p.).

In sum, von Rumker (1974) found that many farmers interviewed were interested in receiving individualized, special advice on crop protection, and about one-half of the respondents expressed a willingness to pay a fee for such a service.

Summary

This review of literature presented background information with emphasis on five areas: the history of IPM, the role of the USDA in IPM, the role of OSU in IPM, the efficacy of IPM, and a review of related literature.

The world's looming food shortage demands maximum food productivity (Huffaker and Messenger, 1976). Heavy use of pesticides has played a significant role in meeting food demands as well as in alleviating insect-borne human disease. However, the extensive (often excessive) use of these powerful broad-spectrum chemicals, some of which are non-biodegradable, has resulted in a variety of harmful and undesirable effects on wildlife, man, and the environment. Moreover, a shortage of synthetic pesticides makes it mandatory that the general public use the limited supplies wisely. This must be done not only to help alleviate the pesticide-induced environmental problem, but to conserve the limited supplies of the much needed pesticides themselves, for chemicals remain the most effective immediate solution to pest problems. Huffaker and Messenger (1976, p. xix) stated that, "Chemicals are not the only, or indeed the best solution to the pest problem."

Useful and imaginative research concerning integrated control of weeds, insects, and diseases is being conducted at agricultural research centers, universities, experiment stations, and on individual farms throughout the world (Goldstein, 1978). These large scale studies also measure the economic consequences of altering present pest control practices and substituting alternative strategies. The range of projects verifies the potential of IPM for all food and fiber production.

In a relatively short period of time, IPM programs have been implemented and analyzed. The conclusion that can be drawn from these numerous studies are: (1) IPM programs can result in savings to growers through reduced use of pesticides, (2) participation of growers in IPM programs brings about a change in outlook regarding the use of pesticides, and (3) growers are willing to bear some of the cost of IPM programs once their effectiveness has been demonstrated.

Some crop protection specialists continue to discredit the IPM concept as representing only new jargon applied to long-established crop protection practices (Smith, 1978). IPM is not a disjunct development in crop protection; however, it is an evolutionary stage in pest control strategy. IPM represents a new conceptual approach that sets crop protection in a new context within a crop protection system. Many components of IPM were developed long ago, but IPM is now conceived as unique: based on ecological principles, it integrates multi-disciplinary methodologies in developing agroecosystem management strategies that are practical, effective, economical, and protective of both public health and the environment.

According to Kendrick (1978) and Hall (1978), the key ingredient of IPM is information. They implied that IPM is an information technology, where information and knowledge are substituted for pesticides. Smith and van den Bosch (1967, p. 295) stated, "The IPM approach will not come about simply because we want it to. It entails intensive and well-balanced training, high competence, objectivity, ingenuity, cooperativeness, dedication, and perserverance."

IPM has proven itself to be successful; nevertheless, throughout the literature related to IPM, one point seems to "stand-out" clearly:

that is, the lack of information being available to producers of farm crops. IPM information delivery systems are a major concern of many who are involved with IPM. The President's Science Advisory Committee (1965, p. 286), in a report entitled "Restoring the Quality of our Environment," stated, "No matter how effective techniques of pest control may be, if they are adopted and used successfully by growers, it will be necessary to educate extension specialists and county agents in their use." Smith (1978, p. 310) further supported the President's Science Advisory Committee with the following statement, "The implementation of IPM is largely an educational process, and the land-grant university with its interacting programs of teaching, research, and extension is uniquely qualified to provide the needed leadership."

In conclusion, the review of literature indicated that the research previously conducted has been beneficial to the Integrated Pest Management programs and continued research is necessary to strengthen IPM programs for the future. Perhaps McKelvey (1972, p. 8) sums the review of literature related to IPM programs in his statement, "A realistic strategy for the management of pest populations depends on a thorough understanding of the goals to be achieved."

CHAPTER III

DESIGN AND METHODOLOGY

Introduction

The purpose of this chapter is to illustrate 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, the sample was determined and the instrument was developed for data collection. A procedure was established and methods of data analyses were selected. Information was collected during the months of December, 1980, and January, 1981.

This study was coordinated with the assistance and cooperation of the OSU Extension Pest Management Specialist (Chairman of the IPM Steering Committee), the Agricultural Program Director of the Oklahoma Cooperative Extension Service, and the Oklahoma Cooperative Extension Service County Director from each of the counties (Garfield, Grant, Kay, and Noble) of the four-county area of north central Oklahoma, which were included in this study, and the investigator's graduate committee members.

The telephone survey instrument developed for this study was designed to elicit information concerning the awareness of the north central Oklahoma wheat producers of the Integrated Pest Management (IPM) program and to elicit information pertaining to specific wheat production problems encountered by the wheat producers.

The Sample

The sample for this study was derived from the list of names and mailing addresses of farmers who resided and farmed in the four-county area of north central Oklahoma. The names and mailing addresses of the farmers were provided to the investigator courtesy of the Cooperative Extension Service County Director from each of the four counties. The Garfield County Director provided telephone numbers in addition to mailing addresses. Also, the Garfield County Director provided the investigator with an approximation of who and how many of the farmers in Garfield County produced wheat. The County Directors from Grant, Kay, and Noble Counties provided only the names and mailing addresses of the farmers in their respective counties.

To accomplish the purpose of this study, it was considered unfeasible, from the standpoint of time and money, to attempt to survey the entire population of farmers in the four-county area of north central Oklahoma. Also, there was no valid evidence that all farmers produced wheat. However, based on reliable sources, it was estimated that approximately 90 percent of the farmers in Garfield County produced wheat. This percentage was inferred to the other three counties because of the close proximity of the four counties involved in the survey. Thus, the investigator felt confident that a sample of the total number of farmers would yield sufficient data that could be inferred to all farmers who were specifically wheat producers in the four-county area of north central Oklahoma.

The total number of farmers whose names appeared on the mailing list acquired from the four-county area was 2,885. Therefore, a method for selecting a sample size for a large population (2,885) was obtained from

Cochran (1963), in his book entitled Sampling Techniques. The formula is given as follows:

$$n = \frac{\frac{t^2PQ}{d^2}}{1 + \left[\frac{1}{N}\left(\frac{t^2PQ}{d^2} - 1\right)\right]} .$$

Where:

t = 2.326

P = .5

Q = 1 - P = .5

d = .02

N = 2,885

n = sample size needed = 1,556

Due to the need for an accurate representation of the entire population of wheat producers in the four-county area of north central Oklahoma, a confidence interval of .98 was chosen. This confidence interval would allow generalization back to the population of wheat producers in the four-county area. Cochran's (1963) formula showed a representative sample of 1,556 wheat producers would provide the required sample to insure the .98 confidence interval needed.

Sampling Method

The sampling procedure selected was a stratified random sampling technique obtained from Bartz (1976), in his book entitled Basic Statistical Concepts in Education and the Behavioral Sciences. The sample was stratified by individual county (Appendix A) and individual county population of farmers. The individual county and corresponding individual county population of farmers were as follows: Garfield, 766;

Grant, 1,026; Kay, 518; and Noble, 575. The total population of the four counties was 2,885.

In order to determine the percentage of farmers to be drawn from each county, the total population of farmers in the four-county area and the total population of farmers in each county was utilized. The total population of farmers (2,885) was used as the divisor and the total population of farmers per county was used as the dividend. For example:

$$\frac{\text{766 total population of farmers in Garfield County}}{\text{2,885 total population of farmers}} = \text{26.55\% of sample}$$

The percentage computed from the above formula for each county was multiplied by the total sample size (1,556) to determine the number of farmers required to constitute the sample selected from each county. For example:

$$\text{26.55\% of sample Garfield County} \times \text{1,556 sample size} = \text{413 farmers selected from Garfield County}$$

The same procedure was used to determine the random sample of farmers in each county surveyed in this study. The resulting sample size can be seen in Table I by counties for the entire sample population of farmers (1,556). It is important to note that the figures used for the total county population of farmers were based on the list of farmers' names and mailing addresses provided to the investigator courtesy of the Oklahoma Cooperative Extension Service County Director from each county. There was no certainty of how many of the farmers actually produced wheat; however, since the four-county area was a major wheat producing area (1,226,000 acres of wheat in 1978 [Sholar, 1979]), the investigator was confident that at least the sample size of farmers (1,556) produced wheat.

TABLE I

SAMPLE SIZE BY COUNTY

County	Total Population of Producers	Sample Size	Percentage of Total Sample
Garfield	766	413	26.55
Grant	1,026	554	33.57
Kay	518	279	17.95
Noble	575	310	19.93
Total	2,885	1,556	100.00

Random Selection of Individuals

The sampling procedure for selecting farmers was a random sampling technique obtained from Bartz (1976). The sample of farmers was chosen in such a way that each farmer had an equal chance of being included in the sample. According to Bartz, the generally accepted method of obtaining a random sample was to use the much preferred table of random numbers. Bartz further stated:

> A table of random numbers is a collection of random numbers, random in that any digit or any grouping of four digits bears no relationship to any other digit or grouping of digits in the table. In other words, in any position in the table of random numbers, each digit from 0 to 9 has an equal chance of appearing (p. 153).

Several steps were then followed in the sampling procedure. The first included assigning a number to each farmer whose name and mailing address was on the list of farmers within a particular individual county. The first farmer on the list was assigned the number one and the last

farmer was respectively assigned the largest number. For example, Garfield County contained a total population of 766 farmers. Numbers were assigned to each farmer from 1 to 766. The second step involved Bartz's (1976) table of random numbers. From the starting point within the table of random numbers, as many numbers from the columns (maintaining consistent direction--laterally to the right) were drawn as needed to obtain the required sample size per county. For example, Garfield County required 413 randomly selected farmers. Once the 413 randomly selected farmers were obtained, the selection procedure ceased for Garfield County. It is important to note that duplicate numbers were ignored by the investigator and the next non-duplicate number was selected to be included in the sample. The farmers whose assigned number corresponded to the randomly selected number constituted the sample. The preceding process of randomly selecting farmers was repeated for each of the remaining counties (Grant, Kay, and Noble).

The third step involved securing telephone numbers for the farmers who had been randomly selected. The latest editions of public telephone directories were utilized to locate the telephone numbers. This included only three counties (Grant, Kay, and Noble) because the telephone numbers of farmers residing in Garfield County were provided to the investigator courtesy of the Garfield County Cooperative Extension Service County Director. Precaution was taken by the investigator to cross-check the list of names of the farmers in the four-county area to determine if a particular farmer was on more than one county's mailing list. This was done to insure that the farmer would only appear in the random selection once. If a farmer was on more than one county's list, the farmer was assigned to the county in which he resided.

The fourth and final step involved replacement of randomly selected farmers who, when contacted by telephone, were discovered not bo be wheat producers; or, who did not have access to telephone service. In other words, the randomly selected farmer who did not produce wheat nor have access to telephone service was replaced with the next randomly selected farmer drawn from Bartz's (1976) table of random numbers. It was estimated that an "over-sample" of 25 percent would be sufficient for replacement purposes. Therefore, the following number of farmers randomly drawn for "over-sample" purposes, per county, was determined to be necessary: Garfield, 104; Grant, 139; Kay, 68; and Noble, 78. The total "over-sample" was 389 randomly selected farmers.

An acceptable randomly selected farmer was one who produced wheat, resided in the county, had access to telephone service, and was given an opportunity to respond to the telephone survey.

Selection and Development of the Instrument

In the preparation of an instrument to meet the objectives of the study, the first step was to review and evaluate the instruments used in related studies.

In analyzing various methods of data gathering, the questionnaire and interview methods were determined the most appropriate to meet the study objectives. Wallace (1954) provided the following information regarding questionnaires:

> Although mail questionnaires are often the most practical and economical method of obtaining data, some investigators hesitate to employ them because they tend to yield low percentage of returns and relatively incomplete responses (p. 40).

According to Levine and Gordon (1958), the degree to which a questionnaire elicits the desired information depends considerably upon the

manner in which it is constructed. Despite the most diligent effort in respondent preparation and questionnaire design, a considerable number of respondents will fail to respond to the initial mailing. Researchers have stated that first mailings will generally produce a percentage return up to 40 percent. Other researchers consider 40 percent an optimistic percentage, with 20 to 30 percent more realistic.

Interviews are conducted orally, in-person, by administering a structured set of questions to each member of the sample. However, the interview technique is generally expensive and time consuming, and usually involves smaller samples. Due to the expense and time required to conduct personal interviews, this method was deleted from consideration.

In several research studies conducted by the Oklahoma State Department of Vocational-Technical Education, the use of the telephone interview provided response rates of 93 and 95 percent. Also, a research study conducted by Cosner (1980) employed the utilization of the telephone interview technique of surveying. Cosner's research study yielded a 66 percent plus response rate as a result of surveying an infinitely large population (approximately 2.6 million individuals) with a sample size of 2,401 individuals.

A review of the economics (expenditures) of Cosner's (1980) research caused the investigator to conclude the telephone survey-interview to be as economical, if not more so, as other more conventional data gathering techniques (such as the mailed questionnaire); and certainly, based on these past studies, the assurance of a high yield of data seemed apparent to the investigator.

Based on the success of past telephone survey-interviews, the high response rate provided by the use of the telephone interview prompted the investigator to utilize the telephone survey-interview as a method of data gathering.

After determining the telephone survey-interview as being the most appropriate method of data gathering, several steps were taken to make the instrument useful for determining the wheat producer's awareness of the IPM program which was recently initiated in the four-county area of north central Oklahoma. The steps are detailed as follows:

The first step in the preparation of the interview schedule was to compile a list of general questions that were relevant to determining the wheat producer's awareness of the IPM program. In addition, to aid in direction of the IPM program in the future, it was determined pertinent to ask the wheat producers questions pertaining to their current wheat production problems. These questions were derived from related studies (primarily von Rumker [1974] and Beal [1965]) and interviews with the OSU Extension Pest Management Specialist who chairs the IPM Steering Committee, the Agricultural Program Director of the Oklahoma Cooperative Extension Service, and a member of the investigator's graduate committee. Input regarding the questions to be used in the interview schedule was utilized from several others and revisions were made accordingly.

The second step was to make the necessary revisions and then test the applicability and continuity of the questions to be used. The questions were used in numerous mock telephone interviews. Several valid comments and questions were raised by the persons cooperating in the mock telephone interviews. This allowed the investigator to strengthen

several areas within the interview schedule. Step two was repeated numerous times.

The third step was to provide the OSU Extension Pest Management Specialist, the Agricultural Program Director of the Oklahoma Cooperative Extension Service, and the investigator's graduate committee member with a copy of the revised interview schedule for their reaction and comments.

The fourth step was to take into consideration the comments and any suggestions for improving the interview schedule. The interview schedule was then again used in numerous mock telephone interviews.

The fifth step included a meeting of the investigator and the Cooperative Extension County Directors of each of the four counties to be surveyed (Garfield, Grant, Kay, and Noble). The County Directors were provided with copies of the interview schedule. Their comments, suggestions, and cooperation proved to be invaluable. It was pertinent the County Directors be informed and involved in the development of the interview schedule, primarily due to the fact that they would probably be contacted and questioned by the farmers in their county pertaining to the nature of the survey. During the course of the meeting, the County Directors consented to cooperate in securing a list of names of the farmers in their county which would be provided to the investigator and they consented to releasing a news bulletin, informing the farmers in their county that they would be contacted by a team of researchers from OSU pertaining to IPM (Appendix B). The County Directors requested to be notified in advance of the starting date of the telephoning. The OSU Extension Pest Management Specialist agreed to notify the County Directors and forwarded a letter of notification to them prior to the start of the telephone survey (Appendix C).

The sixth step included having the interview schedule typed and copies given to the Associate Director of the Oklahoma Cooperative Extension Service, the Agricultural Program Director of the Oklahoma Cooperative Extension Service, the OSU Extension Pest Management Specialist (Chairman of the IPM Steering Committee), and members of the investigator's graduate committee members to gain their final approval. Upon receiving additional comments, the interview schedule was considered ready for use.

The seventh step was to develop a system for coding each of the questions on the interview schedule. The coding system was needed to provide a method of ease and consistency in keypunching answer sheets for the interview schedule. To accomplish this, an interview schedule containing a built-in coding system was developed and implemented.

Throughout the process of developing the interview schedule, the length of the instrument was of concern. Several individuals felt that it would be extremely difficult to get people to provided needed information if the interview schedule was too long. The length of the interview was carefully considered in the preparation of the interview schedule. The interview survey was designed to require a minimum amount of the respondent's time and yet provide the needed information. It was felt that the final interview survey could be completed within five to seven minutes, depending on the caller and the respondent.

The final step included conducting a telephone survey to test the interview schedule. This was accomplished by telephone interviewing 10 wheat producers in Payne County, Oklahoma, whose names were provided to the investigator courtesy of the Payne County Cooperative Extension Service County Director. The results of the survey were tabulated by

the investigator and then analyzed. The results, conclusions, and recommendations of the survey-test were typed and copies were distributed to the Cooperative Extension Service County Directors of Payne, Garfield, Grant, Noble, and Kay Counties; the OSU Extension Pest Management Specialist (Chairman of the IPM Steering Committee); the Agricultural Program Director of the Oklahoma Cooperative Extension Service, and the investigator's graduate committee members.

It was then concluded the interview schedule was ready to be administered to the farmers who produced wheat, had access to telephone service, and resided in the four-county area of north central Oklahoma.

In its final form, most of the questions on the interview schedule utilized the forced-response format with a "don't know/not sure" option. This format allowed data of a quantitative nature to be obtained, thereby facilitating analysis of the data. There were also several open-ended questions on the interview schedule which were designed to obtain qualitative responses. The final form of the instrument survey may be found in Appendix D.

The survey instrument used for this study contained 15 questions specifically related to integrated pest management (IPM), 17 questions specifically related to wheat production and wheat production problems, and five questions pertaining to the respondent's personal demographic data. The questions or items used may be classified under one of the following seven divisions:

1. Wheat producers' current practices of scouting wheat to detect major pest problems.

2. Problems encountered by the wheat producers in their production of wheat.

3. Wheat producers' awareness of the IPM program.

4. Advantages and disadvantages of the IPM program as perceived by the wheat producers who actually practice IPM.

5. Wheat producers' sources of information relating to their production of wheat.

6. Factors influencing the wheat producers' farming practices and decision-making processes.

7. Personal data.

A copy of the interview schedule may be found in Appendix D.

Coordination of the Survey

Considerable effort was exhausted to insure proper coordination and understanding of the interview instrument and its component parts, as well as the purpose of this study, by the individuals participating in the telephone survey. These individuals included: the OSU Extension Pest Management Specialist (Chairman of the IPM Steering Committee); the Agricultural Program Director of the Oklahoma Cooperative Extension Service; the Cooperative Extension County Directors of Garfield, Grant, Kay, and Noble Counties; the investigator's graduate commitee members; and the individuals employed to telephone the farmers in the four-county area of north central Oklahoma. The primary effort of coordination and understanding of the survey and the interview instrument was directed toward the County Directors and the individuals employed to telephone the farmers.

It was determined to be absolutely necessary to involve the County Directors of each county to be surveyed in the four-county area. This was considered necessary in order that the County Directors would be

fully aware of the purpose and objectives of this study. The County Directors were receptive to this study and extended their cooperation in whatever way necessary to aid in making the survey successful. They expressed their cooperation by providing to the investigator the names and mailing addresses of the farmers in their respective counties. In addition, the County Directors submitted news releases within their respective counties in an attempt to notify farmers within their counties in advance of the purpose and nature of the telephone inquiry pertaining to IPM (Appendix B).

Realizing the individuals (callers) who were employed to telephone the farmers lacked technical knowledge concerning IPM, wheat, and wheat production, the investigator determined it necessary to conduct an orientation of the callers before the telephoning began. Considerable time was devoted to the callers providing them with technical information concerning IPM, wheat, and wheat production. Just as importantly, the investigator sought consistency of the callers in their asking questions and seeking desired information; therefore, considerable amount of time was devoted to reviewing the survey instrument and its component parts. Toward the end of the orientation, the callers conducted mock telephone interviews among themselves and were then asked to mock interview the investigator via telephone. Once the investigator was satisfied the callers had acquired the consistency desired, the investigator then stressed that the interview of the farmers was to be as conversational as possible, thus not to appear to simply be reading from the survey instrument. It is important to note that the investigator stressed to the callers that if the farmer wished not to respond

to a particular question, the question would be dismissed and the following question would then be asked. The investigator further stressed that the farmers were not be be pressured in any way to respond to any question they chose not to respond to. The investigator wanted to be certain only voluntary responses would be secured from the farmers who responded to the telephone interview.

When it was determined that a general understanding of the interview instrument and the purpose of the study was satisfactorally acquired by the individuals concerned, the callers then proceeded to telephone the farmers on December 19, 1980. The hours established daily for calling were between 6:30 and 10:00 p.m. eacn evening, excluding holidays.

Analysis of Data

The survey involved attitudes, opinions, and subjective judgments which resulted in qualitative data. The survey was also designed to quantify the responses given, which allowed the use of statistical procedures to aid in the interpretation of the data.

To determine the wheat producers' awareness of the IPM program and to determine their specific wheat production problems, it was necessary to interview specifically those farmers who produced wheat regardless of whether they farmed part- or full-time and regardless of the number of acres of wheat which they farmed. Therefore, the first question (Question 1 on the survey instrument) was, "Do you produce or grow wheat?" If the response was "yes," then the caller proceeded to the next question. If the response was "no," the farmer was politely excused from further questioning and was not included as a respondent of the

survey. A response of "yes" to Question 1 qualified the farmer as an acceptable respondent. The respondent was then asked, "May we have a few minutes of your time to ask you a few questions?" (Question 2). If the response of the farmer to Question 2 was "no," the farmer was included in the survey as a "non-respondent wheat producer." If the response was "yes," the farmer was included in the survey as a "responding wheat producer" and then was asked the remaining questions on the survey instrument which applied directly to him and his awareness of IPM.

It is important to note that it was left to the discretion of the respondents whether or not to respond to any or all of the questions asked by the callers. The respondents were not forced or pressured to respond to any particular question or questions. The responses were totally voluntary; therefore, the total number of respondents per question varied. This occurred because some respondents chose not to respond to certain questions. For example: Some respondents volunteered a response when asked Question 37, "Would you mind estimating your gross farm income?" On the other hand, some respondents chose not to volunteer a response to Question 37.

The demographic data (Questions 33 through 37) obtained consisted of the location of the respondent's residence (rural farm residence, rural non-farm residence, or urban residence), age, educational level completed, percentage of gross farm income which came from the production of wheat, and gross farm income.

Throughout the survey, the respondents were allowed one answer per question, with the exception of Question 10 which was in essence a three-part question.

The population of this study was a stratified random sample of wheat producers who resided in a four-county area of north central Oklahoma and had access to telephone service. The information obtained from the telephone survey was classified as nominal and ordinal and, therefore, utilized as discrete data.

The information collected from the survey instrument was keypunched on International Business Machine (IBM) cards and a Statistical Analysis System (SAS) 76 program developed by Barr, Goodnight, Sall, and Helwig (1976) was utilized in initiating statistical computations by the IBM System 370, Model 158 computer. Also, a record was kept of the qualitative information collected from the survey instrument. The qualitative information was tallied by the investigator and the frequency distribution (numbers and percentages) was reported accordingly.

Since the information collected from the survey was considered baseline data for a future research study, the investigator was interested in applying only descriptive statistics (frequency distributions--numbers and percentages). No other statistical manipulation was considered necessary.

According to Bartz (1976), descriptive statistics refers to the meaningful values which describe the result of a particular behavior. Key (1974) further added:

> The primary use of descriptive statistics is to describe information or data through the use of numbers. The characteristics of groups of numbers representing information or data are called descriptive statistics (Section S1, p. 3).

As a further explanation of descriptive statistics, Bartz (1976, p. 22) stated, "Basically the frequency distribution is simply a table constructed to show how many times a given score or group of scores occurred."

The statistical program utilized by SAS was a frequency procedure: "The FREQ procedure can produce one-way to n-way frequency and cross-tabulation tables. Tables can be produced for either numeric or character variables" (Barr et al., 1976, p. 120). Included in the frequency procedure were frequency counts and percentages. The frequency procedure was used on all data collected from the survey.

CHAPTER IV

PRESENTATION AND ANALYSIS OF DATA

Introduction

The purpose of this chapter is to describe the wheat producers' attitudes and practices concerning Integrated Pest Management and wheat production problems in ~~a~~ the four-county area of north central Oklahoma. In addition, it describes base-line data for future research efforts involving the impact of the OSU IPM program in wheat. Finally, it analyzes the data, presents and interprets the results.

Data collected in this study were from a stratified random sample of wheat producers. The characteristics of the producers who responded to the telephone survey are reported in frequency distributions. In the second section of this chapter, the frequency distributions of responses to each question pertaining to the respondents' wheat production problems are presented. Frequency distributions of responses to each question pertaining to the respondents' awareness, attitudes, and practices of IPM are reported in the third section of this chapter. In the final section, the frequency distributions of responses to each question pertaining to the respondents' wheat production attitudes and practices are presented.

Background of the Sample

The population of this study included 1,556 wheat producers residing

in a four-county area of north central Oklahoma, 18 years of age or older, having access to telephone service, and having their telephone number listed in a published telephone directory. These producers were dispersed among four Oklahoma counties as follows: 413 in Garfield County, 554 in Grant County, 279 in Kay County, and 310 in Noble County. However, of this number, 1,194 wheat producers cooperated by responding to the 37-item telephone survey. The 1,194 respondents comprised 76.74 percent of the 1,556 wheat producer sample.

General Characteristics of Respondents

The telephone survey instrument contained 10 questions designed to obtain personal information from each wheat producer concerning their residential location, age, educational level, percentage of gross farm income which came from the production of wheat, gross farm income, occupational time devoted to farming, number of years devoted to wheat production, main reason for producing wheat, bushels of wheat yielded per acre, and acres of wheat produced. In responding to the survey, not all questions were answered by all respondents; therefore, the "N" of different tables may vary.

In Table II, the number (N) and percentage (%) of respondents by their residential location is presented. Of the 1,174 respondents, 77.09 percent indicated their residence was rural farms. The remaining respondents, 22.91 percent, indicated their residence was either non-farm or urban.

Presented in Table III are the age categories of the wheat producers by number and percentage. The largest percentage (23.80) of the wheat

TABLE II

DISTRIBUTION OF RESPONDENTS BY RESIDENTIAL LOCATION

Location	Frequency Distribution	
	N	%
Rural Farm Residence	905	77.09
Rural Non-Farm Residence	41	3.49
Urban Residence	228	19.42
Total Responses	1,174	100.00

producers was 63 years of age or older. Considerably less than 1.0 percent of the wheat producers were 18 to 22 years of age. The categories including ages from 38 to 62 were closely distributed and accounted for more than 58 percent of the wheat producers surveyed.

TABLE III

DISTRIBUTION OF RESPONDENTS BY AGE

Age	Frequency Distribution	
	N	%
18 to 22	4	0.37
23 to 27	48	4.40
28 to 32	78	7.14
33 to 37	66	6.04
38 to 42	110	10.07
43 to 47	105	9.62
48 to 52	122	11.17
53 to 57	137	12.55
58 to 62	162	14.84
63 or Older	260	23.80
Total Respondents	1,092	100.00

In Table IV, the number and percentages of the respondents by their educational level are presented. Four hundred and eighty-six

respondents (44.38 percent) attended three to four years of high school. It should be noted that 42.74 percent of the respondents attended one to four years of college and 4.75 percent attended more than four years of college. More than 47.0 percent of the 1,095 respondents had received some college training.

TABLE IV

DISTRIBUTION OF RESPONDENTS BY HIGHEST LEVEL OF EDUCATION COMPLETED

Educational Level Completed	Frequency Distribution N	%
0 to 8 Years	53	4.84
1 to 2 Years of High School	36	3.29
3 to 4 Years of High School	486	44.38
1 to 2 Years of College	234	21.37
3 to 4 Years of College	234	21.37
Over 4 Years of College	52	4.75
Total Responses	1,095	100.00

52.51 + 47.49

52.51% had ≤ High school diploma

The number and percentages of respondents according to the percentage of gross farm income which came from the production of wheat is reported in Table V. Five hundred and ninety-one of the respondents (59.20 percent) indicated 41 to 80 percent of their gross farm income came from the production of wheat. Twenty-four of the respondents (2.40 percent)

indicated that 10 percent or less of their gross farm income came from the production of wheat. However, 146 of the respondents (14.65 percent) indicated that from 90 to 100 percent of their gross farm income came from the production of wheat.

TABLE V

DISTRIBUTION OF RESPONDENTS ACCORDING TO PERCENTAGE OF ESTIMATED GROSS FARM INCOME FROM THE PRODUCTION OF WHEAT

Percentage of Gross Farm Income	Frequency Distribution	
	N	%
1 to 10 Percent	24	2.40
11 to 20 Percent	25	2.50
21 to 30 Percent	53	5.31
31 to 40 Percent	67	6.72
41 to 50 Percent	148	14.82
51 to 60 Percent	102	10.22
61 to 70 Percent	140	14.02
71 to 80 Percent	201	20.14
81 to 90 Percent	92	9.22
91 to 100 Percent	146	14.65
Total Responses	998	100.00

In Table VI, the number and percentage of respondents in each level of gross farm income is presented. Six hundred and thirty-six wheat producers responded to the question pertaining to gross farm income. Of these 636 respondents, 114 or 17.92 percent of the respondents had gross farm incomes less than $20,000. Fifty-two of the respondents (8.18 percent) had gross farm incomes less than $10,000 and 63 of the respondents (9.74 percent) had gross farm incomes in excess of $200,000. The largest number of respondents, 156 or 24.55 percent, had gross farm incomes in the category of $50,000 to $100,000.

When asked whether they farmed part-time or full-time, 884 of the respondents (74.35 percent) indicated they farmed full-time and 305 of the respondents (25.65 percent) indicated they farmed part-time (see Table VII).

In Table VIII, the number and percentage of respondents in each level pertaining to the number of years they have produced wheat are presented. Eight hundred and thirty-seven of the respondents (70.28 percent) indicated they have produced wheat more than 20 years. Forty-nine of the respondents (4.18 percent) have produced wheat between one and five years. Three hundred and four respondents (25.54 percent) have produced wheat between 6 and 20 years.

The number and percentage of respondents according to the purpose or reason they produced wheat is presented in Table IX. The largest number of respondents, 1,084 (91.39 percent), produced or grew wheat so they could sell the grain commercially. Eleven of the respondents (0.93 percent) produced or grew wheat for ground cover purposes only (one example was a respondent who indicated he planted five acres of wheat beneath and around his pecan trees). Of the 1,186 respondents, 43

TABLE VI

DISTRIBUTION OF RESPONDENTS ACCORDING TO ESTIMATED GROSS FARM INCOME

Estimated Gross Farm Income	Frequency Distribution	
	N	%
Less than $2,500	7	1.10
$2,501 to $5,000	11	1.73
$5,001 to $7,500	11	1.73
$7,501 to $10,000	23	3.62
$10,001 to $20,000	62	9.74
$20,001 to $30,000	61	9.59
$30,001 to $40,000	45	7.07
$40,001 to $50,000	75	11.79
$50,001 to $100,000	156	24.55
$100,001 to $150,000	86	13.52
$150,001 to $200,000	37	5.82
Over $200,000	62	9.74
Total Responses	636	100.00

TABLE VII

DISTRIBUTION OF RESPONDENTS BY AMOUNT OF TIME DEVOTED TO FARMING

Time Devoted to Farming	Frequency Distribution	
	N	%
Part-Time	305	25.65
Full-Time	884	74.35
Total Responses	1,189	100.00

TABLE VIII

DISTRIBUTION OF RESPONDENTS BY NUMBER OF YEARS THEY HAVE PRODUCED WHEAT

Number of Years	Frequency Distribution	
	N	%
1 to 5 Years	49	4.18
6 to 10 Years	125	10.50
11 to 15 Years	91	7.65
16 to 20 Years	88	7.39
Over 20 Years	837	70.28
Total Responses	1,190	100.00

respondents (3.63 percent) produced certified wheat seed and 48 respondents (4.05 percent) produced wheat for livestock grazing purposes only.

TABLE IX

DISTRIBUTION OF RESPONDENTS BY WHY THEY GROW WHEAT

Why Grow Wheat	Frequency Distribution	
	%	%
Sell the Grain Commercially	1,084	91.39
Sell the Certified Seed	43	3.63
Grazing Livestock	48	4.05
Ground Cover	11	0.93
Total Responses	1,186	100.00

The frequency distribution of the number of bushels of wheat averaged per acre (yield), as reported by the respondents, is presented in Table X. In total, 1,116 wheat producers responded to the question pertaining to their yield. Nine hundred and five of the respondents (81.08 percent) reported bushels of wheat yielded per acre as being between 28 and 43 bushels. Of these 905 respondents, 311 (27.87 percent) reported yield per acre as being between 40 and 43 bushels. Of the total respondents, three of the respondents (0.27 percent) reported average yield per acre as being more than 55 bushels and nine of the

respondents (0.81 percent) reported average yield per acre as being less than 20 bushels.

TABLE X

DISTRIBUTION OF RESPONDENTS BY THE NUMBER OF BUSHELS OF WHEAT AVERAGED PER ACRE IN 1980

Bushels per Acre	Frequency Distribution	
	N	%
Less than 20	9	0.81
20 to 23	21	1.88
24 to 27	38	3.41
28 to 31	155	13.88
32 to 35	233	20.88
36 to 39	206	18.45
40 to 43	311	27.87
44 to 47	85	7.62
48 to 51	45	4.03
52 to 55	10	0.90
More than 55	3	0.27
Total Responses	1,116	100.00

In Table XI, the number and percentage of respondents, according to the number of acres of wheat farmed, is presented. Of the 1,148 respondents, 501 (43.65 percent) farmed 400 acres of wheat or less. Four

TABLE XI

DISTRIBUTION OF RESPONDENTS BY THE NUMBER OF ACRES OF WHEAT FARMED

Acres of Wheat Farmed	Frequency Distribution	
	N	%
1 to 200	255	22.22
201 to 400	246	21.43
401 to 600	176	15.33
601 to 800	177	15.42
801 to 1,000	93	8.10
1,001 to 1,200	60	5.23
1,201 to 1,400	27	2.35
1,401 to 1,600	38	3.31
1,601 to 1,800	16	1.39
1,801 to 2,000	27	2.35
2,001 to 2,200	5	0.44
2,201 to 2,400	6	0.52
2,401 to 2,600	6	0.52
2,601 to 2,800	3	0.26
2,801 to 3,000	4	0.35
More than 3,000	9	0.78
Total Responses	1,148	100.00

hundred and forty-six of the respondents (38.85 percent) farmed between 400 and 1,000 acres of wheat. One hundred and sixty-eight respondents (15.07 percent) farmed between 1,000 and 2,000 acres of wheat. Thirty-three respondents (2.87 percent) farmed more than 2,000 acres of wheat.

Responses to Questions Pertaining to Wheat Production Problems

In order to ascertain the major problems encountered by the respondents pertaining to their production of wheat, several related questions were developed and included as part of the survey questionnaire. In total, eight questions constituted the wheat production problem section of the questionnaire. The questions were numbered 3 through 10. It is important to note Question 10 was a three-part question (Appendix D).

In Table XII, the frequency distribution is reported for the following question: "At the present, is your wheat regularly checked or scouted by anyone to detect major problems?" Of the 1,194 respondents, 603 of the respondents (50.50 percent) indicated they regularly checked or scouted their wheat and 591 of the respondents (49.50 percent) indicated they did not regularly check or scout their wheat.

The 603 respondents who indicated they regularly checked or scouted their wheat to detect major pest problems were then asked the following question: "Who regularly checks or scouts your wheat?" Five hundred and twenty-three of the respondents (86.75 percent) indicated they checked or scouted the wheat themselves. Thirty-one of the respondents (5.14 percent) indicated either members of their immediate family or their employees checked or scouted the wheat. Of the 603 respondents, only 49 of the respondents (11.26 percent) indicated consultants (including Coop

fieldmen, Extension Service Specialists, County Extension Agents, and others) checked or scouted their wheat (see Table XIII).

TABLE XII

DISTRIBUTION OF RESPONDENTS WHOSE WHEAT WAS REGULARLY CHECKED OR SCOUTED BY ANYONE TO DETECT ANY MAJOR PROBLEMS

Wheat Checked or Scouted by Anyone	Frequency Distribution	
	N	%
Yes	603	50.50
No	591	49.50
Total Responses	1,194	100.00

To report "how regularly" the 603 respondents checked or scouted their wheat, Table XIV presents the number and percentage of the responses elicited from the respondents. Two hundred and eighty-one of the respondents (46.60 percent) indicated they checked or scouted their wheat less than once per week. One hundred and ninety-seven of the respondents (32.66 percent) indicated they checked or scouted their wheat at least once per week and 125 of the respondents (20.74 percent) indicated they checked or scouted their wheat more than once per week.

In Table XV, the frequency distribution is reported for the following question which was responded to by 1,194 wheat producers: "How frequently do you have insect, disease, or weed related problems?" The

TABLE XIII

DISTRIBUTION OF RESPONDENTS BY INDIVIDUALS WHO REGULARLY SCOUTED OR CHECKED THEIR WHEAT FIELDS

Individuals Who Checked or Scouted the Wheat Fields	Frequency Distribution	
	N	%
Farmer (Himself)	523	86.75
Son/Daughter	12	1.99
Spouse	0	0.00
Hired Hand	19	3.15
Coop Fieldman	14	2.32
Extension Service Specialist	15	2.48
County Extension Agent	6	0.99
Other	14	2.32
Total Responses	603	100.00

TABLE XIV

DISTRIBUTION OF RESPONDENTS BY HOW REGULARLY THEIR WHEAT WAS CHECKED OR SCOUTED

How Regular	Frequency Distribution N	%
Less than Once per Week	281	46.60
Once per Week	197	32.66
More than Once per Week	125	20.74
Total Responses	603	100.00

TABLE XV

DISTRIBUTION OF RESPONDENTS BY HOW FREQUENTLY THEY HAD INSECT, DISEASE, OR WEED RELATED PROBLEMS

Frequency of Pest Problems	Frequency Distribution N	%
Very Often	52	4.35
Often	454	38.02
Seldom	651	54.52
Never	37	3.11
Total Responses	1,194	100.00

largest number of respondents, 651 (54.52 percent), indicated they seldom had insect, disease, or weed related problems. However, 506 of the respondents (42.37 percent) indicated they had insect, disease, or weed related problems either often or very often. A small number of the respondents, 37 (3.11 percent), indicated they never had insect, disease, or weed related problems.

When asked how often they found insect, disease, or weed related problems with which they were not familiar, 922 of the respondents (77.22 percent) indicated they seldom "were not familiar" and 156 of the respondents (13.32 percent) indicated they never "were not familiar." However, 116 of the respondents (9.46 percent) indicated they were either often or very often "not familiar" with their insect, disease, or weed related problems (see Table XVI).

TABLE XVI

DISTRIBUTION OF RESPONDENTS BY HOW OFTEN THEY DISCOVERED INSECT, DISEASE, OR WEED RELATED PROBLEMS WITH WHICH THEY WERE NOT FAMILIAR

How Often Not Familiar	Frequency Distribution	
	N	%
Very Often	19	1.34
Often	97	8.12
Seldom	922	77.22
Never	156	13.32
Total Responses	1,194	100.00

Presented in Table XVII are the responses of 1,194 respondents who were asked who they consulted most often about insect, disease, or weed related problems with which they were not familiar. Five hundred and eighty-one of the respondents (48.67 percent) indicated they consulted either the county extension agent or the extension service specialist. Five hundred and forty of the respondents (45.22 percent) indicated they consulted either a farm supply salesperson or other farmers. Seventy-three of the respondents (6.11 percent) indicated they either consulted the experiment station scientist, the vocational agriculture teacher, other persons, or no one at all concerning their insect, disease, or weed related problems.

Eleven hundred and ninety-four wheat producers responded when asked to identify the major problem affecting wheat production on their farm. Table XVIII presents their responses. Six hundred and twelve of the respondents (51.27 percent) identified climate (rainfall and temperature) as being the major problem affecting wheat production on their farm. Three hundred and twenty-eight of the respondents (27.47 percent) identified weeds as being the major problem and 145 respondents (12.14 percent) identified insects as being the major problem. One hundred and nine respondents (9.12 percent) identified either diseases, soil problems, national economy, other problems, or no problems at all as being the major problem affecting wheat production on their farm.

In Table XIX, the frequency distribution is reported for the major weed problem identified by the 1,194 respondents. Three hundred and forty of the respondents (28.48 percent) indicated they "did not have a major weed problem." However, 525 of the respondents (43.97 percent) identified "Cheat" as being their major weed problem. Three hundred and

TABLE XVII

DISTRIBUTION OF RESPONDENTS BY WHO THEY CONSULTED MOST OFTEN CONCERNING PEST RELATED PROBLEMS

Who They Consulted	Frequency Distribution N	%
Independent Private Consultant	0	0.00
County Extension Agent	457	38.29
Extension Service Specialist	124	10.38
Experiment Station Scientist	3	0.25
Vocational Agriculture Teacher	1	0.08
Farm Supply Salesperson	307	25.71
Other Farmers	233	19.51
Consult No One	29	2.43
Others	40	3.35
Total Responses	1,194	100.00

TABLE XVIII

DISTRIBUTION OF RESPONDENTS BY THE MAJOR PROBLEM AFFECTING WHEAT PRODUCTION ON THEIR FARM

Major Problem	Frequency Distribution N	%
Weed Problems	328	27.47
Disease Problems	17	1.42
Insect Problems	145	12.14
Soil Problems	38	3.18
Climate (Rainfall and Temperature)	612	51.27
National Economy	28	2.35
No Major Problems	9	0.75
Other	17	1.42
Total Responses	1,194	100.00

TABLE XIX

DISTRIBUTION OF RESPONDENTS BY THEIR MAJOR WEED PROBLEM

Specific Weed Problem	Frequency Distribution	
	%	%
Cheat	525	43.97
Bindweed	26	2.18
Wild Buckwheat	77	6.45
Mustards	161	13.48
Henbit	22	1.84
Other	43	3.60
No Weed Problems	340	28.48
Total Responses	1,194	100.00

twenty-nine of the respondents (27.55 percent) identified either "Bindweed," "Wild Buckwheat," "Mustards," "Henbit," or other weeds as being their major weed problems.

Presented in Table XX are the responses of 1,194 respondents who were asked to identify the major disease problem affecting wheat production of their farm. Eight hundred and fifty-seven of the respondents (71.79 percent) indicated they "did not have a major disease problem." However, 270 of the respondents (22.61 percent) identified "Soil Borne Mosaic" as being their major disease problem. Sixty-seven of the respondents (5.60 percent) identified either "Tan Spot," "Dryland Root Rot," "Leaf Rust," "Loose Smut," or other diseases as being their major disease problem.

When asked to identify the major insect problem affecting wheat production on their farm, 602 of the 1,194 respondents (50.43 percent) identified "Greenbugs" as being their major insect problem. Two hundred and nine of the respondents (17.50 percent) identified "Armyworms" as their major insect problem and 373 of the respondents (31.24 percent) indicated they "did not have a major insect problem" (see Table XXI).

Responses to Questions Pertaining to Integrated Pest Management

In order to ascertain the wheat producers' awareness of IPM and their attitudes and practices concerning IPM, several IPM related questions were developed and included as a part of the survey questionnaire. In total, 12 questions constituted the IPM section of the questionnaire. The questions were numbered 11 through 22, inclusive. It is important to

TABLE XX

DISTRIBUTION OF RESPONDENTS BY THEIR MAJOR DISEASE PROBLEM

Specific Disease Problem	Frequency Distribution N	%
Soil Borne Mosaic	270	22.61
Tan Spot	16	1.34
Dryland Root Rot	8	0.67
Leaf Rust	24	2.01
Bunt	0	0.00
Loose Smut	6	0.50
Other	13	1.08
No Disease Problems	857	71.79
Total Responses	1,194	100.00

TABLE XXI

DISTRIBUTION OF RESPONDENTS BY THEIR MAJOR INSECT PROBLEM

Specific Insect Problem	Frequency Distribution	
	N	%
Greenbugs	602	50.43
Chinchbugs	0	0.00
Fall Armyworm	1	0.08
White Grub	0	0.00
Armyworm	209	17.50
Other	9	0.75
No Insect Problems	373	31.24
Total Responses	1,194	100.00

note that only the respondents who actually practiced IPM were asked questions 14 through 19 (Appendix D).

Eleven hundred and ninety-four wheat producers were given a brief definition of IPM (see Question 11, Appendix D) and then they were asked the following question: "Have you heard of this type of farming practice referred to as Integrated Pest Management?" Of the 1,194 respondents, 358 (29.98 percent) indicated they "had heard" of IPM and 836 of the respondents (70.02 percent) indicated they "had not heard" of IPM (Table XXII).

TABLE XXII

DISTRIBUTION OF RESPONDENTS BY THEIR AWARENESS OF INTEGRATED PEST MANAGEMENT (IPM)

Aware of IPM	Frequency Distribution	
	N	%
Yes	358	29.98
No	836	70.02
Total Responses	1,194	100.00

The 358 respondents who indicated an awareness of IPM were asked how they "first" became aware of IPM. Table XXIII reports their responses in numbers and percentages. One hundred and forty-seven of the 358 respondents (41.07 percent) first became aware of IPM by reading information provided in the newspapers. Seventy-one of the respondents

TABLE XXIII

DISTRIBUTION OF RESPONDENTS BY HOW THEY FIRST BECAME AWARE OF THE INTEGRATED PEST MANAGEMENT PROGRAM

Method of Awareness	Frequency Distribution N	%
Independent Private Consultant	0	0.00
County Extension Agent	43	12.00
Extension Service Specialist	28	7.82
Experiment Station Scientist	3	0.84
Vocational Agriculture Teacher	2	0.56
Farm Supply Salesperson	10	2.79
Other Farmers	31	8.66
Magazines	70	19.55
Newspapers	147	41.07
Radio	3	0.84
Television	5	1.40
Other	16	4.47
Total Responses	358	100.00

(19.82 percent) first became aware of IPM by information provided by either county extension agents or extension service specialists and 70 of the respondents (19.55 percent) first became aware of IPM by reading information provided in magazines. Seventy of the respondents (19.55 percent) first became aware of IPM by information provided by either experiment station scientists, vocational agriculture teachers, farm supply salespersons, other farmers, radio, television, or other sources.

Table XXIV reports the frequency distribution of "how much" the 358 respondents were currently practicing IPM in their production of wheat. Two hundred and eighty-four of the respondents (79.33 percent) indicated they were not practicing IPM. However, 74 of the respondents (20.67 percent) indicated they were currently practicing IPM in their production of wheat.

TABLE XXIV

DISTRIBUTION OF RESPONDENTS BY HOW MUCH THEY CURRENTLY PRACTICED INTEGRATED PEST MANAGEMENT IN THEIR PRODUCTION OF WHEAT

How Much IPM was Practiced	Frequency Distribution	
	N	%
Very Much	14	3.91
Some	35	9.78
Very Little	25	6.98
None	284	79.33
Total Responses	358	100.00

The 74 respondents who indicated they currently practiced IPM were asked why they decided to practice IPM. Table XXV reports their responses in numbers and percentages. Forty-six of the respondents (62.18 percent) indicated they practiced IPM to increase their wheat production profit. Nine of the respondents (12.15 percent) indicated chemical-use related responses for their reason for practicing IPM and five of the respondents (6.75 percent) indicated they decided to practice IPM based on either their neighbor's practices or organizational and/or environmental concerns. Fourteen of the respondents (18.92 percent) indicated other reasons for practicing IPM (for example, some of the respondents indicated they either wanted to try something new or wanted to become better farmers).

Also, the 74 respondents who indicated they currently practiced IPM were asked "who or what" helped them decide to adopt IPM as a part of their farming practice. Thirty of the respondents (40.54 percent) indicated the county extension agent or the extension service specialist helped them decide to adopt IPM (Table XXVI). Twenty-one of the respondents (28.38 percent) indicated that either newspapers, magazines, or radio broadcasts influenced their decision to adopt IPM and 13 of the respondents (17.57 percent) indicated either farm supply salespersons or other farmers influenced their decision to adopt IPM. Ten of the respondents (13.51 percent) indicated experiment station scientists or other persons or factors influenced their decision to adopt IPM.

The 74 respondents who indicated they currently practiced IPM were also asked what they believed to be the primary "advantage" of IPM (Table XXVII). Thirty-six of the respondents (48.66 percent) indicated "lower wheat production costs" or "higher net income" as being the primary

TABLE XXV

DISTRIBUTION OF RESPONDENTS BY WHY THEY DECIDED TO PRACTICE INTEGRATED PEST CONTROL

Why Integrated Pest Management	Frequency Distribution	
	N	%
Increase Profit	46	62.18
Soil Problems	0	0.00
Cost of Chemicals	4	5.40
Chemicals Not Effective	1	1.35
Dislike of Chemicals	4	5.40
Dealer for IPM	0	0.00
Farmers/Neighbors	2	2.70
Organizations	2	2.70
Environmental Concern	1	1.35
Human Health	0	0.00
Other	14	18.92
Total Responses	74	100.00

TABLE XXVI

DISTRIBUTION OF RESPONDENTS BY "WHO" OR "WHAT" HELPED THEM DECIDE TO ADOPT THE INTEGRATED PEST MANAGEMENT PRACTICE

"Who" or "What"	Frequency Distribution N	%
Independent Private Consultant	0	0.00
County Extension Agent	19	25.68
Extension Service Specialist	11	14.86
Experiment Station Scientist	1	1.35
Vocational Agriculture Teacher	0	0.00
Farm Supply Salesperson	6	8.11
Other Farmers	7	9.46
Magazines	6	8.11
Newspapers	14	18.92
Radio	1	1.35
Television	0	0.00
Other	9	12.16
Total Responses	74	100.00

TABLE XXVII

DISTRIBUTION OF RESPONDENTS BY THEIR PERCEIVED "ADVANTAGE" OF INTEGRATED PEST MANAGEMENT

Advantage of IPM	Frequency Distribution	
	N	%
Lower Production Cost	25	33.80
Higher Net Income	11	14.86
Higher Quality Product	8	10.81
Tillage Easier	0	0.00
Consumes Less Energy	0	0.00
Fewer Insects	6	8.11
Fewer Diseases	1	1.35
Fewer Weeds	2	2.70
Yields are Higher	9	12.16
Better for Environment	3	4.05
Better for Soil	0	0.00
Other	9	12.16
Total Responses	74	100.00

advantage of IPM. Nine of the respondents (12.16 percent) indicated "fewer pest problems" as being the primary advantage of IPM and nine of the respondents (12.16 percent) indicated their "yields were higher." Eleven of the respondents (14.86 percent) indicated either "higher quality products" or "better for environment" as being the primary advantage of IPM.

When the 74 respondents who indicated they currently practiced IPM were asked what they believed to be the primary "disadvantage" of IPM, 50 of the respondents (67.57 percent) indicated there was "no disadvantage" in practicing IPM (Table XXVIII). However, 12 of the respondents (16.22 percent) indicated that either "greater expertise was needed" or "more labor was required" as being disadvantages of IPM. Four of the respondents (6.75 percent) indicated that either "weed problems were worse," "lower yields resulted," "lower profits resulted," or the "lack of up-to-date sources" as being disadvantages of practicing IPM. Seven of the respondents (9.46 percent) indicated "other" disadvantages of IPM, one of which they indicated was IPM was "too expensive" to practice.

Table XXIX presents, in numbers and percentages, the number of years the 74 respondents (who indicated they currently practiced IPM) had actually practiced IPM. Twenty-eight of the respondents (37.84 percent) had practiced IPM one year or less. Seventeen of the respondents (22.97 percent) had practiced IPM at least two years and nine of the respondents (12.16 percent) had practiced IPM at least three years. Twenty of the respondents (27.03 percent) had practiced IPM four years or longer in their production of wheat.

The 74 respondents who indicated they currently practiced IPM were asked if they believed practicing IPM was profitable enough that they

TABLE XXVIII

DISTRIBUTION OF RESPONDENTS BY THEIR PERCEIVED "DISADVANTAGE" OF INTEGRATED PEST MANAGEMENT

Disadvantage of IPM	Frequency Distribution N	%
Weed Problems Worse	2	2.70
Insect Problems Worse	0	0.00
Disease Problems Worse	0	0.00
Fewer Up-To-Date Sources	1	1.35
Greater Expertise Needed	6	8.11
More Labor Required	6	8.11
Lower Yields	1	1.35
Lower Profits	1	1.35
No "Disadvantage"	50	67.57
Other	7	9.46
Total Responses	74	100.00

want to continue practicing it in the future. Table XXX reports their responses in numbers and percentages. Fifty-five of the respondents (74.32 percent) indicated IPM was profitable enough to merit continued use; however, 19 of the respondents (25.68 percent) indicated that they either were not sure or did not know. It is important to note that "none" of the respondents indicated IPM was profitable enough to merit continued use in the future.

TABLE XXIX

DISTRIBUTION OF RESPONDENTS BY NUMBER OF YEARS THEY HAVE PRACTICED INTEGRATED PEST MANAGEMENT

Years Practicing IPM	Frequency Distribution	
	N	%
Less than One Year	14	18.92
One Year	14	18.92
Two Years	17	22.97
Three Years	9	12.16
Four Years or Longer	20	27.03
Total Responses	74	100.00

Eleven hundred and ninety-four wheat producers responded to the question, "Would you like to receive additional information about the Integrated Pest Management Program?" Of the 1,194 respondents, 971

respondents (81.32 percent) indicated they "would" like to receive additional information about IPM. Two hundred and twenty-three of the respondents (18.68 percent) indicated they "would not" like to receive additional information about IPM (Table XXXI).

TABLE XXX

DISTRIBUTION OF RESPONDENTS WHO BELIEVE INTEGRATED PEST MANAGEMENT IS PROFITABLE ENOUGH TO MERIT CONTINUED USE

Profitable Enough	Frequency Distribution N	%
Yes	55	74.32
No	0	0.00
Not Sure/Don't Know	19	25.68
Total Responses	74	100.00

TABLE XXXI

DISTRIBUTION OF RESPONDENTS BY THOSE WHO WOULD LIKE TO RECEIVE ADDITIONAL INFORMATION CONCERNING INTEGRATED PEST MANAGEMENT

Receive Additional Information	Frequency Distribution N	%
Yes	971	81.32
No	223	18.68
Total Responses	1,194	100.00

A brief explanation of IPM services provided to farmers in other parts of the country by private consultants was presented to 1,190 wheat producers (see Question 21, Appendix D). Following the brief explanation, the 1,190 wheat producers were asked, "Would you prefer to receive training to check your own fields or would you perfer to pay someone to check them." Table XXXII reports the responses of the 1,190 wheat producers in numbers and percentages. Nine hundred and thirty of the respondents (78.23 percent) preferred to be trained to check their own fields and 135 of the respondents (11.31 percent) indicated they would prefer to pay someone to check their fields for them. One hundred and twenty-five of the respondents (10.46 percent) were undecisive when asked the question.

TABLE XXXII

DISTRIBUTION OF RESPONDENTS ACCORDING TO THEIR PREFERENCE FOR CHECKING OR SCOUTING THEIR OWN WHEAT

Preference	Frequency Distribution	
	N	%
Prefer to be Trained	930	78.23
Prefer to Pay Someone	135	11.31
Not Sure/Don't Know	125	10.46
Total Responses	1,190	100.00

The respondents who either preferred to pay someone to check their fields and the respondents who were undecisive about whether they would rather check their own fields or pay someone to check them were asked, "Who would you prefer to provide the service?" Of the 260 respondents, 49 respondents (18.84 percent) indicated they preferred to pay either the county extension agent or the extension service specialist to check their fields. Thirty-six of the respondents (13.84 percent) indicated they preferred to pay either the farm supply salesperson or other farmers to check their fields and 13 of the respondents (5.0 percent) indicated they preferred to pay an independent private consultant. One hundred and sixty-one of the respondents (61.74 percent) were undecisive and did not indicate a preference (Table XXXIII).

Responses to Questions Pertaining to Wheat Production Attitudes and Practices

In order to ascertain the wheat producers' attitudes and practices concerning wheat production, several related questions were developed and included as a part of the survey questionnaire. In total, five questions constituted attitudes and practices concerning wheat production section of the questionnaire. The questions were numbered 23 through 27 (see Appendix D).

Eleven hundred and ninety wheat producers responded to the following question: "If the cost of herbicides and insecticides doubled, would you consider other alternatives for pest control?" The numbers and percentages of the wheat producers' responses are presented in Table XXXIV. Of the 1,190 respondents, 908 (76.30 percent) indicated they "would consider alternatives" for pest control, providing the cost of herbicides

TABLE XXXIII

DISTRIBUTION OF RESPONDENTS BY WHO THEY WOULD PREFER TO PROVIDE INTEGRATED PEST MANAGEMENT SERVICES

Provide IPM Service	Frequency Distribution N	%
Independent Private Consultant	13	5.00
County Extension Agent	37	14.23
Extension Service Specialist	12	4.61
Experiment Station Scientist	1	0.38
Vocational Agriculture Teacher	0	0.00
Farm Supply Salesperson	20	7.69
Other Farmers	16	6.15
Not Sure/Don't Know	161	61.94
Total Responses	260	100.00

TABLE XXXIV

DISTRIBUTION OF RESPONDENTS' ATTITUDES CONCERNING USE OF HERBICIDES AND INSECTICIDES ASSUMING THE COST OF EACH WOULD DOUBLE

Consider Alternatives	Frequency Distribution N	%
Yes	908	76.30
No	93	7.82
Not Sure/Don't Know	189	15.88
Total Responses	1,190	100.00

and insecticides doubled. Ninety-three of the respondents (7.82 percent) indicated they "would not consider alternatives" and 189 of the respondents (15.88 percent) indicated they were "undecided" in response to the question.

Table XXXV presents the frequency distribution of the responses indicated by the wheat producers who were asked if they would continue to grow wheat if no herbicides or insecticides were available for use. Of the 1,190 wheat producers responding to the question, 954 of the respondents (80.17 percent) indicated they "would continue to grow wheat" and 110 of the respondents (9.24 percent) indicated they "would not continue to grow wheat." One hundred and twenty-six of the respondents (10.59 percent) were undecided in response to the question.

TABLE XXXV

DISTRIBUTION OF RESPONDENTS' ATTITUDES TOWARD FURTHER PRODUCTION OF WHEAT ASSUMING NO HERBICIDES OR INSECTICIDES WERE AVAILABLE FOR USE

Continue to Produce Wheat	Frequency Distribution	
	N	%
Yes	954	80.17
No	110	9.24
Not Sure/Don't Know	126	10.59
Total Responses	1,190	100.00

When asked, "What major factor influences your selection of wheat seed?" 788 of the 1,190 respondents (66.21 percent) indicated the "OSU Yield Test Results" as being the major factor influencing their selection of wheat seed. One hundred and eighty-four of the respondents (15.46 percent) based their selection of wheat seed on its capabilities of being either "disease and/or insect resistant." Two hundred and eighteen of the respondents (18.33 percent) indicated such factors as either "cost of seed," "stalk size and/or strength of the plant," "other farmers," or "other factors" as being the major factors influencing their selection of wheat seed (Table XXXVI).

TABLE XXXVI

DISTRIBUTION OF RESPONDENTS BY THE MAJOR FACTOR INFLUENCING THEIR SELECTION OF WHEAT SEED

Major Factor	Frequency Distribution N	%
OSU Yield Test Results	788	66.21
Disease and/or Insect Resistance	184	15.46
Cost of the Seed	26	2.19
Stalk Size and/or Strength of Plant	51	4.29
Other Farmers	64	5.38
Others	77	6.47
Total Responses	1,190	100.00

Eleven hundred and ninety respondents indicated "how" they tried to solve their weed problems (Table XXXVII). Four hundred and ninety-nine of the respondents (41.93 percent) indicated they tried to solve their weed problems by "tillage" (plowing). Three hundred and fifty-seven of the respondents (30.0 percent) used "chemicals" and 283 of the respondents (23.78 percent) used a combination of "chemicals and tillage" in trying to solve their weed problems. Fifty-one of the respondents (4.29 percent) tried to solve their weed problems by utilizing either "crop rotation," "grazing livestock," "burning," or "other" means.

TABLE XXXVII

DISTRIBUTION OF RESPONDENTS BY HOW THEY TRIED TO SOLVE THEIR WEED PROBLEMS

Solution	Frequency Distribution	
	N	%
Tillage (Plowing)	499	41.93
Herbicides (Chemicals)	357	30.00
Tillage and Herbicides	283	23.78
Crop Rotation	14	1.18
Graze by Livestock	10	0.84
Burning	9	0.76
Other	18	1.51
Total Responses	1,190	100.00

Table XXXVIII presents the number and percentage of the 1,190 wheat producers who responded to the following question: "Who has the major influence pertaining to your farm management decisions?" Eleven hundred and twenty-nine of the respondents (94.86 percent) indicated they (themselves) had the major influence pertaining to their farm management decisions. Sixty-one of the respondents (5.14 percent) indicated a variety of persons including landlords, other farmers, spouses, and professional persons had the major influence pertaining to their farm management decisions.

The investigator conducted an analysis of the responses elicited from wheat producers by each individual county. Due to the fact those data were indirectly related to this particular study, the data were not presented, analyzed, and interpreted within this study, nor were the findings reported. However, a review of the information (data) elicited from wheat producers by each individual county yielded the following findings: (1) a comparison of the wheat producers' responses by county were not significantly different from the other counties and (2) a comparison of the wheat producers' responses by county (when compared to the area data) were not significantly different. Therefore, the area study (this study) could be generalized back to each individual county and each individual county could be generalized to each other. (The preceding findings include all questions pertaining to awareness of IPM, wheat production attitudes and practices, wheat production problems, and demographic data.)

TABLE XXXVIII

DISTRIBUTION OF RESPONDENTS BY WHO HAD THE MAJOR INFLUENCE PERTAINING TO THEIR FARM MANAGEMENT DECISIONS

Who Influences	Frequency Distribution N	%
Self (Respondent)	1,129	94.86
Spouse (Wife)	7	0.59
Independent Private Consultant	0	0.00
Landlord	4	0.34
Financial Advisor	6	0.51
County Extension Agent	4	0.34
Extension Service Specialist	2	0.17
Experiment Station Scientist	2	0.17
Vocational Agriculture Teacher	0	0.00
Farm Supply Salesperson	1	0.08
Other Farmers	35	2.94
Total Responses	1,190	100.00

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

The intent of this chapter was to present concise summaries of the following topics: purpose of the study, rationale for the study, design of the study, and the major findings of the research. Through a detailed inspection of these topics, conclusions and recommendations were presented based on the analysis of the data.

Purpose of the Study

The primary purpose of this study was to determine a baseline awareness of the wheat producers who resided in a four-county area in north central Oklahoma of the newly initiated Oklahoma State University Integrated Pest Management (IPM) programs in wheat and, also, to determine the specific pest related problems the wheat producers were confronted with in the production of their wheat.

Rationale of the Study

Land-grant universities grew out of the concept that their mission included the acquisition, transmission, and application of knowledge. This concept has been best exemplified in agriculture where each component--teaching, research, and extension--provided a catalytic influence

on the other two. It is in the land-grant universities that much of the pest control research has been conducted and from this base that recommendations have flowed through the Cooperative Extension Service for implementation in the field.

The Cooperative Extension Service is the educational partnership between the United States Department of Agriculture (USDA), the land-grant university, and the local community (the county).

Oklahoma State University, in cooperation with the Oklahoma Cooperative Extension Service, had determined to make IPM an integral part of all crop educational programs. Therefore, in 1979, a fully integrated, interdisciplinary pest management research project was begun at OSU and it included the cooperative efforts the the agronomy, entomology, and plant pathology departments. Thus, OSU had placed a very high priority on IPM programs and on insuring that the concept of IPM was delivered to and understood by producers.

Although OSU has an impressive record of success since it began its involvement in IPM programs in 1970, OSU's IPM Steering Committee considered it desirable to establish a base-line and determine the progress of the newly initiated "wheat" IPM program.

In essence, it was strongly anticipated by OSU's IPM Steering Committee that the results of this investigation of the wheat producers' awareness of IPM and of their major pest related problems would be highly beneficial in the delivery of pest management information. Also, the results of this investigation was considered base-line information by the OSU IPM Steering Committee in order that they could determine the impact of the IPM program in wheat (which will be specifically determined approximately three years after this investigation).

Based upon the forementioned considerations, research had to be conducted to answer the following question: "Just how much of this IPM information manages to find its way to all producers and are all producers aware of pest management practices?" (Bowers, 1980). Also, based upon the forementioned considerations, research had to be conducted to answer the following question: "What are the major pest related problems presently confronting the wheat producers?"

Design of the Study

Following a review of literature and research indirectly and/or directly related to the study, procedures were established to satisfy the purpose of the study.

The population for this study was derived from the list of names and mailing addresses of farmers who resided and farmed in the four-county area of north central Oklahoma. The names and mailing addresses of the farmers were provided to the investigator courtesy of the Cooperative Extension County Director from each of the four counties.

The individual county and corresponding individual county population of farmers were as follows: Garfield, 766; Grant, 1,026; Kay, 518; and Noble, 575. The total population of the four counties was 2,885.

A method for selecting a sample size for a large population (2,885) was obtained and a representative sample of 1,556 wheat producers was considered necessary to insure the .98 confidence interval needed. The total sample size (1,556) was stratified proportionally by counties and the resulting numbers and percentages of farmers drawn from the population of farmers from each county were as follows: Garfield, 413 (26.55 percent); Grant, 554 (33.57 percent); Kay, 279 (17.95 percent), and Noble,

310 (19.93 percent). The wheat producers who constituted the sample for each county were randomly selected from the total population of farmers in each individual county. Therefore, the sampling procedure was a stratified proportional random sampling technique.

The data collected for this study were collected using a telephone survey-interview. The interview schedule developed contained a total of 37 individual questions. The first question was asked to determine if the farmer produced or grew wheat and the second question was asked (once the farmer was determined to be a wheat producer) to elicit the wheat producer's cooperation in responding to the questionnaire. The remaining 35 questions were separated into four separate sections as follows: 10 questions were designed to obtain personal information (demographic data); eight questions were designed to obtain information pertaining to the wheat producers' pest related wheat production problems; 12 questions were designed to obtain information pertaining to the wheat producers' awareness, attitudes, and/or practices concerning IPM; and five questions were designed to obtain information pertaining to the wheat producers' attitudes and practices concerning wheat production.

The telephone survey was conducted during the months of December, 1980, and January, 1981. Eleven hundred and ninety-four (77.09 percent) wheat producers cooperated and provided responses to the survey.

The data obtained from the instrument were keypunched on the IBM cards and a SAS program was used in calculating the frequency distributions (numbers and percentages) of the data.

Major Findings of the Study

The major findings of this study were divided into four sections.

They were as follows:

1. General characteristics of respondents,

2. Responses to questions pertaining to wheat production problems,

3. Responses to questions pertaining to Integrated Pest Management, and

4. Responses to questions pertaining to wheat production attitudes and practices.

General Characteristics of Respondents

General characteristics of respondents in this study indicated a large majority of the respondents' residences were located on rural farms. A summary of the general characteristics of respondents is presented in Table XXXIX.

Ages of the respondents revealed that the smallest group responding to the survey were from 18 to 27 years of age. More than 50 percent of the respondents were either 53 years of age or older.

The largest group of respondents (more than 47 percent) indicated they had completed one or more years of college and more than 44 percent of the respondents had completed three to four years of high school.

When respondents were asked to estimate the percentage of gross farm income which came from the production of wheat, the smallest group of respondents (102 or 10.22 percent) indicated that 30 percent or less of their gross farm income came from the production of wheat. The largest group of respondents (579 or 58.02 percent) indicated that approximately more than 60 percent of their gross farm income came from the production of wheat.

TABLE XXXIX

SUMMARY OF THE GENERAL CHARACTERISTICS OF RESPONDENTS

Characteristics of Respondents	Frequency Distribution of Responses N (%)			Totals N (%)
Residential Location of Respondents	Rural Farm 905 (77.09%)	Rural Non-Farm 41 (3.49%)	Urban 228 (19.42%)	1174 (100.00%)
Age of Respondents	18 to 27 52 (4.76%)	28 to 52 481 (44.04%)	53 or Older 559 (51.20%)	1092 (100.00%)
Educational Level of Respondents (Years)	0 to 10 89 (8.13%)	11 to 12 486 (44.38%)	One Year College + 520 (47.49%)	1095 (100.00%)
Percentage of Gross Farm Income Attributed to Wheat	30% or Less 102 (10.22%)	31 to 60% 317 (31.76%)	61% or More 579 (58.02%)	998 (100.00%)
Estimated Gross Farm Income of Respondents	$10,000 or Less 52 (8.18%)	$10,001 to $50,000 243 (38.20%)	$50,001 or More 341 (53.62%)	636 (100.00%)
Amount of Time Devoted to Farming	Full-Time 884 (74.35%)	Part-Time 305 (25.65%)		1189 (100.00%)
Number of Years Respondents Produced Wheat	1 to 10 174 (14.68%)	11 to 20 179 (15.04%)	More than 20 837 (70.28%)	1190 (100.00%)
Major Reason for Producing Wheat	Sell the Grain Commercially 1084 (91.39%)		Other Reasons 102 (8.51%)	1186 (100.00%)

TABLE XXXIX (Continued)

Characteristics of Respondents	Frequency Distribution of Responses N (%)			Totals N (%)
1980 Wheat Yield/Bushels per Acre	31 Bu./Ac. or Less 223 (19.98%)	32 to 47 Bu./Ac. 835 (74.08%)	48 Bu./Ac. + 58 (5.94%)	1116 (100.00%)
Acres of Wheat Farmed by Respondents	400 Ac. or Less 501 (43.65%)	401 to 800 Ac. 353 (30.74%)	801 Ac. + 294 (25.61%)	1148 (100.00%)

The range of responses elicited from respondents when they were asked to estimate their gross farm income was from less than $2,500 to more than $200,000 per year. The smallest group of respondents (52 or 8.18 percent) indicated their estimated gross farm income was $10,000 or less. The largest group of respondents (341 or 53.62 percent) indicated their gross farm income was $50,000 or more per year.

Full-time farmers constituted the vast majority (74.35 percent) of respondents.

A large majority of the respondents (70.28 percent) had produced wheat for more than 20 years.

One thousand and eighty-four of the respondents (91.39 percent) indicated they produced wheat so they could sell the grain commercially. One hundred and two of the respondents (8.51 percent) produced wheat in order that they could either sell certified wheat seed, graze livestock, or cover ground (bare soil).

The range of responses elicited from respondents when they were asked to indicate their 1980 wheat yield (bushels per acre) was from less than 20 to more than 55 bushels of wheat per acre. The largest group of respondents (835 or 74.08 percent) indicated their yield was between 32 and 47 bushels of wheat per acre. The smallest group of respondents (58 or 5.94 percent) indicated their yield was 48 or more bushels of wheat per acre. Two hundred and twenty-three of the respondents (19.98 percent) reported 31 or less bushels of wheat per acre in 1980.

The wheat producers were asked to indicate the number of acres of wheat they farmed. The responses elicited ranged from one acre to more than 3,000 acres. The largest group of respondents (501 or 43.65

percent) farmed 400 acres of wheat or less. Three hundred and fifty-three of the respondents (30.74 percent) farmed between 401 and 800 acres of wheat. The smallest group of respondents (294 or 25.61 percent) farmed more than 801 acres of wheat.

Responses to Questions Pertaining to Wheat Production Problems

A summary of the responses to questions pertaining to wheat production is presented in Table XL.

The wheat producers were asked if they either checked or scouted their wheat to detect major problems. Their responses indicated approximately one-half of the respondents checked or scouted their wheat and the other approximate one-half did not.

The respondents (who checked or scouted their wheat) were asked "who" checked or scouted their wheat. A vast majority of the respondents (91.87 percent) indicated either themselves, members of their immediate family, or their employees checked or scouted the wheat.

Those respondents (who checked or scouted their wheat) were asked "how regularly" they checked or scouted their wheat. Two hundred and eighty-one of the respondents (44.60 percent) checked or scouted their wheat less than once per week. However, 322 of the respondents (53.40 percent) checked or scouted their wheat once per week or more often than once per week.

When asked how frequently they had insect, disease, or weed related problems, 506 of the respondents (42.37 percent) indicated either often or very often and 651 of the respondents (54.52 percent) indicated

TABLE XL

SUMMARY OF RESPONSES TO QUESTIONS PERTAINING TO PROBLEMS AFFECTING WHEAT PRODUCTION

Problem Related Questions	Frequency Distribution of Responses N (%)			Totals N (%)
Checked or Scouted Their Wheat	Yes 603 (50.50%)	No 591 (49.50%)		1194 (100.00%)
"Who" Checked or Scouted Their Wheat	Themselves 554 (91.87%)	Extension Personnel 21 (3.49%)	Others 28 (4.64%)	603 (100.00%)
"How" Regular Wheat was Checked or Scouted	Less than Once/Wk. 281 (46.60%)	Once/Wk. 197 (32.66%)	More than Once/Wk. 125 (20.74%)	603 (100.00%)
Frequency of Pest Related Problems	Often/Very Often 506 (42.37%)	Seldom 651 (54.52%)	Never 37 (3.11%)	1194 (100.00%)
"How Often" Not Familiar with Pest Related Problems	Often/Very Often 116 (9.46%)	Seldom 922 (77.22%)	Never 156 (13.32%)	1194 (100.00%)
"Who" Respondents Consulted About Pest Related Problems	Extension Personnel 581 (48.65%)	Farm Supply Salespersons 307 (25.71%)	Other Farmers (or Others) 306 (25.64%)	1194 (100.00%)
Major Wheat Production Problem	Pest Related 528 (44.22%)	Climate 612 (51.25%)	Other 54 (4.53%)	1194 (100.00%)
Major Weed Problem	"Cheat" 525 (43.97%)	Other 329 (27.55%)	No Weed Problem 340 (28.48%)	1194 (100.00%)

TABLE XL (Continued)

Problem Related Questions	Frequency Distribution of Responses N (%)			Totals N (%)
Major Disease Problem	"Soil Borne Mosaic" 270 (22.61%)	Other 67 (5.60%)	No Disease Problems 857 (71.79%)	1194 (100.00%)
Major Insect Problem	"Greenbugs" 602 (50.43%)	Other 219 (18.33%)	No Insect Problems 373 (31.24%)	1194 (100.00%)

seldom. A very small percentage of the respondents (3.11 percent) indicated they never had insect, disease, or weed related problems.

A large majority of the respondents (77.22 percent) indicated they seldom discovered insect, disease, or weed related problems with which they were not familiar. One hundred and sixteen of the respondents (9.46 percent) indicated they either often or very often discovered pest related problems with which they were not familiar.

The respondents were asked who they consulted most often concerning pest related problems. A large majority of the respondents (48.65 percent) indicated they consulted either the county extension agent or the extension service specialist. Approximately one-fourth of the respondents consulted farm supply salespersons and another one-fourth consulted either other farmers or other persons.

Five hundred and twenty-eight of the respondents (44.22 percent) indicated either weeds, diseases, or insects were the major problem affecting wheat production on their farm. Approximately one-half of the respondents attributed the major problem affecting wheat production on their farm to climate (rainfall and temperature).

The major weed problem identified by the respondents was "Cheat." However, 340 of the respondents (28.48 percent) indicated they "did not" have a major weed problem.

The major disease problem identified by the respondents was "Soil Borne Mosaic." However, a vast majority of the respondents (71.79 percent) indicated they "did not" have a major disease problem.

The major insect problem identified by approximately one-half of the respondents was "Greenbugs." Three hundred and seventy-three of the respondents indicated they "did not" have a major insect problem.

Responses to Questions Pertaining to Integrated Pest Management

A summary of responses to questions pertaining to integrated pest management is presented in Table XLI.

A large majority of the respondents (70.02 percent) had not "heard" of integrated pest management. However, 358 of the respondents had heard or were aware of integrated pest management.

The 358 respondents who were aware of IPM were asked how they "first" learned of IPM. One hundred and forty-seven of the respondents (41.07 percent) first learned of IPM by information provided in newspapers and 71 of the respondents (19.82 percent) first learned of IPM by information received from Cooperative Extension Service personnel.

The 358 respondents who were aware of IPM were also asked "how much" they currently practiced IPM in their production of wheat. A vast majority of the respondents (79.33 percent) indicated they were not currently practicing IPM. However, 74 of the respondents (20.67 percent) indicated they were currently practicing IPM in the production of wheat.

When the 74 respondents (who were currently practicing IPM) were asked why they decided to practice IPM, 46 of those respondents (62.18 percent) indicated they wanted to "increase their profit."

Cooperative Extension Service personnel (county extension agents or extension service specialists) were credited by 30 of the respondents (40.54 percent) for helping them decide to adopt the IPM practice. Magazines and newspapers were credited by 20 of the respondents (27.03 percent) for helping them decide to adopt the IPM practice.

TABLE XLI

SUMMARY OF RESPONSES TO QUESTIONS PERTAINING TO INTEGRATED PEST MANAGEMENT

IPM Questions	Frequency Distribution of Responses N (%)				Totals N (%)
Awareness of IPM	Yes 358 (29.98%)	No 836 (70.02%)			1194 (100.00%)
Method of Awareness of IPM	Extension Personnel 71 (19.82%)	Newspapers 147 (41.07%)	Magazines 70 (19.55%)	Other 70 (19.55%)	358 (100.00%)
"How Much" IPM is Practiced	Very Much 14 (3.91%)	Some 35 (9.78%)	Very Little 25 (6.98%)	None 284 (79.33%)	358 (100.00%)
"Why" Respondents Decided to Use IPM	Increase Profits 46 (62.18%)	Chemical Related Reasons 9 (12.15%)	Other 19 (25.67%)		74 (100.00%)
"Who" or "What" Influenced Respondents to Adopt IPM	Extension Personnel 30 (40.54%)	Newspapers/ Magazines 20 (27.03%)	Other 24 (33.43%)		74 (100.00%)
Advantages of IPM	Increased Profits 36 (48.66%)	Fewer Pests 9 (12.16%)	Higher Yields 9 (12.16%)	Other 20 (27.02%)	74 (100.00%)

TABLE XLI (Continued)

IPM Questions	Frequency Distribution of Responses N (%)				Totals N (%)
Disadvantages of IPM	Greater Expertise or More Labor Required	Other	"No" Disadvantages		
	12 (16.21%)	12 (16.21%)	50 (67.58%)		74 (100.00%)
"How Long" Respondents Practiced IPM	One Year or Less	Two to Three Years	Four Years or More		
	28 (37.84%)	26 (35.13%)	20 (27.03%)		74 (100.00%)
IPM A Profitable Practice	Yes	No	Not Sure/Don't Know		
	55 (74.32%)	0 (0.00%)	19 (25.68%)		74 (100.00%)
Want Additional Information About IPM	Yes	No			
	971 (81.32%)	223 (18.68%)			1194 (100.00%)
Preference of IPM Services	Prefer to be Trained	Prefer to Pay Someone	Not Sure/Don't Know		
	930 (78.23%)	135 (11.31%)	125 (10.46%)		1190 (100.00%)
"Who" Preferred to Provide IPM Services	Independent Private Consultant	Extension Personnel	Other	Not Sure/ Don't Know	
	13 (5.00%)	49 (18.84%)	37 (14.22%)	161 (61.94%)	260 (100.00%)

Thirty-six of the respondents (48.66 percent) considered either "higher net income" or "lower production costs" as being primary advantages of practicing IPM. However, when asked the primary "disadvantage" of IPM, a large majority of the respondents (67.58 percent) indicated there was "no disadvantage" in practicing IPM.

Fifty-four of the 74 respondents (72.97 percent) indicated they had actually practiced IPM three years or less and 20 of the respondents (27.03 percent) had practiced IPM four years or longer.

Fifty-five of the 74 respondents (74.32 percent) indicated practicing IPM was profitable enough to merit continued use and 19 of the respondents (25.68 percent) were either not sure or did not know if IPM was profitable enough to merit continued use. It is important to stress that none of the respondents indicated practicing IPM was not profitable.

Eleven hundred and ninety-four of the respondents were asked if they would like to receive additional information concerning integrated pest management. Nine hundred and seventy-one of the respondents (81.32 percent) indicated they would like to receive additional information.

A vast majority of the respondents (78.23 percent) indicated they would prefer to be trained to check or scout their own wheat fields for pest related problems. However, 135 of the respondents (11.31 percent) indicated they preferred to pay someone to check or scout their wheat fields for them.

The respondents who preferred to pay someone to check or scout their wheat fields for them and those respondents who were undecided were asked "who" they preferred to provide the IPM services. One hundred and sixty-one of the respondents (61.94 percent) indicated they did not know or

were not sure who they would prefer to provide the IPM service. A small group of the respondents indicated they preferred either extension service personnel or others to provide the IPM service.

Responses to Questions Pertaining to Wheat Production Attitudes and Practices

A summary of the responses to questions pertaining to wheat production attitudes and practices is presented in Table XLII.

Nine hundred and eight of the respondents (76.30 percent) indicated they would consider alternatives for pest control providing the cost of insecticides and herbicides doubled. One hundred and eighty-nine of the respondents (15.88 percent) were undecisive and 93 of the respondents (7.82 percent) indicated they would not consider other alternatives.

A large majority of the respondents (80.17 percent) indicated they would continue to grow wheat (assuming no insecticides or herbicides were available for use).

The "OSU Yield Test Results" were credited by 788 of the respondents (66.21 percent) as being the major influence pertaining to their selection of wheat seed. "Disease and/or Insect Resistant" wheat varieties were credited by 186 of the respondents (15.46 percent), and other major factors were credited by 218 of the respondents (18.33 percent) as being the major factor influencing their selection of wheat seed.

When asked how they try to solve their weed problems, 499 of the respondents (41.93 percent) indicated they used tillage practices. Three hundred and fifty-seven of the respondents (30.00 percent) used chemicals and 283 of the respondents (23.78 percent) utilized a combination of tillage and chemicals to try to solve their weed problems.

TABLE XLII

SUMMARY OF RESPONSES TO QUESTIONS PERTAINING TO WHEAT PRODUCTION ATTITUDES AND PRACTICES

Attitudes and Practices	Frequency Distribution of Responses N (%)				Totals N (%)
Consider Alternatives Other than Herbicides or Insecticides	Yes 908 (76.30%)	No 93 (7.82%)	Not Sure/Don't Know 189 (15.88%)		1190 (100.00%)
Continue to Produce Wheat (without Herbicides or Insecticides)	Yes 954 (80.17%)	No 110 (9.24%)	Not Sure/Don't Know 126 (10.59%)		1190 (100.00%)
Major Factor Influencing Selection of Wheat Seed	OSU Yield Test Results 788 (66.21%)	Disease/Insect Resistance 186 (15.46%)	Other 218 (18.33%)		1190 (100.00%)
Solution for Controlling Weed Problems	Tillage 499 (41.93%)	Chemicals 357 (30.00%)	Tillage/Chemicals 283 (23.78%)	Other 51 (4.29%)	1190 (100.00%)
Who Influences Major Farm Management Decisions	Wheat Producer (Himself) 1129 (94.86%)	Other Farmers 35 (2.94%)	Other Persons 26 (2.20%)		1190 (100.00%)

A vast majority of the respondents (1,129 or 94.86 percent) indicated that they (themselves) had the major influence pertaining to their farm management decisions.

Conclusions

The analysis of data and subsequent findings were the basis for the following conclusions:

1. It was concluded, as a result of the findings, most wheat producers in the four-county area of north central Oklahoma had the following general characteristics: farmed full-time, resided on the farm, were 53 years of age or older, have produced wheat for more than 20 years, have had some college training, farmed 800 acres of wheat or less, averaged 32 to 47 bushels of wheat per acre, produced wheat to sell the grain commercially, and had an estimated gross farm income of $50,000 or more (of which an estimated 60 percent of the gross farm income came from the production of wheat).

2. Based on the findings, it was concluded approximately one-half of the wheat producers checked or scouted their own fields to detect major pest related problems. It was further concluded, as a result of the information elicited from those wheat producers (who regularly checked or scouted their fields), that they checked or scouted their wheat either at least once per week or more often than twice per week.

3. Although it was apparent in the findings that most of the wheat producers were "seldom" not familiar with pest related problems, it was concluded that a majority of the wheat producers consulted either the county extension agent or the extension service specialist concerning pest related problems.

4. It was very evident in the findings that a very small percentage of the wheat producers "did not" have a major weed, disease, or insect problem. As a result of that evidence, it was concluded a very large percentage of the wheat producers had either a major weed, disease, or insect problem. That conclusion was supported by a majority of wheat producers who identified either "Cheat" (a weed), "Soil Borne Mosaic" (a disease), or "Greenbugs" (an insect) as having been their major pest related problem. Although the forementioned pests were identified by the wheat producers as having been their major pest related problems, the major problem affecting wheat production on their farms was identified as rainfall and/or temperature (climate). That conclusion was supported by a large percentage of wheat producers.

5. Although it was very apparent in the findings that a large majority of the wheat producers were "not" aware of IPM, it was concluded that those wheat producers (who were aware of IPM) "first" became aware of IPM by reading about it. The conclusion was strongly supported by those wheat producers who indicated they relied upon reading newspapers the majority of the time in securing their information.

6. After review of the findings, it was concluded a vast majority of the wheat producers (who currently practice IPM) considered either a "higher net income" or "lower production cost" as advantages of IPM; therefore, it was further concluded that practicing IPM resulted in a higher profit.

7. A large majority of the wheat producers (who currently practiced IPM) believed there were "no" disadvantages in practicing IPM; therefore, it was concluded IPM was profitable enough to merit continued use, particularly since "no" disadvantages were identified by a large

majority of the forementioned producers and, also, particularly since practicing IPM resulted in higher profits.

8. It was concluded that credit should be given to either the county extension agent or the extension service specialist for having helped a majority of the wheat producers (who currently practice IPM) to decide to adopt IPM as a part of their farming practice.

9. Due to the responses elicited from the wheat producers, it was concluded the wheat producers wanted to receive additional information pertaining to IPM. It was further concluded the wheat producers not only wanted additional information concerning IPM, they also preferred to be trained to check or scout their own fields for pest related problems. In addition, it was concluded that a large majority of the wheat producers preferred "not" to pay someone to check or scout their fields for them; however, the wheat producers who preferred to pay someone for IPM services were for the most part undecided as to who they preferred to pay.

10. Based on a review of the findings, it was concluded that a large majority of the wheat producers would continue to produce wheat and would consider alternatives to herbicides and insecticides in their production of wheat, if the cost of herbicides or insecticides doubled or if they were not available for use.

11. It was very apparent in the findings that the wheat producers considered the "OSU Yield Test Results" as the major factor influencing their selection of what seed. Based upon such a significant finding, it was concluded no other major factor influenced the wheat producers' selection of wheat as much as the "OSU Yield Test Results."

12. Although a majority of the wheat producers consulted either the county extension agent or the extension service specialist concerning pest related problems, it was concluded that when farm management decisions were made, the wheat producers (themselves) made those farm management decisions.

Recommendations

As a result of the conclusions drawn from the analysis and interpretation of data, the following recommendations are made:

1. It was apparent in the findings and conclusions that most wheat producers prefer to be trained to check or scout their own wheat fields for pest related problems; therefore, it is recommended that Oklahoma State University, in cooperation with the Oklahoma Cooperative Extension Service, should develop comprehensive training programs to train the wheat producers to check or scout their own wheat fields for pest related problems.

2. Although approximately one-half of the wheat producers surveyed consulted either the county extension agent or the extension service specialist, a large percentage of the wheat producers depended upon their neighbors (other farmers) for advice concerning pest related problems which affect wheat production on their farms. Therefore, it is recommended that some of the wheat producers receive training to become "paraprofessionals" in order to assist the county extension agent or the extension service specialist in training the wheat producers to check or scout their own wheat for pest related problems (particularly since it is virtually impossible for the county extension agents or extension service specialists to train such a large population of wheat producers).

3. Although it was concluded that climate (rainfall and temperature) was the major problem affecting wheat production, the IPM program should be directed toward the following major pest problems: (a) Cheat weeds; (b) Soil Borne Mosaic, which is a disease; and (c) Greenbugs, which are insects.

4. Based upon the conclusion that wheat producers (who currently practice IPM) have increased their profits (by either receiving a higher net income or by lowering their production costs), it is recommended that these advantages be stressed to wheat producers who are not practicing IPM. It is also recommended that it should be stressed that a majority of wheat producers (who currently practice IPM) believe there are "no" disadvantages in practicing IPM.

5. It was apparent that the wheat producers (who currently practice IPM) consider IPM profitable enough to merit continued use; therefore, it is recommended that the IPM program in wheat be continued and expanded to involve more wheat producers in more counties.

6. Oklahoma State University, in cooperation with the Oklahoma Cooperative Extension Service, should develop a comprehensive information delivery system to provide wheat producers with more information concerning IPM. This conclusion was a result of a large majority of the wheat producers wanting to receive additional information concerning IPM. It is further recommended that other persons (for example: 4-H club members, FFA members, vocational agriculture teachers, and others involved with agricultural programs) should be provided with information pertaining to IPM. In addition, information pertaining to the utilization of independent private IPM consultants should be provided to the producers and others.

7. Based on the conclusion that reading was the major source wheat producers used in obtaining information pertaining to new farm practices, it is recommended that more information concerning IPM should be developed for release to newspapers and magazines.

8. It was apparent that the wheat producers made their own decisions pertaining to their farm management practices; therefore, it is recommended that they (themselves) be the target audience for IPM training in order that they would possibly adopt the IPM practice.

9. It was concluded that the wheat producers would consider alternatives for pest control (assuming the cost of herbicides and insecticides would double in cost) and they would continue to produce wheat (assuming no herbicides or insecticides were available for use); therefore, it is recommended that IPM be promoted as an alternative pest control strategy for the wheat producers and that it be stressed as a "apply as needed" chemical use technology.

10. Based upon the conclusion that the major factor influencing the wheat producers' selection of wheat seed is the "OSU Yield Test Results," it is recommended that the Oklahoma State University Experiment Station, in cooperation with the Oklahoma Cooperative Extension Service, should inform all wheat producers of tours, field trips, research efforts at OSU, and they should expand their information delivery system pertaining to research efforts and findings.

Recommendations for Additional Research

The following recommendations are made in regard to additional research. The recommendations are judgments based on having conducted the study and on the examination of the findings of the study. The

recommendations are in two parts: (1) methodology and (2) additional research.

Methodology

1. As further research is developed, consideration should be given by the county extension agents to maintaining up-to-date files of names, addresses, and telephone numbers of farmers residing in their counties.

2. In using a telephone survey, callers should receive intensive training in obtaining information from potential respondents and should have a comprehensive understanding of the questionnaire instrument used for data collection.

3. It should be emphasized that the respondents who were interviewed preferred to be surveyed by telephone rather than receiving mailed questionnaires; therefore, it is recommended that the telephone survey interview technique be utilized more as a means of eliciting information.

4. Questions pertaining to respondents' personal income should either not be asked or should be structured in such a manner as not to be offensive to the respondent.

Additional Research

1. There should be a similar study conducted concerning OSU's IPM program in wheat, in the same four-county area of north central Oklahoma, in order that the IPM program can be evaluated and in order that the impact of the IPM program can be determined.

2. A more comprehensive study involving wheat producers from all

wheat producing counties in Oklahoma should be conducted and the results compared with the findings of this study.

3. Similar research should be conducted that would involve either other crop or livestock programs as potential target areas for IPM practices.

4. Specific research should be conducted to investigate the nature, extent, and potential for introducing trained "paraprofessionals" to the farmers in order that the county extension agent or the extension service specialist could either expand existing IPM programs or implement new IPM programs.

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APPENDIXES

APPENDIX A

GEOGRAPHICAL LOCATION OF COUNTIES

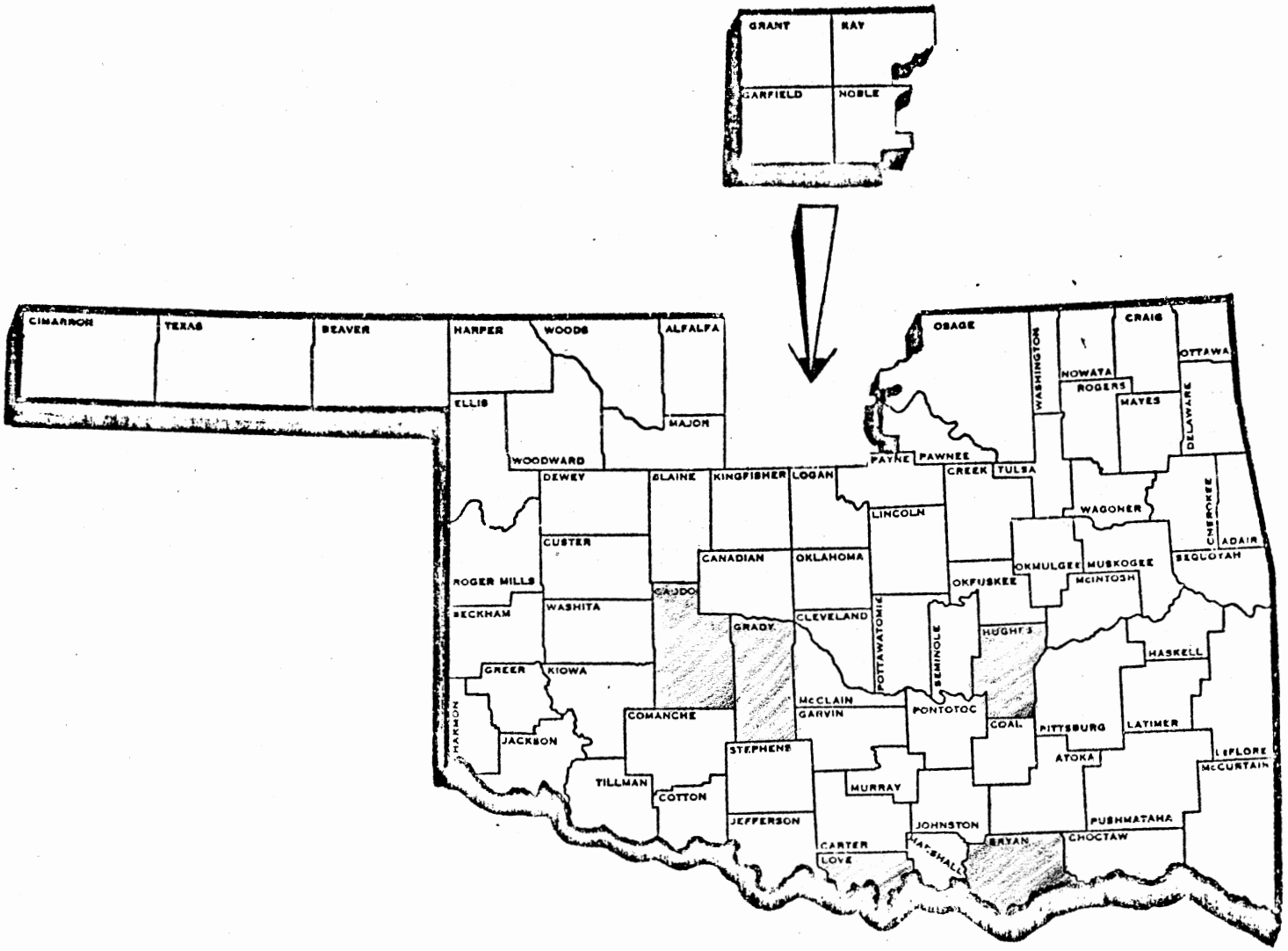

Figure 1. Geographical Location of Counties

APPENDIX B

NEWS RELEASE

"NEWS RELEASE"

WHEAT PRODUCERS TO BE SURVEYED

Beginning December 18, wheat producers in a four county area of Oklahoma (including Kay, Noble, Grant and Garfield Counties) will be contacted by telephone by a team of researchers from the Oklahoma State University Departments of Cooperative Agricultural Extension and Agricultural Education.

The primary purpose of the survey is to measure the awareness of the wheat producers of the Integrated Pest Management Program. However, the long range purpose is to measure the impact of the program.

Information pertaining to details and the nature of the telephone survey can be obtained from the County Cooperative Extension Office or the Department of Agricultural Education at OSU.

APPENDIX C

CORRESPONDENCE

COOPERATIVE EXTENSION SERVICE

OKLAHOMA STATE UNIVERSITY
AGRICULTURE AND
RURAL DEVELOPMENT PROGRAMS

DIVISION OF AGRICULTURE
STILLWATER, OKLAHOMA 74078

December 5, 1980

Don Wearmouth
County Ext. Director
316 E. Oxford
Enid, OK 73701

Dear Don:

Eddy Finley in Ag Education wants to start his IPM survey in your county during the first week of January. He has asked us to help inform the public prior to making any phone calls. Will you use the attached news release or something similar of your choosing to let your producers be aware of this survey? Eddy informs me that you have already received a copy of the Payne County Results which includes a copy of the survey.

Sincerely,

Ron

James R. Sholar
Ext. Pest Management Specialist

JRS/msm
enclosure
cc: Eddy Finley
Wendell Bowers
Jim Key

COOPERATIVE EXTENSION SERVICE

OKLAHOMA STATE UNIVERSITY
AGRICULTURE AND
RURAL DEVELOPMENT PROGRAMS

DIVISION OF AGRICULTURE
STILLWATER, OKLAHOMA 74078

December 19, 1980

Mr. Don Tallent
Box 227 Courthouse
Medford, OK 73759

Dear Don:

Eddy Finley in Ag Education wants to begin his IPM survey in your county during the first week of January. He has asked us to hel, inform the public prior to making any phone calls. Will you use the attached news release or something similar of your choosing to let your producers be aware of this survey? Eddy informs me that you have already received a copy of the Payne County Results which includes a copy of the survey.

Sincerely,

Ron

James R. Sholar
Extension Pest Management
Specialist

JRS:mc
cc: Eddy Finley
Wendell Bowers
Jim Key

COOPERATIVE EXTENSION SERVICE

OKLAHOMA STATE UNIVERSITY
AGRICULTURE AND
RURAL DEVELOPMENT PROGRAMS

DIVISION OF AGRICULTURE
STILLWATER, OKLAHOMA 74078

December 19, 1980

Mr. Larry Fleck
Box 430 Courthouse
Newkirk, OK 74647

Dear Larry:

Eddy Finley in Ag Education wants to begin his IPM survey in your county during the first week of January. He has asked us to help inform the public prior to making any phone calls. Will you use the attached news release or something similar of your choosing to let your producers be aware of this survey? Eddy informs me that you have already received a copy of the Payne County Results which includes a copy of the survey.

Sincerely,

Ron

James R. Sholar
Extension Pest Management
Specialist

JRS:mc
cc: Eddy Finley
Wendell Bowers
Jim Key

COOPERATIVE EXTENSION SERVICE

OKLAHOMA STATE UNIVERSITY
AGRICULTURE AND
RURAL DEVELOPMENT PROGRAMS

DIVISION OF AGRICULTURE
STILLWATER, OKLAHOMA 74078

December 19, 1980

Mr. Bob Farabough
Box 8 Courthouse
Perry, OK 73077

Dear Bob:

Eddy Finley in Ag Education wants to begin his IPM survey in your county during the first week of January. He has asked us to help inform the public prior to making any phone calls. Will you use the attached news release or something similar of your choosing to let your producers be aware of this survey? Eddy informs me that you have already received a copy of the Payne County Results which includes a copy of the survey.

Sincerely,

Ron

James R. Sholar
Extension Pest Management
Specialist

JRS:mc
cc: Eddy Finley
Wendell Bowers
Jim Key

APPENDIX D

INSTRUMENT

IPM SURVEY

COUNTY (1) _____ DATE _____ NAME _____ NUMBER (2-5) _____

1. (May I speak with Mr. _____.) Thank you. Hello _____, my name is _____ and I am with Oklahoma State University at Stillwater. We are conducting a survey of the wheat producers in your area concerning the Integrated Pest Management Program. Do you produce or grow wheat?

(6) 1 _____ *Yes*
2 _____ *No--Thank you. Good-bye.*

2. Since you produce wheat, we value your opinion and we believe you can provide us with some valuable information. May we have a few minutes of your time to ask you a few questions?

(7) 1 _____ *Yes*
2 _____ *No--Thank you. Good-bye.*

3. At the present is your wheat regularly checked or scouted by anyone to detect any major problems?

(8) 1 _____ *Yes*
2 _____ *No--Move to Question #6*

4. Who regularly checks or scouts your wheat?

(9)
1 _____ *Farmer (Self)*
2 _____ *Son/Daughter*
3 _____ *Spouse*
4 _____ *Hired Hand*
5 _____ *Coop Fieldman*
6 _____ *Other (Specify)* _____

5. On the average, how regularly is your wheat checked or scouted? *(Read)*

(10)
1 _____ *Less Than Once Per Week*
2 _____ *Once Per Week*
3 _____ *More Than Once Per Week*

6. How frequently do you have insect, disease, or weed related problems? *(Read)*

(11)
1 _____ *Very Often*
2 _____ *Often*
3 _____ *Seldom*
4 _____ *Never*

7. How often do you find insect, disease or weed problems with which you are not familiar? *(Read)*

(12)
1 _____ *Very Often*
2 _____ *Often*
3 _____ *Seldom*
4 _____ *Never*

8. Who do you consult most often about these problems with which you are not familiar?

(13)
1 _____ *Independent Private Consultant*
2 _____ *County Extension Agent*
3 _____ *Extension Service Specialist*
4 _____ *Experiment Station Scientist*
5 _____ *Vocational Ag. Teacher*
6 _____ *Farm Supply Salesperson*
7 _____ *Other Farmers*
8 _____ *Others (Specify)* _____

9. What is the major problem affecting wheat production on your farm?

(14)
1 _____ *Weed Problems*
2 _____ *Disease Problems*
3 _____ *Insect Problems*
4 _____ *Soil Problems*
5 _____ *Climate (Rainfall & Temperature)*
6 _____ *Other (Specify)* _____

10. What is your major . . .

Weed Problem?

(15)
1 _____ *Cheat*
2 _____ *Bindweed*
3 _____ *Wild Buckwheat*
4 _____ *Mustards*
5 _____ *Other* _____
6 _____ *No Weed Problem*

Disease Problem?

(16)
1 _____ *Soil Borne Mosaic*
2 _____ *Tan Spot*
3 _____ *Dryland Root Rot*
4 _____ *Leaf Rust*
5 _____ *Bunt*
6 _____ *Loose Smut*
7 _____ *Other* _____
8 _____ *No Disease Problem*

Insect Problem?

(17)
1 _____ *Greenbugs*
2 _____ *Chinchbugs*
3 _____ *Fall Armyworm*
4 _____ *White Grub*
5 _____ *Armyworm*
6 _____ *Other* _____
7 _____ *No Insect Problem*

11. Integrated Pest Management is a farming practice that includes regular checking or scouting the fields for insects, diseases, and weeds so something can be done to "prevent" problems and to use chemicals only "if" needed. Have you heard of this type of farming practice referred to as "Integrated Pest Management?"

(18)
1 Yes
2 No—Move to Question #20

12. How did you "first" learn of the Integrated Pest Management Program?

(19-20)
01 Independent Private Consultant
02 County Extension Agent
03 Extension Service Specialist
04 Experiment Station Scientist
05 Vocational Ag. Teacher
06 Farm Supply Salesperson
07 Other Farmers
08 Magazines
09 Newspaper
10 Radio
11 Television
12 Other (Specify)_____

13. How much are you currently practicing Integrated Pest Management in your production of wheat? (The systematic control of insects, diseases, and weeds)

(21)
1 Very Much
2 Some
3 Very Little
4 None—Move to Question #20

14. Why did you decide to use the Integrated Pest Management Practice?

(22-23)
01 Increase Profit
02 Soil Problems
03 Cost of Chemicals
04 Chemicals Not Effective
05 Dislike of Chemicals
06 Dealer for IPM
07 Farmers/Neighbors
08 Organizations
09 Environmental Concern
10 Human Health
11 Other (Specify)_____

15. "Who" or "What" helped you decide to adopt the Integrated Pest Management Practice?

(24-25)
01 Independent Private Consultant
02 County Extension Agent
03 Extension Service Specialist
04 Experiment Station Scientist
05 Vocational Ag. Teacher
06 Farm Supply Salesperson
07 Other Farmers
08 Magazines
09 Newspaper
10 Radio
11 Television
12 Other (Specify)_____

16. What do you believe is the primary "advantage" of Integrated Pest Management?

(26-27)
01 Lower Production Cost
02 Higher Net Income
03 Higher Quality Product
04 Tillage Easier
05 Consumes Less Energy
06 Fewer Insects
07 Fewer Diseases
08 Fewer Weeds
09 Yields Are Higher
10 Better for Environment
11 Better for Soil
12 Other (Specify)_____

17. What do you believe is the primary "disadvantage" of Integrated Pest Management?

(28-29)
01 Weed Problems Worse
02 Insect Problems Worse
03 Disease Problems Worse
04 Fewer Up-To-Date Sources
05 Greater Expertise Needed
06 More Labor Required
07 Lower Yields
08 Lower Profits
09 No "Disadvantage"
10 Other (Specify)_____

18. How long have you been practicing Integrated Pest Management?

(30)
1 Less Than One Year
2 One Year
3 Two Years
4 Three Years
5 Four Years or Longer

19. Do you think Integrated Pest Management is profitable enough that you would want to use it in the future?

(31) 1 Yes
2 No
3 Not Sure/Don't Know

20. Would you like to receive additional information about the Integrated Pest Management Program?

(32) 1 Yes
2 No

21. In many parts of the country, wheat growers are having private consultants perform certain services such as checking their fields thus saving farmers pesticide applications. Would you prefer to receive training to check your own fields or would you prefer to pay someone to check them?

(33) 1 Prefer to be Trained-- [Move to Question #23]
2 Prefer to Pay Someone
3 Not Sure/Don't Know

22. Who would you prefer to provide the service?

(34) 1 Independent Private Consultant
2 County Extension Agent
3 Extension Service Specialist
4 Experiment Station Scientist
5 Vocational Ag. Teacher
6 Farm Supply Salesperson
7 Other Farmers
8 Not Sure/Don't Know

23. If the cost of herbicides and insecticides doubled, would you consider other alternatives for pest control?

(35) 1 Yes
2 No
3 Not Sure/Don't Know

24. Would you continue to grow wheat if no herbicide or insecticide were available for use?

(36) 1 Yes
2 No
3 Not Sure/Don't Know

25. What major factor influences your selection of wheat seed?

(37) 1 OSU Yield Test Results
2 Disease and/or Insect Resistance
3 Cost of the Seed
4 Other Farmers
5 Other (Specify)_____

26. If you have weed problems, how do you try to solve the problem? *(Read)*

(38) 1 Tillage (Plowing)
2 Herbicides (Chemicals)
3 Tillage and Herbicides
4 Other (Specify)_____

27. Who has the major influence pertaining to your farm management decisions?

(39-40) 01 Self
02 Spouse (Wife)
03 Independent Private Consultant
04 Landlord
05 Financial Advisor
06 County Extension Agent
07 Extension Service Specialist
08 Experiment Station Scientist
09 Vocational Ag. Teacher
10 Farm Supply Salesperson
11 Other Farmers

28. How long have you been growing wheat?

(41) 1 1 to 5 Years
2 6 to 10 Years
3 11 to 15 Years
4 16 to 20 Years
5 Over 20 Years

29. Why do you grow wheat?

(42) 1 Sell the Grain Commercially
2 Sell Certified Seed
3 Grazing Livestock
4 Ground Cover

30. Do you farm part-time or full-time?

(43) 1 Part-Time
2 Full-Time

31. How many bushels of wheat did you average per acre in 1980?

(44-46) 1 Bushels/Acre

32. How many acres of wheat do you have?

(47-51) 1_____Acres of Wheat

33. Where is your residence? *(Read)*

(52)
1_____Rural Farm Residence
2_____Rural Non-Farm Residence
3_____Urban Residence

Mr. _____, the next few questions will be kept in strictest confidence and will only be reported within the totals of the survey.

34. What year were you born?

(53-54)
01_____18 to 22, 1958-1962
02_____23 to 27, 1953-1957
03_____28 to 32, 1948-1952
04_____33 to 37, 1943-1947
05_____38 to 42, 1938-1942
06_____43 to 47, 1933-1937
07_____48 to 52, 1928-1932
08_____53 to 57, 1923-1927
09_____58 to 62, 1918-1922
10_____63 or Over, Before 1917

35. What is the highest grade you completed in school?

(55)
1_____0 to 8 Years
2_____1-2 Years of High School
3_____3-4 Years of High School
4_____1-2 Years of College
5_____3-4 Years of College
6_____Over 4 Years of College

36. What percentage of your 1980 gross "farm" income came from the production of wheat?

(56-57)
01_____1 to 10%
02_____11 to 20%
03_____21 to 30%
04_____31 to 40%
05_____41 to 50%
06_____51 to 60%
07_____61 to 70%
08_____71 to 80%
09_____81 to 90%
10_____91 to 100%

37. Would you mind estimating your gross "farm" income?

(58) 1_____NO RESPONSE

(59-60)
02_____$2,500 or Less
03_____$2,501 to 5,000
04_____$5,001 to 7,500
05_____$7,501 to 10,000
06_____$10,001 to 20,000
07_____$20,001 to 30,000
08_____$30,001 to 40,000
09_____$40,001 to 50,000
10_____$50,001 to 100,000
11_____$100,001 to 150,000
12_____$150,000 to 200,000
13_____Over $200,000

Mr. _____, thank you very much for your time. This information will be a benefit to the Integrated Pest Management Survey. Thanks again. Good-bye.

VITA[2]

George Edward Finley

Candidate for the Degree of

Doctor of Education

Thesis: WHEAT PRODUCERS' AWARENESS, ATTITUDES, AND PRACTICES CONCERNING INTEGRATED PEST MANAGEMENT AND PRODUCTION PROBLEMS IN A FOUR-COUNTY AREA OF OKLAHOMA

Major Field: Agricultural Education

Biographical:

Personal Data: Born in Clarendon, Texas, January 11, 1950, the son of Jess and Betty Finley.

Education: Graduated from McLean High School, McLean, Texas, May, 1967; received the Bachelor of Science degree from Texas Tech University, Lubbock, Texas, December, 1971, with a major in Agricultural Education; received the Master of Education degree from Texas Tech University, May, 1976, with a major in Agricultural Education; completed requirements for the Doctor of Education degree at Oklahoma State University in May, 1981.

Professional Experience: Superintendent of schools, Alanreed, Texas, July, 1972, to June, 1973; vocational agriculture instructor, Spur, Texas, July, 1973, to June, 1975; vocational agriculture instructor, Amarillo, Texas, July, 1975, to December, 1976; quality control manager, Dharhan, Saudi Arabia, January, 1977, to July, 1978; vocational agriculture instructor, Roosevelt, Texas, August, 1978, to June, 1979; graduate research assistant at Oklahoma State University, September, 1979, to present.

Organizations: Member of Texas State Teachers Association, member of Texas Vocational Agriculture Teachers Association, member of Texas Classroom Teachers Association, member of National Education Association, member of Alpha Tau Alpha, member of Phi Delta Kappa, member of Omicron Delta Kappa.