PERCEPTIONS OF OKLAHOMA AGRICULTURAL EDUCATION TEACHERS OF SELECTED ASPECTS OF SUSTAINABLE AGRICULTURE

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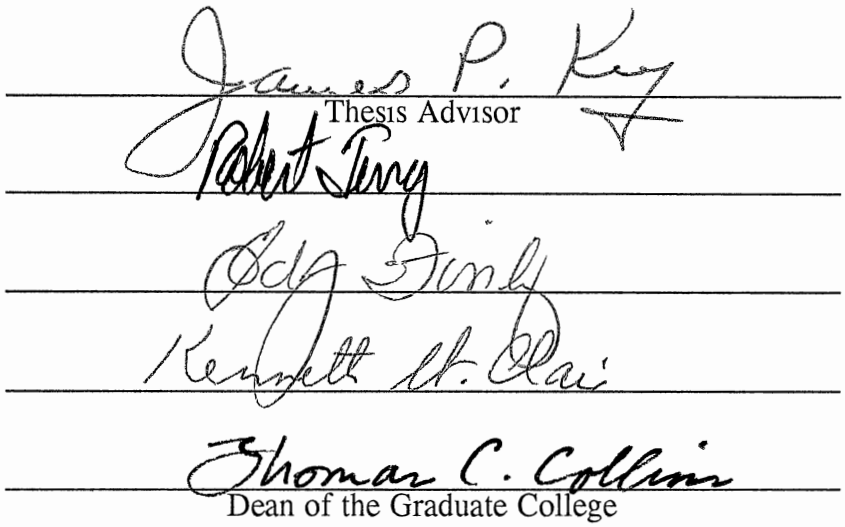

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CHAPTER I

INTRODUCTION

In recent years the agricultural industry has been criticized as being wasteful and harmful to the environment and the whole of society. There is also concern that rural communities and the rural way of life are slowly becoming obselete because of the lack of practices that conserve and maintain the resources needed for the production and management of agricultural products (Poincelot, 1986). As a result of these criticisms and concerns many people in the field have begun to take a closer look at the production and management practices of modern agriculturalists and have tried to develop a farming model or paradigm that will help American farmers and rural communities survive and thrive as society enters the twenty-first century.

One of the most popular, as well as controversial, farming models being lauded by agriculture professionals is that of sustainable agriculture. The Texas Agricultural Extension Service Sustainable Agriculture Committee (1989) defined sustainable agriculture as:

> The selection and application of scientific knowledge and procedures to produce acceptable long-term economic returns, protect the environment, and promote social values including human health and safety (p.1).

The idea of applying knowledge to a particular concern is not new but in the wake of constant reports of health risks, economic failure, resource depletion, and pollution tied directly to the agricultural industry there is a need for new application of the knowledge gained from the past. Before this knowledge can be applied, however, it must be learned and accepted by those who may be in a position to use it later, specifically secondary agricultural education students.

The area of sustainable agriculture may be of great benefit to future agriculturalists in maintaining and strengthening the agricultural infrastructure in the U.S.A. and the world (Madden, 1988). It is for this reason that it appeared to be essential to assess the extent to which sustainable agriculture topics are being taught in secondary agricultural education classes.

Problem Statement

While the subject of sustainable agriculture is currently in the spotlight of the agricultural industry, there is a lack of evidence that secondary agricultural education instructors are teaching this topic in their classes. An assessment of the extent to which sustainable agriculture is being taught in secondary agricultural education classes was needed to determine the course of action that teachers should take to ensure that this new area of agriculture is made available to all students.

Purpose

The primary purpose of this study was to determine the extent to which Oklahoma agricultural education instructors were teaching sustainable agriculture topics in their classes. A secondary purpose of this study was to assess the availability and usefulness of curricular and teaching materials in this area.

Objectives

The objectives of this study were to:

1. Determine the age, years teaching experience, locale, and specific classes being taught by current Oklahoma agricultural education instructors;
2. Determine the amount of emphasis Oklahoma Agricultural Education teachers placed on teaching sustainable agriculture topics, the classes in which they were being taught, and those in which the topics would be taught in the future.
3. Determine the perceived quality of curriculum material available to those agricultural education instructors who taught or would teach sustainable agriculture topics in their classes;
4. Determine why Oklahoma agricultural education instructors were or were not teaching sustainable agriculture topics in their classes.

5. Determine the perceived knowledge of Oklahoma Agricultural Education Teachers concerning sustainable agriculture.
6. Determine the perceived need for in-service concerning sustainable agriculture.
7. Determine the overall perceptions of Oklahoma Agricultural Education Teachers concerning sustainable agriculture.
8. Determine the perceived local importance of sustainable agriculture in Oklahoma communities.

Assumptions

For the purpose of this study the following assumptions were made:

1. The responses, opinions, and perceptions obtained from the questionnaire were given honestly and conscientiously by the teachers surveyed.
2. The teachers surveyed were and knowledgeable about the agricultural industry in their areas.

Definition of Terms

Agricultural Education- courses taught at the secondary school level to prepare students for the pursuit of agricultural careers and interests.

Sustainable Agriculture- the selection and application of agricultural practices which produce long-term economic returns, protect the environment, maintain or enhance rural

communities, and promote social values including human health and safety. Also may be referred to as alternative agriculture. This definition was formulated after a review of the literature illustrated the inclusion of these aspects in the concept of sustainable agriculture.

Paradigm- a pattern or example for performing some function; a generally accepted method for conducting an activity.

Scope

The scope of this study included all 446 of the secondary agricultural education teachers currently employed in public schools in Oklahoma.

CHAPTER II

REVIEW OF LITERATURE

The purpose of this chapter is to provide a theoretical background of the sustainable agriculture movement and its implications to secondary agricultural education based upon current and past literature. Included in this review were books, periodicals, research studies, newsletters, government documents, and professional magazines containing relevant information. In order to provide for a more meaningful review, the literature has been divided and categorized under the following headings:

1. Introduction
2. Historical Aspects
3. Definition of Sustainable Agriculture
4. Economic Importance of Sustainable Agriculture
5. The Need for Knowledge About Sustainable Agriculture
6. Sustainable Agriculture Curriculum
7. Related Research
8. Summary

Introduction

> The grass is rich and matted, you cannot see the soil. It holds the rain and the mist, and they seep into the ground, feeding the streams in every kloof. It is well tended, and not too many fires

> burn it, laying bare the soil. Stand unshod upon it , for the ground is holy being even as it came from the Creator. Keep it, guard it, care for it, for it keeps men, guards men, cares for men. Destroy it and man is destroyed. (Storer, 1956, p. 142)

American agriculturalists are currently searching for ways to produce quality food products in sufficient quantity to feed a growing population. At the same time the agricultural industry is finding it more and more urgent to find solutions to problems such as dwindling natural resources, chemical residues on crops, groundwater contamination, and rural community collapse. A farming system now known as sustainable agriculture may hold the key to solving these and other problems facing modern agriculture.

The National Research Council (1989) identified alternative farming as either biological, low input, organic, regenerative, or sustainable. A review of literature indicated that more and more emphasis is being placed on sustainable agricultural practices as a way of improving the management of agriculture's natural resources and the total farm operation. Daberkow and Reichelderfer (1988) noted that the inclusion of the "low-input" section in the 1990 farm bill and the subsequent funding has generated numerous articles in farm magazines, sessions at professional meetings of agricultural scientists, publications in professional journals, and hundreds of research and extension proposals.

Ikerd (1990a) stated: "The search for sustainability in agriculture, in a practical sense, is the search for an acceptable balance between lower external inputs and greater profitability (p.19)." The emphasis on profitability is the cornerstone of any sustainable agriculture system. In recent years, farmers have been encouraged to use whatever means were available to produce the highest yields possible with little or no concern for profit maximization or the effects of their practices on the environment. Even with current subsidy programs in place, those farmers with the largest acreages have the most to gain by mono-cropping. Hassebrook and Kroese (1990) noted that farmers in the Midwest who use low-input, sustainable crop rotations have smaller corn acreage bases and consequently forego as much as two-thirds of the deficiency payments received by mono-cropping corn producers. An attempt must be made to change public sentiment and policy to facilitate the development and adoption of sustainable agriculture systems if the food production system in America is to remain competitive.

Agricultural education instructors who emphasize sustainable agriculture systems to their students may be helping to ınitiate a change in the public view of agriculture. Many of the topics commonly overlooked by teachers are those that are of the upmost importance in the development of sustainable farming and marketing systems. Harritt (1987) concluded that the most important way to help vocational agriculture students develop a profitable farmıng

system was to teach farm management, including better record keeping, market analysis, sound money management, critical thinking, and examples. He also recommended that these topics be taught in relation to Supervised Agricultural Experiences and should emphasize efficiency, diversification, and management for profit rather than production. Poincelot (1986) also addressed the need for education in sustainable agriculture when he stated: "Agricultural educators and extension personnel must be constantly updated on new developments, if information on sustainable agriculture is to reach and benefit current farmers and be available for training future agriculturalists (p.10)."

Historical Aspects

Before humans began farming the most common method for feeding the population was by hunting and gathering. Early humans hunted large animals, but were not too successful. They had more luck gathering vegetables and insects. The hunter-gatherers consumed so many insects that entire populations of insects were nearly wiped out (Texas A&M University, 1987). These early humans had to devise a way to feed themselves without depleting their resources if they were to survive. This dilemma has faced mankind since time began and there have been many ideas and approaches to rectifying the problem.

Early settlers had no idea that good soil and water would ever become scarce or that they may one day have trouble justifying their farming practices to the general public (Colliers Encyclopedia, 1988). By the early 19th century it became clear that the whole of society was affected by the use of natural resources. British classical economics, during the early 1800s, expressed the doctrine that an inherently limited availability of natural resources sets an upper limit on economic growth and welfare (Barnett and Morse, 1963). Early agriculturalists found it necessary to develop ways to produce food that would ensure a plentiful supply of natural resources for future generations so that they might grow and prosper economically as well as technologically.

Not only were the early agriculturalists concerned with the future availability of resources for their progeny but also with the sustainability of their communities and families. As Barnett and Morse (1963) stated, "The conservation movement of the early 20th century believed that the trend of social welfare over time could be influenced by the extent to which men conserved and managed resources with an eye to the welfare of future generations (p.2)." The subject of sustaining the natural resources used for agriculture as a way to improve the quality of life and economic well-being was expressed by John F. Kennedy in a special message to Congress when he stated:

> From the beginning of civilization, every nation's basic wealth and progress has stemmed in large measure from its natural resources. This nation has been, and is now, especially fortunate in the blessings we have inherited. Our entire society rests upon and is dependent upon our water, our land, our forests, and our minerals. How we use these resources influences our health, security, economy, and well being (Barnett, et.al., 1963, p.21).

The subject of rural community sustainability as it relates to sustainable agriculture is based upon the idea that most of the practices suggested work best on small to medium sized farms. With smaller farms there will be more families living and working in agriculturally based communities. This belief was espoused by Abraham Lincoln when he saw farmers in Illinois during the mid 1800s trying to harness horse power on a large scale. In a speech given at an agricultural exposition in Milwaukee, Wisconsin, in 1859 Lincoln stated, "I have never known a mammoth farm to sustain itself (Rodale, 1990, p.273)." Many modern agriculturalists see the scaling down of farm operations as a very real way to increase the economic sustainability of rural communities.

Conservation and the wise use of resources have been topics of controversy and concern since the dawn of civilization. Sustainable agriculture is one of the most recent responses to this concern and many professional agriculturalists believe, as will be seen later in this chapter, that it may hold the key to solving many of the problems of the past.

The subject of conservation and sustainability of resources as it relates to agriculture has come to be known as alternative or sustainable agriculture. These terms are not new as noted by Beard (1948) when he stated:

> The policy of the greatest good for the greatest number in the long run had been established for all resources on the national forests. President Theodore Roosevelt and Chief Forester Gifford Pinchot saw the use of these interdependent resources as one big problem. Deliberately, they set about to select a term that would best embody their policy. They decided upon "wise use" as a term to describe how administration should manage natural resources. The term "management for sustained yield" is now commonly used to express this concept (pp.22-23).

The term "sustained yield" meant almost the same to the conservationists of the Roosevelt era as it does to professional agriculturalists of today. Although this is true, modern sustainable agriculture encompasses a broader array of practices and ideas designed to maintain and build the agricultural industry in the 21st century.

Definition of Sustainable Agriculture

Though the historical aspects of sustainable agriculture and resource management may suggest that the new movement is simply a reversion back to the practices and ideas of the past many professional agriculturalists view it as being on the cutting edge of the newest technology available. Madden (1988) pointed out that sustainable agriculture "is not a reversion back to the old farming ways, but a combination of modern agricultural science with the practical experience of

farmers (p.1167)." Viewing it as an application of the latest scientific knowledge, the Texas Agricultural Extension Service Sustainable Agriculture Committee (1989) defined sustainable agriculture as: "The application of scientific knowledge to produce acceptable long-term economic returns, protect the environment, and promote social values including human health and safety (p.2)." A common term or concept in any definition of sustainable agriculture is "long-term." The practices, concepts, and ideas expressed by agricultural professionals relating to sustainable agriculture are not quick fixes but long-term solutions to the problems facing agriculture today.

The relatively new concept of sustainable agriculture has gone by many names over the past ten years. "Conservation farming, organic farming, integrated pest management, and alternative agriculture" are a few of the labels that have been placed upon the idea of sustainable agriculture (Cooper and Gamon, 1991, p.12). One term that has gained popularity in the sustainable agriculture movement is Low Input Sustainable Agriculture (hereafter referred to as LISA). This name is based upon the idea that most of the practices suggested for agricultural sustainability require fewer external inputs to achieve the same or better results. Madden (1988) stated:

> Low-Input Sustainable Agriculture encompasses a wide array of approaches to farming that reduce the farmer's dependence on certain kinds of purchased inputs in ways that increase profits, reduce

> environmental hazards, and ensure a more sustainable agriculture for generations to come (p.1167).

The term "low-input" may be misleading to producers and students of sustainable agriculture because it implies that all types of inputs will be reduced. This is not the case as noted by agricultural economists. Although LISA calls for fewer external inputs such as commercial fertilizer, pesticides, and herbicides, the need for managerial and labor inputs increases. Sustainability generally requires increases in the variety of managerial skills and capabilities and may well reduce the opportunity for farmers to work off the farm (Epplin, 1989). Producers may find that there are difficult trade-offs in an operation with sustainability as its base. They may need to become more attuned to the managerial concerns of their business than is presently required in a conventional program.

The subject of management skills is noted by many of the experts in the area of sustainable agriculture. The Consultative Group on International Agricultural Research Technical Advisory Committee (1988) noted that sustainable agriculture operations require more comprehensive management of resources to satisfy changing human needs while maintaining or enhancing the natural resource base and avoiding environmental degradation. The management required for a sustainable agriculture operation is, in many cases, more complicated than that required in a conventional system. Cooper and Gamon (1991) contended that the reason for the increased complexity in management is due to the

fact that the definition of sustainable agriculture changes with every farming situation. The National research Council (1989) made note of the fact that sustainable agriculture in no way makes farming easier when it stated: "The objective is to sustain and enhance rather than reduce and simplify the biological interactions on which production agriculture depends thereby reducing the harmful off-farm effects of production practices (p.4)." As will be noted in a later section of this chapter, many agriculturalists believe that there is a desperate need for education in the area of farm management as it applies to sustainable agriculture.

The definition of sustainable agriculture must include some of the many accepted practices and concepts it encompasses. While the practices are important and basic to the idea of sustainability it should be remembered that sustainable agriculture is more than a set of practices. "It is also the frame of mind or philosophy of agriculture that is keenly attuned to and protective of its resources, using a planning horizon of many generations rather than a few years. (Lukens, 1991, p.3)." As a foundation for this relatively new philosophy many components of sustainable agriculture have been taken from conventional agricultural practices. It is important to remember however, that integrated into these conventional practices is the most modern technology agricultural science has to offer (National Research Council, 1989).

Keeping in mind the philosophy that no one practice can make an agricultural operation sustainable and that the whole farming system must be taken into account, the following paragraphs provide a discussion of specific practices and concepts of sustainable agriculture as mentioned in the literature.

Sustainable agriculture seeks to lower the need for outside capital by more efficiently managing the farm's natural resources. The USDA Agricultural Research Service (1989) listed conservation tillage, crop rotation, limited irrigation, and pest control as sustainable agriculture practices that should be researched to determine their value in lowering inputs. The Kerr Center for Sustainable Agriculture (1990) listed ten points of reference that address the principles of sustainable agriculture. These principles are:

1. Fertility management and soil health;
2. Water management;
3. Insect, disease, and predator management;
4. Weed management;
5. Biological diversity;
6. Plant and animal adaptation;
7. Waste management and nutrient recycling;
8. Energy use;
9. People and communities; and
10. Economical / biological accounting (p.1).

This list is made up of the basic concepts that should be taken into consideration in a sustainable agriculture operation. Enshayan (1990) expanded on the Kerr Center's list when he stated:

> Too many people think that simply reducing chemicals is sustainable agriculture. The following topics need to be addressed.
>
> Renewable energy
> Soil and water conservation
> Agricultural policies
> Urban responsibility
> Rural communities
> Health questions
> True economics
> Education, research, and extension (p.4).

The Texas Agricultural Extension Service Sustainable Agriculture Committee (1989) developed a list of approved practices that specify the types of things that can be done to develop applications for real-life agricultural situations. The list of approved practices includes:

> Integrated pest management
> Weed control
> Fertilizer placement, timing, and nutrient management
> Nonpoint source pollution control
> Use of legumes in row crop and pasture systems
> Crop rotation
> Precision application of pesticides
> Economic analysis
> Comprehensive ranch management
> Total ranch management
> Marketing strategies for alternative products
> Food safety
> Pesticide use safety
> Plant disease control
> Water quality control
> Water conservation
> Livestock waste utilization and management
> Use of industrial and urban sewage effluent and sludges in agricultural production
> Computer models and management guides in crop systems
> Rangeland management using ecologic principles
> Whole farm systems analysis
> Integrated analysis of specific enterprises (p.3).

These practices and concepts encompass a wide range of ideas developed by agriculturalists to help solve the problems being faced by the agricultural industry today.

A more specific list of applied practices that agriculturalists can utilize to make their operations more sustainable was developed by Purswell (1991) in a study concerning producers using alternative agriculture practices in Oklahoma. Farmers were asked to identify the sustainable agriculture practices they most commonly used in their operations. The most commonly stated practices were:

Crop Rotation	Mulching	Cover Crops
Green Manure Crops	Animal Manure	Composting
Reduced Animal Units	Fallow Ground	Rest Pasture
Drip Irrigation	Minimum Till	Terraces
Close Monitoring of Chemical Use	Discontinue Spraying	Organic Pesticides
Reduce Fertilizer Usage	Increase Tillage	Beneficial Insects
Resistant Varieties	Biological	Hand Spraying
Compatible Crops	Control	Integrated Pest Management

(pp.52-53).

The National Research Council (1989) summarized sustainable agriculture practices when it stated, "Many components of alternative agriculture are derived from conventional agronomic practices and livestock husbandry. The hallmark of an alternative farming approach is not the conventional practices it rejects but the innovative practices it includes (p.3)." They also developed a set of goals for sustainable agriculture systems which provides a good summary for the definition of sustainable agriculture. The goals for a sustainable agriculture system are:

> More thorough incorporation of natural processes such as nutrient cycles, nitrogen fixation and pest-predator relationships into the agricultural production process;

> Reduction in the use of off-farm inputs with the greatest potential to harm the environment or the health of farmers and consumers;
>
> Greater productive use of the biological and genetic potential of plant and animal species;
>
> Improvement of the match between cropping patterns and the productive potential and physical limitations of agricultural lands to ensure long-term sustainability of current production levels;and
>
> Profitable and efficient production with emphasis on improved farm management and conservation of soil, water, energy, and biological resources (National Research Council, 1989, p.4).

Economic Importance of Sustainable Agriculture

Any student of agricultural economics knows that when the basic laws of economics are applied to an agricultural enterprise, the point of maximum profit for the producer is not necessarily the point of highest yield. Wagner (1990) noted that there is no need to go overboard with the sustainable agriculture concept. Farmers must still be able to produce enough food using modern technology to feed the growing population. The best approach, Wagner (1990) stated is "that of maximum economic yield (MEY). MEY must be a sustainable system that gives highest return per acre through low unit costs, consistent with a quality environment (p.278)." The concept of maximum economic yield is not one that has not been readily accepted by agriculturalists in recent years. Farm subsidies have tended to make many farmers stick to the idea that maximum yield equals maximum profit. Due to these subsidies, in many instances this has been the case. Williams (1990)

pointed out that many farmers continuing to use conventional methods are only doing so because of a "social trap." A social trap as defined by Williams (1990) refers to:

> ...situations in which an individual or society starts in a direction or relationship that later proves to be unpleasant or lethal, with no easy way to change or avoid the situation. A social trap typically occurs when conflicts exist between highly motivating short-run rewards and long-run consequences (p.28).

In the agricultural industry the short-term rewards have been government subsidies while the long-term consequences have been environmental degradation and rural economic failure. The short-term rewards of the implementation of a sustainable agriculture system may not be as prevalent as with government subsidies, but the long-term rewards may be quite substantial.

Many agricultural economists believe that sustainable agriculture must be entered into gradually and most advocates of sustainable agriculture agree. Developing an environmentally and socially sound agricultural system that will meet the needs of the farmer through maximum economic yield is a long-term proposition. The system should be developed in such a way as to make the farm business and the economic and social wellbeing of surrounding communities prosper.

In many instances the farmer, especially the small-scale operator, must supplement farm income with other forms of employment. The long-term effects of sustainable agriculture are such that the supplemental income source may

remain intact if so desired by the farmer. Carlson (1988) stated:

> Low-input agriculture is frequently referred to as sustainable agriculture, which in terms of farm families may be equated with survival. Survival depends upon long-run profitability of the farm enterprises in combination with off-farm work activities (p.1175).

Sustainable agriculture systems are designed to maximize the profits of the operation in such a way as to reduce the need for input from derived from external sources such as off-farm employment.

One of the most important aspects of the economic impacts of sustainable agriculture is rural community development and sustainability. The farm crisis of the 1980s resulted in many farm foreclosures and the demise of the economic base for some rural communities. This situation, many economists believe, has been caused by the excessive reliance on external inputs by farmers who run the businesses that support rural towns. Edwards, et.al. (1990) stated, "Farming systems collapse or are forced to change when they become unprofitable to the farmer or when they impose on farm families, neighbors, rural communities, or perhaps even whole nations clearly excessive indirect costs or burdens (p.68)." Edwards, et.al. (1990) also addressed the effects of the farm crisis situation on communities and families stating, "The human toll brought on by foreclosures, forced sales, suicides, drought, and stress within families and communities will remain a deep scar for

generations (p.76)." The use of sustainable practices in agricultural operations may be one way to alleviate some of the problems being experienced by rural communities today. Cramer (1990) cited an example of this when he quoted Ron Rossman, an Iowa farmer who uses a variety of sustainable agriculture practices in his operation, as saying:

> To us, sustainable agriculture is more than a set of farming practices to reduce costs and protect the environment. Even more important, it includes a vision of the thriving rural communities we want. The practices we use are more profitable and practical on moderate-sized diversified farms like ours. They employ more people on the land, while using less capital and fewer off-farm inputs. And that, in turn, has a snowball effect on everything else in the local economy and community. It means more people shopping on Main Street, more kids in the schools and more families in church. That's why we farm the way we do. It's worth it to see the whole community benefit (p.14-15).

Lasley, et.al. (1987) noted that in light of the recent farm crisis, rural communities have suffered. "If they are to survive these communities must address how to provide meaningful employment opportunities as well as maintain a desirable quality of life (p.35)."

The deterioration of rural communities' economic structure may be a function of the middle class being phased out. Communities that have been hardest hit by the farm crisis have either a high or low socioeconomic class. The absence of a middle class at the community level has a serious negative effect on both the quality and quantity of social and commercial services, public education, and local governments. Hassebrook and Kroese (1990) stated:

> A substantial body of sociological research indicates that a dispersed farm structure with many owner-operated farms, creates healthier communities than a large farm structure. A University of California researcher summarizes these findings as follows: As farm size and absentee ownership increase, social conditions in the local community deteriorate. We found depressed median family incomes, high levels of poverty, low education levels, etc. associated with land and capital concentration in agriculture (p.24).

Most of the absentee owners of farming operations were found to be of high socioeconomic status while the workers on these operations were low. The communities in which the operations existed were of low socioeconomic status overall. Edwards, et.al. (1990) contended that people in rural communities are beginning to become aware of their communities' relationship with agriculture and natural resources and that there are more sustainable ways to live. While they are aware of these relationships and are ready to change, Edwards, et.al. (1990) stated, "they do not yet know how (p.80)." This fact provides a great opportunity for persons versed in the area of sustainable agriculture to assume leadership roles in shaping the future of rural communities.

Public awareness and perception of the agricultural industry are also important factors to consider when reviewing the economic importance of sustainable agriculture. The opinions and emotions of the consuming public have a profound effect on the economic condition of the agricultural sector. Williams (1990) stated:

> Although public support for agriculture is still prevalent, it is eroding as the impacts of

> agricultural practices and policies on farm employment, the environment, and the structure of agriculture and rural communities are increasingly perceived as negative and severe (p.28).

Woods and Sanders (1987) contended that the negative public perception of agriculture is detrimental to the economic development of rural areas. They also noted that the relationship between agricultural and non-agricultural sectors of local economies in Oklahoma implies that agriculture depends on the rest of the economy and the economy depends on agriculture. This being the case, it is very important for the agricultural sector to take an active role in changing the non-agricultural sector's opinions and perceptions. Ikerd (1990b) pointed out that sustainable agriculture systems will help regain support for agriculture because they are of a type that is both profitable to the producer and socially acceptable to the consuming public.

The Need for Knowledge About Sustainable Agriculture

In order for sustainable agriculture practices to have the effects discussed previously they must be applied to the total farm system. Students of agriculture need to gain knowledge of sustainable agriculture systems if the future of agriculture is to be prosperous. Cooper and Gamon (1991) stated:

> A knowledge of these subjects is needed to ensure that each subsystem within the farm system is managed in the best way. Current and prospective agriculture students should be introduced to the application of these subjects in relation to the total farm operation (p.13).

Future agriculturalists who intend to improve the agricultural industry should gain knowledge in many areas of agriculture often overlooked. Smith (1989) noted that sustainable agriculture approaches are extremely scientific and require a very well educated farmer to be effective. As mentioned earlier the management function in a sustainable agriculture operation is one of the most important skills to be studied. This and many other subjects are often overlooked in traditional agriculture programs (Plowman, 1989). Stevens (1967) stated:

> Agriculture is more than farming. Persons engaged in commercial agricultural production know that their lives are committed to a basic industry. The challenges to produce high quality products, to be efficient, to conserve and use resources wisely, to promote family welfare, and to contribute to society are powerful and worthy motivations. Education along these lines is essential and it must be accessible. (p.26)

The Oklahoma State Department of Vocational and Technical Education (1990) contended that agricultural education programs must broaden their scope in order to provide students with the knowledge needed to enter into the new fields of agriculture. The area of sustainable agriculture is one of the new fields and students should be taught skills and concepts concerning it. Harritt (1987) recommended that educational programs for agricultural education students should emphasize management, marketing, and record keeping. He also maintained that these topics should be covered as they relate to supervised agricultural experiences, efficiency, and diversification and should

emphasize management for maximum profit rather than maximum production. Each of these concepts is inherent in any truly sustainable agriculture system.

Another subject that is commonly overlooked by agricultural students is that of the relationship of agriculture to the environment. Brink (1974) stated that, "Environmental education should be stressed in Oklahoma schools' curricula in order to insure environmental awareness of all students. This area is of great importance in modern agriculture and is one of the primary concerns of any sustainable agriculture operation. In order to understand the environmental impacts of agriculture and sustainable practices which help reduce these the student must be taught the biology behind agriculture (Marking, et.al., 1989). Dixon Hubbard, National Program Manager for the Cooperative Extension Service, observed that even the federal government had recognized the need for an understanding of the relationship between the environment and agriculture when he stated:

> The 1990 farm bills carry a very consistent theme: American agriculture has been broadened to include, not only profitability but environmental soundness and social responsibility (Marking, et.al., 1989, p.11).

The environmental aspects of agriculture may be addressed and studied by agricultural students if sustainable agriculture is covered in their classes.

The effects of agriculture on rural communities is one topic addressed by sustainable agriculture that many

students should be given the chance to study. People of all ages are concerned with the deterioration of the agricultural economy and the impact it is having on their lives and hometowns. Teenagers are especially interested in learning about ways in which they might help solve some of the problems currently being faced in agricultural communities. Pace (1987) pointed out that the teen years are difficult enough with the pressures of peers, homework and body changes. But, teenagers in farming communities have the added pressures of hard work, long hours, and worry over the viability of their family business. She also found that students in agricultural education classes were interested in learning about ways to help their farming parents make their businesses and communities more successful and sustainable. Newcomb, et.al. (1986) contended that a quality agricultural education program should be "community based and reflect the agriculture and agribusiness in the community (p.13)." Teaching students about sustainable agriculture as it relates to their own communities may provide a way to keep their learning community based while allowing for the application of such learning in many diverse areas and regions.

If students wish to learn about ways in which they may use sustainable agriculture concepts to help maintain and improve their family's farms and communities there must be a source of information that their teachers may tap in order

to satisfy this desire. The Kerr Center for Sustainable Agriculture (1990) contended:

> It is important for the sustainable agriculture movement to achieve a new level of cooperation and improve information exchange between farmers, researchers, extension workers, and educators (p.xii)

Tweeten (1982) addressed the need for educational cooperation between Oklahoma State University and the general public concerning the plight of the family farm when he stated:

> The family farm is a cherished institution and a remarkably successful vehicle to serve the food and fiber needs of society. The family farm is competing with larger-than-family farms which can purchase technology, information, and supplies from private sources often far removed from local communities. To remain competitive, family farms must have access to the latest technology and production and marketing information from the Division of Agriculture. Continued availability of this information not only helps preserve a way of life, but also competition and the economic and social base for the local community (p.21).

Vorst (1990) pointed out the need for education in sustainable agriculture practices as well as conventional practices. He asked, "Are reduced-input strategies receiving as much attention from research scientists, extension, and teaching personnel as conventional practices (p.60)?"

The United States Department of Agriculture Office of Special Projects and Program Systems (1990) noted that in 1988 the Secretary of Agriculture issued a memorandum that promoted research and educational programs dealing with sustainable agriculture at all levels. The memorandum

provided a positive view of sustainable agriculture methods by stating, "Profitability of low-input farming methods can be enhanced through properly designed and executed research and educational efforts (USDA Cooperative State Research Service, 1988, p.5)."

Sustainable Agriculture Curriculum

As noted earlier, sustainable agriculture is concerned with the relationship between agriculture, the environment, the economy, and society. The sustainability of agricultural resources is the basis for this concern. In recent years there has been a call for more education in the areas of conservation, the environment, and the ways these factors affect society. Newcomb, et.al. (1986) stated:

> Agricultural programs include education in agricultural resources. This involves subject matter concerned with the principles and processes involved in the conservation and improvement of natural resources such as air, forests, soil, water, fish, plants, and wildlife for economic and recreational purposes (p.12).

Beginning in 1990 the secondary agricultural education programs in the state of Oklahoma included courses titled Agriculture I, Agriculture II, Production Management I&II, Forestry, Agricultural Mechanics I&II, Horticulture I&II, Equine Management and Production, Natural Resources, Agricultural Sales and Services, Agricultural Products and Marketing, Employment in Agribusiness, and Principles of Agricultural Technology (Oklahoma State Department of

Vocational and Technical Education, 1990). The course content for each of these courses includes:

Agriculture I: Orientation to Vocational Agriculture, agricultural safety, leadership, introduction to FFA, parliamentary procedure, making a group presentation, Supervised Agriculture Experience Programs, record keeping, the livestock industry, beef breeds and selection, swine breeds and selection, sheep breeds and selection, dairy breeds and selection, horse breeds and selection, livestock feeding, introduction to plant science, agricultural mechanics orientation and safety, and welding.

Agriculture II: Public speaking, agricultural finance, the crop industry, soil conservation practices, plant growth and reproduction, seed selection, seedbed preparation, pest and disease control, livestock nutrition, livestock health and parasite control, use of power tools, arc welding, oxy-acetylene cutting and welding, project planning, and farm plumbing.

Production Management I&II: Introduction to agricultural production and management, dairy production and management, poultry production and management, beef production and management, sheep production and management, cash crop production and management, hay production and management, aquaculture production and management.

Forestry: Introduction to forestry logging operations

Agricultural Mechanics I&II: Introduction to agricultural mechanics, agricultural power and machinery, agricultural electrification, agriculture structures and conveniences, soil and water management.

Horticulture I&II: Introduction to horticulture, greenhouse operation and management, floriculture, landscape management, arboriculture, fruit and nut production, vegetable production, interior plantscape, garden center operations.

Equine Management and Production: Basic horse production, handling and grooming, handling the young, unbroken horse, horse health and disease prevention, basic first aid, parasites, fundamentals of foot care, foot problems, trimming and shoeing, practical horse nutrition, fertility and genetics of reproduction, breeding efficiency and mating procedures, care of mare and foal, selecting and marketing the horse, judging, transporting the horse, physical facilities and stable management, selection and care of tack.

Natural Resources: Introduction to natural resources, principles of natural resources, water, land, air, wildlife, and habitat management, outdoor recreation, forestry, and energy.

Agricultural Products and Marketing: Trends in agricultural food products, general safety practices, meat products, poultry products, dairy products, fish products, fruit and vegetable products, grain products, packaging agricultural products, preserving agricultural products, specialized and non food agricultural products.

Employment in Agribusiness: Orientation, wages, taxes, fringe benefits, employer/employee/customer relations, communications skills, business organizations, business machines, sales procedures, operating procedures, customer credit, transportation and warehousing, ordering, receiving and delivery, material handling equipment, merchandising, sales techniques, advertising, display.

Principles of Agricultural Technology: Force, work, rate, resistance, energy, transducers, optical systems, power, force transformers, momentum, waves and vibrations, energy converters, radiation, time constant.

While each of these courses covers a different area of specialization in agriculture, the concepts of sustainable agriculture are applicable and relevant to each. The core curriculum materials for these courses, developed by the Oklahoma State Department of Vocational and Technical

Education, cover many of the concepts and practices of sustainable agriculture, but never actually use the words "sustainable agriculture" (ODVTE, 1989). While the concepts are covered to some degree in all course curriculum material, they are not dispersed equally throughout. The Natural Resources curriculum material places heavy emphasis on sustainable agriculture concepts, but the rest only make slight mention of them. Simmons (1989) noted the importance of dispersing the sustainable agriculture concept of environmental education throughout the curriculum when he stated:

> It is widely accepted among professionals that environmental education should be infused throughout the school curriculum at every grade level. The failure to do so may be related, in part, to the types of instructional materials available (p.17).

This brings up the fact that teachers may have a problem finding materials with which to teach sustainable agriculture in the proper context.

The types of curriculum material needed to effectively teach sustainable agriculture is an area which also deserves considerable thought. As sustainable agriculture has a direct relation to the environment, it is useful to investigate the methods used by environmental educators. Jordan (1986) pointed out that students who receive instruction in environmental issues and action plans learned more than those receiving instruction in issue awareness alone. The supervised agriculture experiences of students provide one straight forward way for agricultural education

teachers to use the concept of action plans in teaching sustainable agriculture.

The curriculum taught in agricultural education has been undergoing drastic changes in response to the growing complexities of the agricultural industry in the United States and the world. New areas such as sustainable agriculture are important aspects of the industry and must be added to the current secondary agricultural education curriculum. The National Research Council (1988) summed up the need for more comprehensive curriculum when it stated:

> The subject matter of instruction about agriculture and instruction in agriculture must be broadened. The dominance of production agriculture in the curriculum must give way to a much broader agenda, including the utilization of agricultural commodities, agribusiness marketing and management in a global economy, public policy, environmental and resource management, and nutrition and health (p.6).

Related Research

Many of the studies relating to sustainable agriculture have been done in the field of integrated pest management. The success of this concept observed in field tests helps to substantiate the theory that sustainable agriculture concepts will work in an applied setting. Studies have also been done to determine the factors that have influenced farmers to adopt sustainable agriculture practices such as integrated pest management. These are important factors in determining the value of teaching sustainable agriculture to secondary agriculture students.

Sustainable agriculture practices have been shown to be effective in many past studies. One such study was conducted to compare the demand for pesticides between producers who adopted integrated pest management and those who did not (Burrows, 1981). Results showed that with comparable yield, integrated pest management reduced the use of pesticides by 45-50%. This conclusion implied that practices such as integrated pest management may provide reasonable policy alternatives to the all or nothing approach to pesticides so prevalent today. The study also showed that farmers were more likely to adopt practices that had been proven and did not require a drastic, overnight change in their operation. The adoption of sustainable agriculture as a curricular area by agricultural education teachers may require the same type proof and gradual implementation.

Another study that dealt with the adoption of sustainable agricultural practices by farmers was conducted by Salama (1983). In this study it was found that one of the most important factors influencing the adoption of sustainable agricultural practices was the past educational attainment of the farmer. This finding adds credence to the idea that, if sustainable agriculture is an important and necessary new field and that it is desirable that farmers in the future work and live by the its concepts, students of agriculture should be exposed to it as soon as possible.

The social implications of sustainable agriculture have also been researched. Foster (1981) found that Kansas farmers who utilized organic farming methods consistently believed that organic agriculture was not only a social movement facilitating alternative agriculture, but a movement responsive to increasing natural and human resource scarcities. An even more directly related social implication of sustainable agriculture was described by Sundquist and Molnar (1991) in a study of the impacts of agricultural biotechnology. They noted that the use of biotechnology in agriculture may increase employment and vitality in rural communities. They also contended that the introduction of biotechnology may improve the viability of the family farm and agribusiness as a primary income source. Organic farming and biotechnology, both being sustainable agriculture concepts, are shown by these studies to be important to society and therefore may merit teaching in secondary agriculture programs.

Although some factors influencing the adoption of sustainable agriculture among farmers have been shown it is necessary, due to the objectives of this study, to investigate factors influencing the adoption process of teachers and students. Koshler (1981) studied factors influencing the adoption of a new conservation curriculum among teachers. The study found that inservice provided in a workshop setting proved to be the most effective in encouraging teachers to teach conservation in their classes.

Student adoption of conservation attitudes was also found to be more positive in students who were taught by teachers who had participated in conservation workshops. In another study McCutcheon (1981) found that students who were exposed to conservation topics that were interspersed throughout the curriculum showed more energy conservation behaviors and a more energy conservative attitude. These studies support the argument that sustainable agriculture concepts taught in all of the agricultural education courses will result in students who are more aware of the interrelationships between sustainable agriculture, the agricultural industry, and society as a whole.

Summary

Brannon (1988) noted that since the inception of vocational agriculture in the public school systems of the United States, there has been concern as to the influence of the instruction on future activities of program completers. As agriculture enters the twenty-first century, it becomes more and more urgent that people take a closer look at how all manner of daily activities affect society. It is particularly important that future agriculturalists be prepared to take an active role in sustaining all aspects of agricultural life. Marshall and Herring (1991) stated:

> As educators, our primary responsibility is the transfer of knowledge. As students of agriculture prepare to take their place in society, knowledge of critical issues facing agriculture will be

> essential. We must include sustainable agriculture in the curriculum. (p.10)

Sustainable agriculture can be the answer to many of the problems being faced by the agricultural industry today. Teachers of agricultural education have great influence over the attitudes of their students and therefore may be instrumental in shaping the future of agriculture in the United States and the World by helping to form positive attitudes concerning sustainable agricultural concepts. Ikerd (1990) contended:

> All that is required is a change in the farming paradigm, a new model, or way of thinking. With a new paradigm, diversified farming may be viewed as the system of the future rather than the system of the past. (p.20)

Poincelot (1986) pointed out that if attitudes concerning sustainable agriculture are to be made more positive there must be a committment on the part of the educational community to teach the concepts pertaining to it. He stated:

> Research, extension, and educational activities relating to sustainable agriculture should be assigned the highest priority and existing funding redistributed to reflect this priority. (p.11)

The development and stability of rural communities across the United States depends upon future agriculturalists and their knowledge of new ways and methods of farming that will have a positive impact on the communities in which they live. This also applies to more urban settings as people begin to realize their relationship with agriculture. Edwards, et.al. (1990) noted:

> City dwellers are beginning to become aware of their relationship with agriculture and natural resources and that there are more sustainable ways to live. They are aware of these relationships and are ready to change but do not yet know how. This fact provides a great opportunity for persons versed in the area of sustainable agriculture to assume leadership roles in shaping the future of communities everywhere. (p.80)

If the United States is to retain its place as a leading innovator in the agricultural industry and, more importantly, if all countries of the world are to improve the way in which they feed and care for their citizens new steps must be taken to change the methods, practices, and concepts followed by many agriculturalists today. If these changes are to be made in the future, then the agriculturalists of the future must be taught to make them. The inclusion of sustainable agriculture concepts ın the secondary agricultural education curriculum and classroom is a step in the right direction toward preparıng for the future of agriculture in the United States and the World.

CHAPTER III

METHODOLOGY

Introduction

One of the most popular, as well as controversial, farming models being lauded by agriculture professionals is that of sustainable agriculture. The Texas Agricultural Extension Service Sustainable Agriculture Committee (1989) defined sustainable agriculture as:

> The selection and application of scientific knowledge and procedures to produce acceptable long-term economic returns, protect the environment, and promote social values including human health and safety. (p.1)

The idea of applying knowledge to a particular concern is not new but in the wake of constant reports of health risks, economic failure, resource depletion, and pollution tied directly to the agricultural industry there is a need for new application of the knowledge gained from the past. Before this knowledge can be applied, however, it must be learned and accepted by those who may be in a position to use it later, specifically secondary agricultural education students.

The area of sustainable agriculture may be of great benefit to future agriculturalists in maintaining and strengthening the agricultural infrastructure in the U.S.A.

and the world (Madden, 1988). It is for this reason that it appeared to be essential to assess the extent to which sustainable agriculture topics are being taught in secondary agricultural education classes.

The purpose of this chapter is to describe the procedures and design utilized for the conduct of this study.

Institutional Review Board (IRB) Statement

Federal regulations and Oklahoma State University policy require review and approval of all research studies that involve human subjects before investigators can begin their research. The Oklahoma State University Office of University Research Services and the IRB conduct this review to protect the rights and welfare of human subjects involved in biomedical and behavioral research. In compliance with the aforementioned policy, this study received the proper surveillance and was granted permission to continue. Refer to Appendix B for IRB approval.

Objectives

The objectives of the study were to:

1. Determine the age, years teaching experience, locale, and specific classes being taught by Oklahoma agricultural education instructors currently teaching in Oklahoma;

2. Determine the number of agricultural education instructors teaching sustainable agriculture topics and the classes in which they were being taught and those in which the topics would be taught in the future.
3. Determine the perceived quality of curriculum material available to those agricultural education instructors who taught or would teach sustainable agriculture topics in their classes;
4. Determine why Oklahoma agricultural education instructors were or were not teaching sustainable agriculture topics in their classes.
5. Determine the perceived knowledge of Oklahoma Agricultural Education Teachers concerning sustainable agriculture.
6. Determine the perceived need for in-service concerning sustainable agriculture.
7. Determine the overall perceptions of Oklahoma Agricultural Education Teachers concerning sustainable agriculture.
8. Determine the perceived local importance of sustainable agriculture in Oklahoma communities.

Procedures

In order to accomplish these objectives the following procedures were utilized to collect and analyze the necessary data. The procedures are divided into the

following sections: determination of accepted concepts and practices related to sustainable agriculture, scope of the study, development of the instrument, and analysis of data.

Determination of Accepted Concepts and Practices Related to Sustainable Agriculture

In order to survey the utilization of sustainable agriculture concepts as topics for agricultural education classes it was first necessary to identify a representative sample of these concepts that are accepted by the agricultural industry. Various sources were used to develop a list of acceptable sustainable agriculture concepts. These sources included professional journals, government documents, magazines, books, and related research projects. One primary source for the list came from a study done by Purswell (1991) in which he identified the sustainable agriculture practices utilized by Oklahoma farmers who had been involved with the production of alternative enterprises. Concepts dealing with rural community development as it relates to sustainable agriculture were derived from sources including Oklahoma State University Extension Factsheets and other professional publications pertaining to the economic effects of sustainable agriculture.

The list was audited by faculty members of the Oklahoma State University Department of Agricultural Education including the advisory committee for this study, Oklahoma

State University extension specialists, and a randomly selected group of Texas Agricultural Science teachers. Additions and corrections were made to the list as suggested by these persons. After further review, the list of accepted sustainable agriculture concepts was determined to be appropriate for the purposes of this study.

Scope of the Study

The population of this study included all secondary Agricultural Education instructors in the state of Oklahoma. The entire population was surveyed using a researcher developed questionnaire distributed in conjunction with the Oklahoma State Department of Vocational and Technical Education District Supervisors for Agricultural Education. The questionnaires were distributed at the Chapter Officer Leadership Training Conferences (COLT Conferences) in September and October of 1991. Each of these conferences was attended by the researcher and an attempt was made to gather qualitative data by way of personal interviews. Survey instruments were distributed at the COLT Conferences and collected the same day. Follow-up mailings were conducted to gather information from those teachers not attending the conferences. T-tests and Chi-square procedures showed no significant difference between respondents given surveys at conferences and those having surveys mailed to them. Table I includes the respondents and non-respondents to the survey. A total of 368 (82.51%)

TABLE I

DISTRIBUTION OF RESPONDENTS TO QUESTIONNAIRE

	Frequency Distribution N	%
Respondents	368	82.51
Non-Respondents	78	17.49
Total	446	100.00

teachers responded to the survey. Seventy-eight (17.49%) of the teachers were non-respondents.

Development of the Instrument

A researcher developed instrument was utilized to gather tha data necessary for the conduct of this study. The survey instrument developed is included in Appendix A. Sixteen items were developed to address each of the objectives set forth in the study. A brief description of the item formats and the objectives they address follows.

The first four ıtems were designed to gather demographic information about the teachers being surveyed including years teaching experience, age, locale, and courses taught. These items address objective number one.

The fifth and eleventh items were meant to solicit data concerning the amount of emphasis teachers placed upon sustainable agriculture concepts and the specific classes in which these topics were or would most likely be taught. The fifth item, using a Likert-type scale, asked teachers to rate the amount of emphasis they placed on the topics listed on the selected set of acceptable sustainable agriculture concepts. The real limits of the scale and their corresponding interpretations are 1 - 1.49 (low emphasis), 1.5 - 2.49 (moderate emphasis), 2.5 - 3.49 (high emphasis), 3.5 - 4.0 (extreme emphasis). The eleventh item was a matrix in which teachers were asked to match the sustainable agriculture concept with the class or activity ın which they

would most likely teach it. These items address objective number two.

Item number six used a Likert-type scale to solicit the teachers' response to the question of the adequacy of curricular material for teaching broad sustainable agriculture concepts. The real limits and corresponding interpretations of the scale were 0 - .49 (none available), .50 - 1.49 (poor), 1.5 - 2.49 (fair), 2.5 - 3.49 (good), 3.5 - 4.0 (excellent). This item addresses objective number three.

The fourteenth and fifteenth items asked teachers to identify reasons they did or did not teach sustainable agriculture concepts in their classes and to provide qualitative information concerning why sustainable agriculture was or was not important to their students. These items address objective number four.

Items seven and nine used likert-type scales to gather data on the perceived knowledge and comfort level of agricultural education teachers with regard to teaching topics in five broad areas related to sustainable agriculture. Item seven asked teachers to rate their perceived knowledge of sustainable agriculture. The real limits and corresponding interpretations of the scale used in item seven were 1 - 1.49 (very low), 1.5 - 2.49 (below average), 2.5 - 3.49 (average), 3.5 - 4.49 (above average), and 4.5 - 5.0 (very high). Item nine asked teachers to rate the level of comfort they would feel while teaching specific

sustainable agriculture concepts. The real limits and corresponding interpretations of the scale used in item nine were 0 - .49 (would not teach at all), .5 - 1.49 (very uncomfortable), 1.5 - 2.49 (uncomfortable), 2.5 - 3.49 (comfortable), 3.5 - 4.0 (very comfortable). These items address objective number five.

The eighth and tenth items asked teachers to identify the important agricultural products produced in their districts and the approximate level of utilization of sustainable agriculture practices by producers in their areas. These items address objective number six.

Items twelve and thirteen addressed the need for in-service in various topics related to sustainable agriculture. Item twelve used a likert-type scale to solicit the teachers' perceptions concerning the level of need for in-service on sustainable agriculture concepts. The real limits and corresponding interpretations of the scale used in item twelve were 0 - .49 (no need), .5 - 1.49 (minimum need), 1.5 - 2.49 (moderate need), 2.5 - 3.49 (moderately high need), 3.5 - 4.0 (high need). Item thirteen asked teachers to identify specific sustainable agriculture topics over which in-service is needed. These items address objective number seven.

Item sixteen was an open-ended question designed to solicit qualitative information concerning the teachers' personal opinions regarding sustainable agriculture. This item addresses objective number eight.

The instrument was developed and then reviewed by the advisory committee for this study, other graduate students, and experts in the field in attendance at a teleconference over sustainable agriculture at Oklahoma State University. Content and construct validity was established for the instrument through these review processes. The instrument was then pilot tested on twenty randomly selected agricultural science teachers in Texas to further determine validity and appropriateness.

Analysis of Data

Data gathered were recorded on the Microsoft Excel spreadsheet and Microsoft Works Database programs. All statistical treatment of the data gathered in this study was performed using the formula functions of the spreadsheet and database programs. Since the entire population of agricultural education teachers was surveyed only descriptive statistics, frequencies, and percentages were necessary to ascertain the current standing of sustainable agriculture in secondary agricultural education programs in Oklahoma.

For items in which teachers were asked to list or identify specific topics, courses, or practices (including the matrix item) frequencies and percentages were computed and ranked in descending order. Means and standard deviations were computed for all scaled response items. Items upon which teachers responded qualitatively were

analyzed by categorizing responses and computing frequencies and percentages. Pearson Product-Moment correlation was used to determine the relationship between knowledge and comfort level concerning sustainable agriculture.

CHAPTER IV

PRESENTATION AND ANALYSIS OF DATA

Introduction

The purpose of this chapter is to analyze the teaching of sustainable agriculture topics by Oklahoma Agricultural Education teachers (hereafter referred to as teachers) and to present the findings. The population of the study included all teachers (446) under public school contract, in the state of Oklahoma, during the 1991-1992 school year. Surveys were personally distributed to teachers attending the Chapter Officer Leadership Training Conferences (COLT Conferences) during the Fall of 1991. Follow-up mailings were conducted to solicit responses from those teachers not in attendance at the COLT Conferences. After the follow-up mailing nonrespondents were identified and personally contacted at the Oklahoma Department of Vocational and Technical Education Mid-Winter Conference. Surveys were collected by these means from October 15, 1991 to January 11, 1992. Of the 446 teachers included in the study population, 368 (82.51 percent) responded to the survey.

Findings of the Study

The following section was included to present the analysis of the data collected relative to each of the objectives of the study.

The demographic information concerning teachers is shown in Table II. Oklahoma Agricultural Education teachers had a mean of 12.54 years teaching experience and averaged 36.41 years of age.

Of the 368 respondents 64 were located in the Central district, 95 in the Northeast district, 50 in the Northwest district, 76 in the Southeast district, and 83 in the Southwest district.

Agricultural Education Courses Taught

The number of teachers who taught specific Agricultural Education classes during the 1990-1991 school year is illustrated in Table III. Agriculture I was taught by 344 (93.48%) of the teachers, Agriculture II by 221 (60.05%), Production Management I by 169 (45.92%), Production Management II by 38 (10.33%), Forestry by 11 (2.99%), Horticulture I by 78 (21.20%), Horticulture II by 22 (5.98%), Equine Management and Production by 31 (8.42%), Natural Resources by 242 (65.76%), Agricultural Sales and Service by 61 (16.58%), Agricultural Products and Marketingby 19 (5.16%), Principles of Agricultural Technology by 9 (2.45%), Employment in Agribusiness by 30

TABLE II

MEAN AGE AND YEARS TEACHING EXPERIENCE OF RESPONDENTS

Data Type	Mean	SD
Age	36.41	8.65
Years Teaching Experience	12.54	8.40

TABLE III

DISTRIBUTION OF TEACHERS BY SPECIFIC AGRICULTURAL EDUCATION COURSES TAUGHT DURING THE 1990 - 1991 SCHOOL YEAR

Ag.Ed. Course Taught	Frequency Distribution N	%
Agriculture I	344	93.48
Ag. Mechanics I	264	71.74
Natural Resources	242	65.76
Agriculture II	221	60.05
Production Mgmt. I	169	45.92
8th Grade Agriculture	160	43.48
Horticulture I	78	21.20
Ag. Sales and Service	61	16.58
Ag. Mechanics II	56	15.22
Production Mgmt. II	38	10.33
Equine Mgmt. and Prod.	31	8.42
Employment in Ag. Business	30	8.15
Horticulture II	22	5.98
Ag. Products and Mktng.	19	5.16
Forestry	11	2.99
Principles of Ag. Tech.	9	2.45

(8.15%), Agricultural Mechanics I by 264 (71.74%), Agricultural Mechanics II by 56 (15.22%), and Eighth Grade Agriculture by 160 (43.48%).

Emphasis Placed on Sustainable Agriculture Topics

Table IV provides a summary of the amount of emphasis that teachers indicated was placed upon sustainable agriculture concepts and topics in their classes. Mean responses ranged from 3.15 (high emphasis) to 1.44 (low emphasis). Concepts and topics being given high emphasis included alternative enterprises (M=2.63), rural community development (M=2.61), pasture rotation (M=2.77), range/brush control (M=2.62), water quality (M=3.15), and soil erosion (M=3.15). Only one sustainable agriculture concept was indicated to have been given low emphasis. Drip irrigation had a mean response of 1.44 which placed it in the category of low emphasis. All other topics and concepts were rated as being given moderate emphasis and none were rated as being given extreme emphasis.

Curriculum Material

The perceived adequacy of curriculum materials relating to sustainable agriculture as indicated by teachers is illustrated in Table V. Only one sustainable agriculture curriculum topic was rated as being good in terms of adequacy. Conservation practices was rated good in terms of adequacy of curriculum material (M=2.53). Curriculum

TABLE IV

MEAN EMPHASIS PLACED BY TEACHERS UPON SELECTED SUSTAINABLE AGRICULTURE TOPICS

Topics	State Total Mean	SD	Interpretation (N=368)
Water Quality	3.15	.84	High
Soil Erosion	3.15	.80	High
Pasture Rotation	2.77	.86	High
Alternative Enterprises	2.63	.94	High
Range/Brush Control	2.62	.94	High
Rural Community Development	2.61	.90	High
Parasite Monitoring	2.35	.94	Moderate
Cover Crops	2.17	.89	Moderate
Compatible Crops	2.13	.86	Moderate
Rural Population Sustainability	2.09	.97	Moderate
Integrated Pest Mgmt.	2.04	.84	Moderate
Contour Farming	2.04	.88	Moderate
Minimum/No Till	2.01	.92	Moderate
Animal Manure Fert.	1.98	.83	Moderate
Mulching	1.97	.87	Moderate
Resistant Crops	1.93	.84	Moderate
Crop Rotation	1.85	.80	Moderate
Strip Cropping	1.81	.82	Moderate
Organic Gardening	1.80	.86	Moderate
Fallow Ground	1.74	.80	Moderate

TABLE IV (Cont.)

Topics	State Total Mean	SD	Interpretation (N=368)
Alternative Power	1.62	.77	Moderate
Green Manure Crops	1.59	.74	Moderate
Drip Irrigation	1.44	.67	Low

TABLE V

MEAN RESPONSE OF TEACHER PERCEPTIONS CONCERNING THE ADEQUACY OF CURRICULUM MATERIALS FOR TEACHING SUSTAINABLE AGRICULTURE TOPICS

Topic	State Total Mean	SD	Interpretation (N=368)
Conservation Practices	2.53	.82	Good
Environmental Concerns	2.49	.95	Fair
Alternative Enterprises	1.82	.81	Fair
Rural Development	1.58	.85	Fair
Integrated Pest Mgmt.	1.40	.79	Poor

material adequacy for environmental concerns was rated fair (M=2.49), alternative enterprises was rated fair (M=1.82), rural development was rated fair (M=1.58), and integrated pest management was rated poor (M=1.40). None of the five topics were rated as having curriculum material that could have been called excellent in adequacy.

Courses in Which Sustainable Agriculture Topics Would be Taught

The frequency of teachers who indicated that they would teach sustainable agriculture topics in the Agriculture I course is summarized in Table VI. A high of 79 (21.47%) teachers indicated that they would teach alternative enterprises in Agriculture I and a low of 16 (4.35%) stated that they would teach drip irrigation in that class. It should be noted that ten of the topics listed were identified by over 10% of the teachers as being those that would be taught in the Agriculture I course.

Table VII shows the number of teachers who indicated they would teach specific sustainable agriculture topics in the Agriculture II course. A high of 137 (37.23%) would teach cover crops while only 29 (7.88%) indicated that they would teach wildlife management in the Agriculture II course. Fifteen topics were identified by over 20% of the teachers as being those that would be taught in the Agriculture II course.

TABLE VI

DISTRIBUTION OF TEACHERS BY SELECTED SUSTAINABLE AGRICULTURE TOPICS TAUGHT IN THE AGRICULTURE I COURSE

Topic	Distribution of Teachers by Topic [N=number of teachers (368)]	
	N	(%)
Alternative Enterprises	79	(21.47)
Soil Erosion	59	(16.03)
Parasite Monitoring	56	(15.22)
Rural Comm. Development	55	(14.95)
Rural Pop. Sustainability	48	(13.04)
Crop Rotation	47	(12.77)
Pasture Rotation	45	(12.23)
Cover Crops	45	(12.23)
Contour Farming	44	(11.96)
Animal Manure Fert.	43	(11.68)
Minimum / No Till	36	(9.78)
Alternative Power	36	(9.78)
Strip Cropping	34	(9.24)
Mulching	33	(8.97)
Fallow Ground	31	(8.42)
Range / Brush Control	29	(7.88)
Organic Gardening	28	(7.61)
Green Manure Crops	26	(7.07)
Wildlife Management	25	(6.80)
Integrated Pest Mgmt.	24	(6.52)
Water Quality	23	(6.25)
Compatible Crops	20	(5.43)
Resistant Crops	19	(5.16)
Drip Irrigation	16	(4.35)

TABLE VII

DISTRIBUTION OF TEACHERS BY SELECTED SUSTAINABLE AGRICULTURE TOPICS TAUGHT IN THE AGRICULTURE II COURSE

Topic	Distribution of Teachers by Topic [N=number of teachers (368)]	
	N	(%)
Cover Crops	137	(37.23)
Strip Cropping	118	(32.07)
Contour Farming	118	(32.07)
Range / Brush Control	116	(31.52)
Crop Rotation	114	(30.98)
Parasite Monitoring	113	(30.71)
Soil Erosion	113	(30.71)
Pasture Rotation	105	(28.53)
Green Manure Crops	94	(25.54)
Minimum / No Till	85	(23.09)
Mulching	79	(21.47)
Compatible Crops	78	(21.21)
Fallow Ground	78	(21.21)
Animal Manure Fert.	78	(21.21)
Resistant Crops	75	(20.38)
Integrated Pest Mgmt.	71	(19.29)
Drip Irrigation	62	(16.85)
Alternative Enterprises	52	(14.13)
Rural Pop. Sustainability	47	(12.77)
Organic Gardening	45	(12.23)
Rural Comm. Development	43	(11.68)
Water Quality	34	(9.24)
Alternative Power	32	(8.70)
Wildlife Management	29	(7.88)

The number of teachers indicating that they would teach specific sustainable agriculture topics in the Production Management I course is shown in Table VIII. A high of 144 (39.13%) teachers indicated that they would teach pasture rotation in Production Management I while a low of 15 (4.08%) stated that they would teach wildlife management in that class. Note that thirteen topics were identified by over 20% of the teachers as being those that would be taught in the Production Management I course.

Table IX lists the number of teachers who indicated that they would teach specific sustainable agriculture topics in the Production Management II course. Teachers indicated that a high of 78 (21.20%) would teach resistant crops in Production Management II and a low of 3 (0.82%) would teach wildlife management in that class. It should be noted that seventeen topics were identified by over 10% of the teachers as being those topics that would be taught in the Production Management II course.

The number of teachers indicating that they would teach specific sustainable agriculture topics in the Forestry course is shown in Table X. In the Forestry class a high of 12 (3.26%) teachers indicated that they would teach wildlife management while a low of 0 (0.00%) stated that they would teach organic gardening. It is important to note that only two topics were identified by ten or more teachers as being those topics that would be taught in the Forestry course.

Table XI shows the number of teachers that indicated

TABLE VIII

DISTRIBUTION OF TEACHERS BY SELECTED SUSTAINABLE AGRICULTURE TOPICS TAUGHT IN THE PRODUCTION MANAGEMENT I COURSE

Topic	Distribution of Teachers by Topic [N=number of teachers (368)]	
	N	(%)
Pasture Rotation	144	(39.13)
Crop Rotation	116	(31.52)
Range / Brush Control	107	(29.08)
Parasite Monitoring	105	(28.53)
Cover Crops	103	(27.99)
Compatible Crops	103	(27.99)
Animal Manure Fert.	102	(27.72)
Minimum / No Till	102	(27.72)
Contour Farming	102	(27.72)
Fallow Ground	100	(27.17)
Resistant Crops	100	(27.17)
Strip Cropping	99	(26.90)
Green Manure Crops	96	(26.09)
Alternative Enterprises	71	(19.29)
Drip Irrigation	65	(17.66)
Alternative Power	65	(17.66)
Soil Erosion	64	(17.39)
Integrated Pest Mgmt.	63	(17.12)
Mulching	58	(15.76)
Rural Comm. Development	38	(10.33)
Rural Pop. Sustainability	37	(10.05)
Organic Gardening	35	(9.51)
Water Quality	27	(7.34)
Wildlife Management	15	(4.08)

TABLE IX

DISTRIBUTION OF TEACHERS BY SELECTED SUSTAINABLE AGRICULTURE TOPICS TAUGHT IN THE PRODUCTION MANAGEMENT II COURSE

Topic	Distribution of Teachers by Topic [N=number of teachers (368)]	
	N	(%)
Resistant Crops	78	(21.20)
Minimum / No Till	62	(16.85)
Compatible Crops	61	(16.58)
Pasture Rotation	58	(15.76)
Parasite Monitoring	58	(15.76)
Range / Brush Control	57	(15.49)
Fallow Ground	55	(14.95)
Green Manure Crops	51	(13.86)
Integrated Pest Mgmt.	50	(13.59)
Crop Rotation	49	(13.32)
Strip Cropping	48	(13.04)
Contour Farming	45	(12.23)
Alternative Enterprises	43	(11.68)
Drip Irrigation	43	(11.68)
Rural Pop. Sustainability	43	(11.68)
Cover Crops	42	(11.41)
Alternative Power	37	(10.05)
Soil Erosion	35	(9.51)
Animal Manure Fert.	35	(9.51)
Mulching	31	(8.42)
Rural Comm. Development	24	(6.52)
Water Quality	13	(3.53)
Organic Gardening	11	(2.99)
Wildlife Management	3	(0.82)

TABLE X

DISTRIBUTION OF TEACHERS BY SELECTED SUSTAINABLE AGRICULTURE TOPICS TAUGHT IN THE FORESTRY COURSE

Topic	Distribution of Teachers by Topic [N=number of teachers (368)]	
	N	(%)
Wildlife Management	12	(3.26)
Range / Brush Control	10	(2.72)
Animal Manure Fert.	8	(2.17)
Compatible Crops	7	(1.90)
Integrated Pest Mgmt.	7	(1.90)
Parasite Monitoring	6	(1.63)
Water Quality	5	(1.36)
Crop Rotation	5	(1.36)
Alternative Power	5	(1.36)
Minimum / No Till	3	(0.82)
Alternative Enterprises	3	(0.82)
Green Manure Crops	3	(0.82)
Soil Erosion	3	(0.82)
Rural Pop. Sustainability	2	(0.54)
Pasture Rotation	2	(0.54)
Fallow Ground	2	(0.54)
Resistant Crops	2	(0.54)
Strip Cropping	2	(0.54)
Contour Farming	2	(0.54)
Rural Comm. Development	2	(0.54)
Drip Irrigation	1	(0.27)
Mulching	1	(0.27)
Cover Crops	1	(0.27)
Organic Gardening	0	(0.00)

TABLE XI

DISTRIBUTION OF TEACHERS BY SELECTED SUSTAINABLE AGRICULTURE TOPICS TAUGHT IN THE NATURAL RESOURCES COURSE

Topic	Distribution of Teachers by Topic [N=number of teachers (368)]	
	N	(%)
Wildlife Management	270	(73.37)
Water Quality	237	(64.40)
Soil Erosion	111	(30.16)
Rural Comm. Development	69	(18.75)
Rural Pop. Sustainability	44	(11.96)
Mulching	43	(11.68)
Alternative Power	40	(10.87)
Cover Crops	39	(10.59)
Contour Farming	39	(10.59)
Animal Manure Fert.	39	(10.59)
Minimum / No Till	37	(10.05)
Fallow Ground	36	(9.78)
Integrated Pest Mgmt.	33	(8.97)
Range / Brush Control	31	(8.42)
Organic Gardening	29	(7.88)
Strip Cropping	27	(7.34)
Alternative Enterprises	26	(7.07)
Green Manure Crops	25	(6.79)
Pasture Rotation	21	(5.71)
Drip Irrigation	18	(4.89)
Resistant Crops	17	(4.62)
Crop Rotation	17	(4.62)
Parasite Monitoring	12	(3.26)
Compatible Crops	5	(1.36)

they would teach specific sustainable agriculture topics in the Natural Resources course. A high of 270 (73.37%) teachers stated that they would teach wildlife management in Natural Resources and a low of 5 (1.36%) indicated that they would teach compatible crops in that same class. Eleven of the topics listed were identified by over 10% of the teachers as being those topics that would be taught in the Natural Resources course.

The number of teachers indicating they would teach specific sustainable agriculture topics in the Agricultural Mechanics I course is illustrated in Table XII. Only ten of the twenty-four topics listed were indicated as those that would be taught in Agricultural Mechanics I. Of these ten topics a high of 16 (4.35%) teachers stated that they would teach alternative power and a low of 1 (0.27%) indicated that they would teach cover crops, pasture rotation, minimum/no till, rural community development, and soil erosion. A total of fourteen topics were indicated as being those that no teachers would teach in Agricultural Mechanics I. Only one sustainable agriculture topic was identified by more than 10 teachers as being a topic that would be taught in the Agricultural Mechanics I course.

Table XIII shows the number of teachers that indicated that they would teach specific sustainable agriculture topics in the Agricultural Mechanics II course. Fourteen of the twenty-four topics were indicated to be those that teachers would teach in Agriculture Mechanics II. Of these

TABLE XII

DISTRIBUTION OF TEACHERS BY SELECTED SUSTAINABLE AGRICULTURE TOPICS TAUGHT IN THE AGRICULTURAL MECHANICS I COURSE

Topic	Distribution of Teachers by Topic [N=number of teachers (368)]	
	N	(%)
Alternative Power	16	(4.35)
Drip Irrigation	6	(1.63)
Water Quality	3	(0.82)
Alternative Enterprises	3	(0.82)
Contour Farming	3	(0.82)
Cover Crops	1	(0.27)
Pasture Rotation	1	(0.27)
Minimum / No Till	1	(0.27)
Rural Comm. Development	1	(0.27)
Soil Erosion	1	(0.27)
Range / Brush Control	0	(0.00)
Organic Gardening	0	(0.00)
Compatible Crops	0	(0.00)
Parasite Monitoring	0	(0.00)
Rural Pop. Sustainability	0	(0.00)
Fallow Ground	0	(0.00)
Resistant Crops	0	(0.00)
Crop Rotation	0	(0.00)
Strip Cropping	0	(0.00)
Green Manure Crops	0	(0.00)
Wildlife Management	0	(0.00)
Mulching	0	(0.00)
Integrated Pest Mgmt.	0	(0.00)
Animal Manure Fert.	0	(0.00)

TABLE XIII

DISTRIBUTION OF TEACHERS BY SELECTED SUSTAINABLE AGRICULTURE TOPICS TAUGHT IN THE AGRICULTURAL MECHANICS II COURSE

Topic	Distribution of Teachers by Topic [N=number of teachers (368)]	
	N	(%)
Alternative Power	15	(4.08)
Drip Irrigation	5	(1.36)
Mulching	4	(1.09)
Integrated Pest Mgmt.	4	(1.09)
Animal Manure Fert.	4	(1.09)
Organic Gardening	3	(0.82)
Wildlife Management	3	(0.82)
Green Manure Crops	2	(0.54)
Rural Comm. Development	2	(0.54)
Soil Erosion	2	(0.54)
Crop Rotation	1	(0.27)
Strip Cropping	1	(0.27)
Contour Farming	1	(0.27)
Pasture Rotation	1	(0.27)
Cover Crops	0	(0.00)
Range / Brush Control	0	(0.00)
Compatible Crops	0	(0.00)
Parasite Monitoring	0	(0.00)
Rural Pop. Sustainability	0	(0.00)
Water Quality	0	(0.00)
Fallow Ground	0	(0.00)
Minimum / No Till	0	(0.00)
Alternative Enterprises	0	(0.00)
Resistant Crops	0	(0.00)

fourteen a high of 15 (4.08%) teachers stated that they would teach alternative power and a low of 1 (0.27%) indicated that they would teach pasture rotation, crop rotation, strip cropping, and contour farming in Agriculture Mechanics II. The remaining ten topics were shown to be those that would not be taught in Agriculture Mechanics II. Once again, only one topic was identified by 10 or more teachers as being a topic that would be taught in the Agricultural Mechanics II course.

The number of teachers indicating that they would teach specific sustainable agriculture topics in the Horticulture I course is shown in Table XIV. In the Horticulture I class a high of 123 (33.42%) teachers indicated that they would teach organic gardening while a low of 0 (0.00%) stated that they would teach rural community development. Four topics were identified by over 10% of the teachers as being those that would be taught in the Horticulture I course.

Table XV shows the number of teachers indicating that they would teach specific sustainable agriculture topics in the Horticulture II course. Responses in the Horticulture II class ranged from a high of 34 (9.24%) teachers who indicated that they would teach organic gardening to a low of 1 (0.27%) who indicated that they would teach alternative power. Six of the topics listed were identified by ten or more teachers as being those that would be taught in the Horticulture II course.

The number of teachers indicating that they would teach

TABLE XIV

DISTRIBUTION OF TEACHERS BY SELECTED SUSTAINABLE AGRICULTURE TOPICS TAUGHT IN THE HORTICULTURE I COURSE

Topic	Distribution of Teachers by Topic [N=number of teachers (368)]	
	N	(%)
Organic Gardening	123	(33.42)
Mulching	70	(19.02)
Drip Irrigation	53	(14.40)
Integrated Pest Mgmt.	49	(13.32)
Animal Manure Fert.	34	(9.24)
Resistant Crops	25	(6.79)
Compatible Crops	19	(5.16)
Parasite Monitoring	17	(4.62)
Green Manure Crops	16	(4.35)
Soil Erosion	12	(3.26)
Range / Brush Control	11	(2.99)
Water Quality	11	(2.99)
Alternative Enterprises	10	(2.72)
Fallow Ground	8	(2.17)
Minimum / No Till	8	(2.17)
Cover Crops	7	(1.90)
Crop Rotation	5	(1.36)
Rural Pop. Sustainability	4	(1.09)
Pasture Rotation	3	(0.82)
Strip Cropping	2	(0.54)
Contour Farming	2	(0.54)
Wildlife Management	1	(0.27)
Alternative Power	1	(0.27)
Rural Comm. Development	0	(0.00)

TABLE XV

DISTRIBUTION OF TEACHERS BY SELECTED SUSTAINABLE AGRICULTURE TOPICS TAUGHT IN THE HORTICULTURE II COURSE

Topic	Distribution of Teachers by Topic [N=number of teachers (368)]	
	N	(%)
Organic Gardening	34	(9.24)
Drip Irrigation	20	(5.43)
Integrated Pest Mgmt.	15	(4.08)
Resistant Crops	13	(3.53)
Mulching	13	(3.53)
Animal Manure Fert.	11	(2.99)
Range / Brush Control	6	(1.63)
Parasite Monitoring	6	(1.63)
Green Manure Crops	5	(1.36)
Alternative Enterprises	4	(1.09)
Crop Rotation	4	(1.09)
Compatible Crops	4	(1.09)
Water Quality	4	(1.09)
Strip Cropping	4	(1.09)
Fallow Ground	2	(0.54)
Minimum / No Till	2	(0.54)
Contour Farming	2	(0.54)
Wildlife Management	2	(0.54)
Rural Comm. Development	2	(0.54)
Soil Erosion	2	(0.54)
Cover Crops	2	(0.54)
Rural Pop. Sustainability	2	(0.54)
Alternative Power	1	(0.27)
Pasture Rotation	0	(0.00)

specific sustainable agriculture topics in the 8th Grade Agriculture course is shown in Table XVI. A high of 34 (9.24%) teachers stated that they would teach alternative enterprises in Eighth Grade Agriculture and a low of 0 (0.00%) indicated that they would teach resistant crops in that class. Nine of the topics were identified by ten or more teachers as being those topics that would be taught in the 8th Grade Agriculture course.

Table XVII shows the number of teachers indicating that they would teach specific sustainable agriculture topics in the Equine Management and Production course. Eleven of the topics were indicated to be those that would not be taught in Equine Management and Production. Of the remaining fifteen topics a high of 10 (2.72%) teachers indicated that they would teach alternative power in Equine Management and Production while a low of 1 (0.27%) stated that they would teach cover crops, resistant crops, green manure crops, drip irrigation, wildlife management, and rural community developement in that class. It should be noted that only one topic was identified by ten or more teachers as being a sustainable agriculture topic that would be taught in the Equine Management and Production course.

Table XVIII shows the number of teachers that indicated that they would teach specific sustainable agriculture topics in the Agricultural Sales and Service course. Only eight of the topics were indicated to be those that would be taught in Agricultural Sales and Service. Of those topics

TABLE XVI

DISTRIBUTION OF TEACHERS BY SELECTED SUSTAINABLE AGRICULTURE TOPICS TAUGHT IN THE 8TH GRADE AGRICULTURE COURSE

Topic	Distribution of Teachers by Topic [N=number of teachers (368)]	
	N	(%)
Alternative Enterprises	34	(9.24)
Rural Comm. Development	33	(8.97)
Rural Pop. Sustainability	23	(6.25)
Alternative Power	22	(5.98)
Soil Erosion	13	(3.53)
Water Quality	12	(3.26)
Wildlife Management	12	(3.26)
Animal Manure Fert.	10	(2.72)
Organic Gardening	10	(2.72)
Parasite Monitoring	9	(2.45)
Contour Farming	8	(2.17)
Mulching	8	(2.17)
Cover Crops	6	(1.63)
Range / Brush Control	6	(1.63)
Pasture Rotation	5	(1.36)
Crop Rotation	5	(1.36)
Green Manure Crops	4	(1.09)
Integrated Pest Mgmt.	4	(1.09)
Strip Cropping	3	(0.82)
Drip Irrigation	3	(0.82)
Compatible Crops	2	(0.54)
Fallow Ground	2	(0.54)
Minimum / No Till	1	(0.27)
Resistant Crops	0	(0.00)

TABLE XVII

DISTRIBUTION OF TEACHERS BY SELECTED SUSTAINABLE AGRICULTURE TOPICS TAUGHT IN THE EQUINE MANAGEMENT COURSE

Topic	Distribution of Teachers by Topic [N=number of teachers (368)]	
	N	(%)
Alternative Power	10	(2.72)
Rural Pop. Sustainability	9	(2.45)
Parasite Monitoring	7	(1.90)
Pasture Rotation	6	(1.63)
Animal Manure Fert.	3	(0.82)
Water Quality	3	(0.82)
Mulching	2	(0.54)
Resistant Crops	1	(0.27)
Cover Crops	1	(0.27)
Green Manure Crops	1	(0.27)
Drip Irrigation	1	(0.27)
Wildlife Management	1	(0.27)
Rural Comm. Development	1	(0.27)
Range / Brush Control	0	(0.00)
Organic Gardening	0	(0.00)
Compatible Crops	0	(0.00)
Fallow Ground	0	(0.00)
Minimum / No Till	0	(0.00)
Alternative Enterprises	0	(0.00)
Crop Rotation	0	(0.00)
Strip Cropping	0	(0.00)
Contour Farming	0	(0.00)
Soil Erosion	0	(0.00)
Integrated Pest Mgmt.	0	(0.00)

TABLE XVIII

DISTRIBUTION OF TEACHERS BY SELECTED SUSTAINABLE AGRICULTURE TOPICS TAUGHT IN THE AGRICULTURAL SALES AND SERVICE COURSE

Topic	Distribution of Teachers by Topic [N=number of teachers (368)]	
	N	(%)
Rural Comm. Development	21	(5.71)
Rural Pop. Sustainability	19	(5.16)
Alternative Enterprises	15	(4.08)
Alternative Power	3	(0.82)
Animal Manure Fert.	2	(0.54)
Integrated Pest Mgmt.	1	(0.27)
Resistant Crops	1	(0.27)
Wildlife Management	1	(0.27)
Cover Crops	0	(0.00)
Range / Brush Control	0	(0.00)
Organic Gardening	0	(0.00)
Compatible Crops	0	(0.00)
Parasite Monitoring	0	(0.00)
Pasture Rotation	0	(0.00)
Water Quality	0	(0.00)
Fallow Ground	0	(0.00)
Minimum / No Till	0	(0.00)
Crop Rotation	0	(0.00)
Strip Cropping	0	(0.00)
Contour Farming	0	(0.00)
Green Manure Crops	0	(0.00)
Drip Irrigation	0	(0.00)
Soil Erosion	0	(0.00)
Mulching	0	(0.00)

that were chosen a high of 21 (5.71%) teachers indicated that they would teach rural community development while a low of 1 (0.27%) teachers stated that they would teach resistant crops, wildlife management, and integrated pest management in Agricultural Sales and Service. Three of the topics were identified by ten or more teachers as being those that would be taught in the Agricultural Sales and Service course.

The number of teachers that indicated that they would teach specific sustainable agriculture topics in the Agricultural Products and Marketing course is shown in Table XIX. In Agricultural Products and Marketing only three of the topics were indicated to be those that would not be taught. Of the 21 remaining topics a high of 16 (4.35%) teachers stated that they would teach alternative enterprises and a low of 1 (0.27%) indicated that they would teach compatible crops, parasite monitoring, pasture rotation, water quality, fallow ground, minimum/no till, resistant crops, crop rotation, strip cropping, contour farming, green manure crops, drip irrigation, wildlife management, and animal manure fertilizer in Agricultural Products and Marketing. Two sustainable agriculture topics were identified by ten or more teachers as being those that would be taught in the Agricultural Products and Marketing course.

Table XX shows the number of teachers that indicated

TABLE XIX

DISTRIBUTION OF TEACHERS BY SELECTED SUSTAINABLE AGRICULTURE TOPICS TAUGHT IN THE AGRICULTURAL PRODUCTS AND MARKETING COURSE

Topic	Distribution of Teachers by Topic [N=number of teachers (368)]	
	N	(%)
Alternative Enterprises	16	(4.35)
Rural Comm. Development	14	(3.80)
Rural Pop. Sustainability	8	(2.17)
Organic Gardening	7	(1.90)
Cover Crops	4	(1.09)
Integrated Pest Mgmt.	2	(0.54)
Range / Brush Control	2	(0.54)
Compatible Crops	1	(0.27)
Parasite Monitoring	1	(0.27)
Pasture Rotation	1	(0.27)
Water Quality	1	(0.27)
Fallow Ground	1	(0.27)
Minimum / No Till	1	(0.27)
Resistant Crops	1	(0.27)
Crop Rotation	1	(0.27)
Strip Cropping	1	(0.27)
Contour Farming	1	(0.27)
Green Manure Crops	1	(0.27)
Drip Irrigation	1	(0.27)
Wildlife Management	1	(0.27)
Animal Manure Fert.	1	(0.27)
Soil Erosion	0	(0.00)
Mulching	0	(0.00)
Alternative Power	0	(0.00)

TABLE XX

DISTRIBUTION OF TEACHERS BY SELECTED SUSTAINABLE AGRICULTURE TOPICS TAUGHT IN THE EMPLOYMENT IN AGRIBUSINESS COURSE

Topic	Distribution of Teachers by Topic [N=number of teachers (368)]	
	N	(%)
Rural Pop. Sustainability	19	(5.16)
Rural Comm. Development	16	(4.35)
Alternative Enterprises	11	(2.99)
Alternative Power	3	(0.82)
Cover Crops	1	(0.27)
Range / Brush Control	0	(0.00)
Organic Gardening	0	(0.00)
Compatible Crops	0	(0.00)
Parasite Monitoring	0	(0.00)
Pasture Rotation	0	(0.00)
Water Quality	0	(0.00)
Fallow Ground	0	(0.00)
Minimum / No Till	0	(0.00)
Resistant Crops	0	(0.00)
Crop Rotation	0	(0.00)
Strip Cropping	0	(0.00)
Contour Farming	0	(0.00)
Green Manure Crops	0	(0.00)
Drip Irrigation	0	(0.00)
Wildlife Management	0	(0.00)
Soil Erosion	0	(0.00)
Mulching	0	(0.00)
Integrated Pest Mgmt.	0	(0.00)
Animal Manure Fert.	0	(0.00)

that they would teach specific sustainable agriculture topics in the Employment in Agribusiness course. Only five of the topics were indicated to be those that would be taught in Employment in Agrıbusiness. Of these five topıcs 19 (5.16%) teachers stated that they would teach rural population sustaınability, 16 (4.35%) would teach rural community development, 11 (2.99%) would teach alternatıve enterprises, 3 (0.82%) would teach alternative power, and 1 (0.27%) would teach cover crops. The 19 remaınıng topics were indicated to be those that would not be taught in Employment in Agribusiness. Only three topics were identified by ten or more teachers as being sustainable agriculture topics that would be taught in the Employment in Agrıbusiness course.

The number of teachers indicating that they would teach specific sustainable agrıculture topıcs in the Agrıcultural Career Orientation course is shown in Table XXI. Eight of the topics were indıcated to be those that would be taught in Agricultural Career Orientation. Of these eıght topics 15 (4.08%) teachers stated that they would teach rural population sustainability, 8 (2.17%) would teach alternative enterprıses, 7 (1.90%) would teach rural community development, 3 (0.82%) would teach integrated pest management, and 1 (0.27%) would teach parasite monıtoring, green manure crops, animal manure fertilizer, and alternative power. Sixteen of the topics were ındicated to be those that would not be taught in Agricultural Career

TABLE XXI

DISTRIBUTION OF TEACHERS BY SELECTED SUSTAINABLE AGRICULTURE TOPICS TAUGHT IN THE AGRICULTURAL CAREER ORIENTATION COURSE

Topic	Distribution of Teachers by Topic [N=number of teachers (368)]	
	N	(%)
Rural Pop. Sustainability	15	(4.08)
Alternative Enterprises	8	(2.17)
Rural Comm. Development	7	(1.90)
Integrated Pest Mgmt.	3	(0.82)
Parasite Monitoring	1	(0.27)
Green Manure Crops	1	(0.27)
Animal Manure Fert.	1	(0.27)
Alternative Power	1	(0.27)
Cover Crops	0	(0.00)
Range / Brush Control	0	(0.00)
Organic Gardening	0	(0.00)
Compatible Crops	0	(0.00)
Pasture Rotation	0	(0.00)
Water Quality	0	(0.00)
Fallow Ground	0	(0.00)
Minimum / No Till	0	(0.00)
Resistant Crops	0	(0.00)
Crop Rotation	0	(0.00)
Strip Cropping	0	(0.00)
Contour Farming	0	(0.00)
Drip Irrigation	0	(0.00)
Wildlife Management	0	(0.00)
Soil Erosion	0	(0.00)
Mulching	0	(0.00)

Orientation. It should be noted that only one topic was identified as being a sustainable agriculture topic that would be taught in the Agricultural Career Orientation course.

Sustainable Agriculture Topics Taught in FFA and SAE Programs

Table XXII shows the topics that teachers indicated they would teach as a part of the FFA and SAE aspects of their programs. Only eight of the topics were indicated to be those that would be taught as a part of the FFA aspect of the program. Of these eight topics 23 (6.25%) teachers indicated that they would teach rural population sustainability, 17 (4.62%) would teach rural community development, 4 (1.09%) would teach alternative enterprises, 3 (0.82%) would teach wildlife management, 2 (0.54%) would teach range/brush control and soil erosion, and 1 (0.27%) would teach parasite monitoring and integrated pest management. The remaining 16 topics were indicated to be those that would not be taught as a part of the FFA aspect of the program. Only two of the topics (drip irrigation and mulching) were indicated to be those that would not be taught as a part of the SAE aspect of the program. Of the remaining topics a high of 10 (2.72%) teachers indicated that they would teach alternative enterprises while a low of 1 (0.27%) indicated that they would teach fallow ground, minimum/no till, green manure crops, and rural community

TABLE XXII

DISTRIBUTION OF TEACHERS BY SELECTED SUSTAINABLE AGRICULTURE TOPICS TAUGHT AS A PART OF FFA AND SAE

Topic	Distribution of Teachers by Topic [N=number of teachers (368)]			
	FFA		SAE	
	N	(%)	N	(%)
Cover Crops	0	(0.00)	2	(0.54)
Range / Brush Control	2	(0.54)	5	(1.36)
Organic Gardening	0	(0.00)	5	(1.36)
Compatible Crops	0	(0.00)	2	(0.54)
Parasite Monitoring	1	(0.27)	5	(1.36)
Rural Pop. Sustainability	23	(6.25)	4	(1.09)
Pasture Rotation	0	(0.00)	3	(0.82)
Water Quality	0	(0.00)	2	(0.54)
Fallow Ground	0	(0.00)	1	(0.27)
Minimum / No Till	0	(0.00)	1	(0.27)
Alternative Enterprises	4	(1.09)	10	(2.72)
Resistant Crops	0	(0.00)	3	(0.82)
Crop Rotation	0	(0.00)	2	(0.54)
Strip Cropping	0	(0.00)	2	(0.54)
Contour Farming	0	(0.00)	2	(0.54)
Green Manure Crops	0	(0.00)	1	(0.27)
Drip Irrigation	0	(0.00)	0	(0.00)
Wildlife Management	3	(0.82)	3	(0.82)
Rural Comm. Development	17	(4.62)	1	(0.27)
Soil Erosion	2	(0.54)	2	(0.54)
Mulching	0	(0.00)	0	(0.00)
Integrated Pest Mgmt.	1	(0.27)	2	(0.54)
Animal Manure Fert.	0	(0.00)	2	(0.54)
Alternative Power	0	(0.00)	4	(1.09)

development as a part of the SAE aspect of their Agricultural Education program.

Reasons for Teaching or Not Teaching Sustainable Agriculture

Figure 1 shows the frequency of teachers' responses concerning various reasons for teaching sustainable agriculture in their classes. The highest response was in the personal interest category in which 178 (48.37%) teachers stated that they taught or would teach sustainable agriculture because of a personal interest in the subject. Economic importance was indicated by 127 (34.51%) teachers and student interest by 128 (34.78%) as reasons why sustainable agriculture was being or would be taught in classes. The lowest frequency of responses was observed in the category of courses in college and concepts have always been taught. Having taken courses in college over sustainable agriculture was cited by 30 (8.15%) teachers as a reason for teaching or planning to teach sustainable agriculture. The idea that sustainable agriculture concepts had always been taught was given by 38 (10.33%) teachers as one of their reasons for teaching or planning to teach sustainable agriculture in their classes.

Figure 2 shows the frequency of responses given by teachers concerning reasons for not teaching or not planning to teach sustainable agriculture. The highest frequency of responses was in the category of no curriculum material available. This category was indicated by 68 (18.48%)

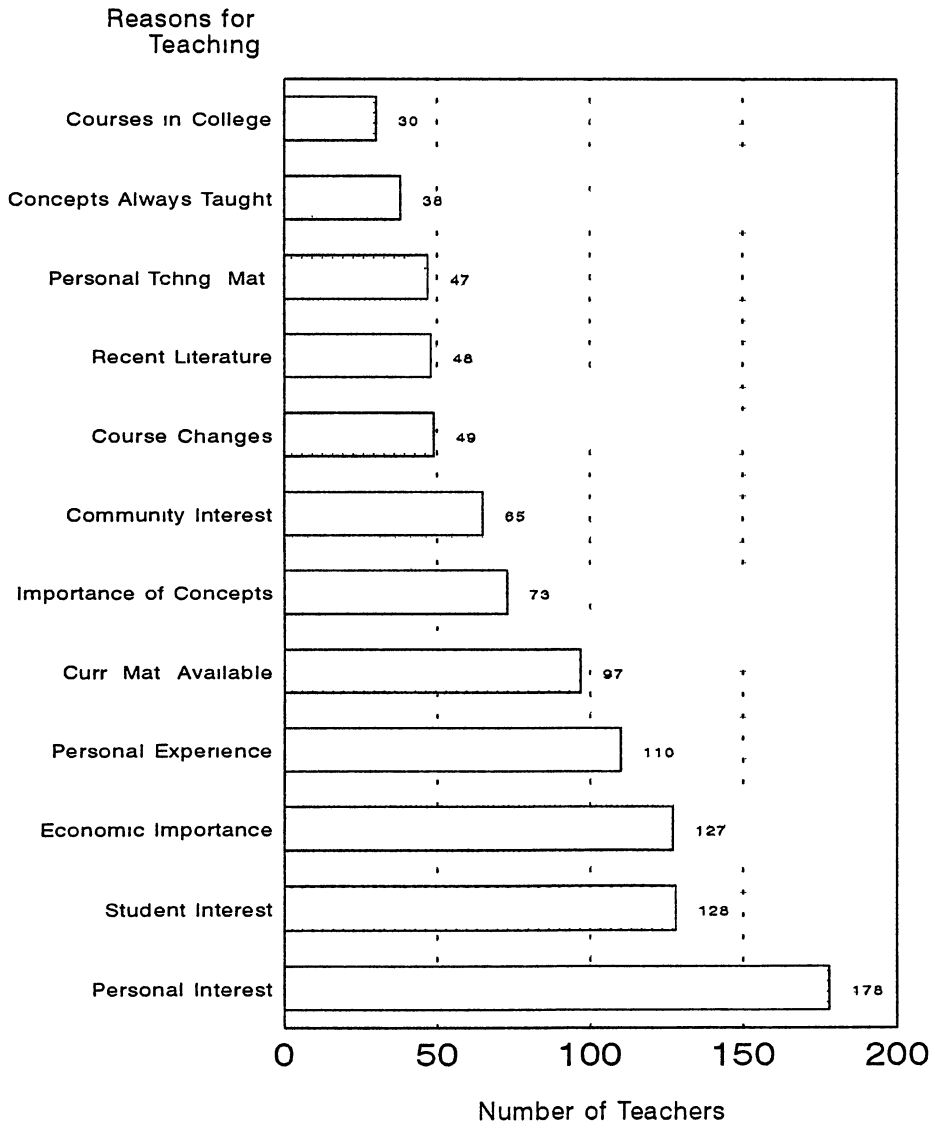

Figure 1 Frequency of Teachers' Responses Concerning Reasons for Teaching Sustainable Agriculture Topics

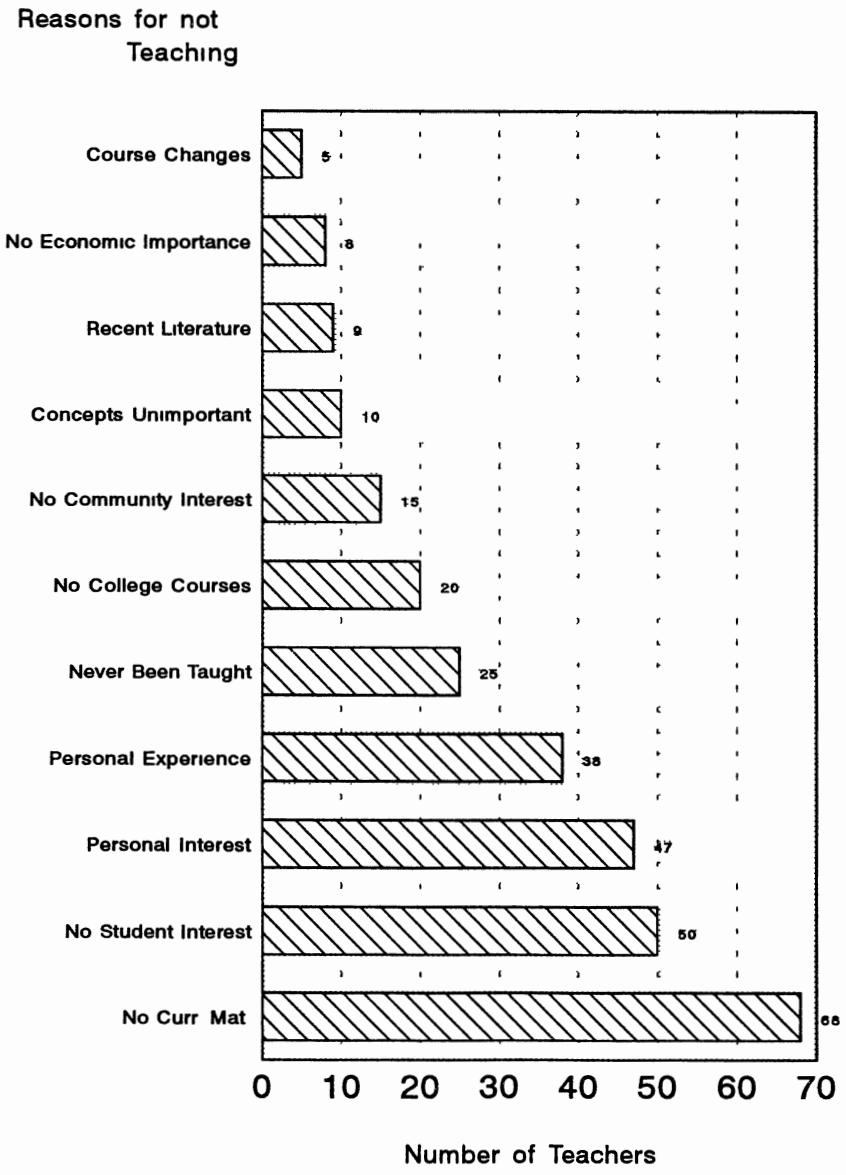

Figure 2 Frequency of Responses Concerning Reasons for not Teaching Sustainable Agriculture Topics

teachers as one reason for not teaching or planning to teach sustainable agriculture in their classes. The lowest frequency of responses as cited by 5 (1.40%) teachers indicated that the course changes made in Oklahoma had not caused them to teach or plan to teach sustainable agriculture in their classes.

Importance of Students Learning Sustainable Agriculture

Teachers were asked to provide reasons, in an open-ended question, for why they did or did not think it was important for students to learn sustainable agriculture. These responses were categorized into groups based upon the concern they addressed and the positive or negative nature of the response. Categories into which responses were grouped were:

1. Positive environmental responses;
2. Negative environmental responses;
3. Positive economic responses;
4. Negative economic responses;
5. Positive social responses;
6. Negative social responses;
7. Positive miscellaneous responses; and
8. Negative miscellaneous responses;

In fairness to the respondents and to ensure the unbiased reporting of data all responses in each category are listed here.

The first category of responses included positive statements dealing with the environment. Responses as to why students should learn sustainable agriculture that fell into the environmental category were as follows: (1) In order to grow their own food and protect the environment. (2) Because of the long term effects such as air quality, water quality, etc. (3) Environmental issues. (4) Agriculture is a major contributor to water pollution and we need to change methods or find ourselves without clean water. (5) Environmental concerns will dictate our move this way. (6) Someone has to protect the environment. (7) To be aware of the use of pesticides and herbicides. (8) Because of environmental importance. (9) Because we must become environmentally minded. (10) The importance of future agriculture to have the natural resources to use. (11) Protect the environment for future generations. (12) Promote safety and protect the environment. (13) Because agriculture is changing. If we don't take care of agriculture, then it won't take care of us. We must manage our natural resources. (14) Our rural communities are fading away along with our environment. (15) Environmental concerns, lack of effective commercial products to use. (16) Be aware of environmental concerns, safety, and health in their chosen careers. (17) Because of the environmental dangers associated with some agricultural practices. (18) Protection of the environment along with agricultural practices will continue to be of major importance. (19) So they might be

able to learn how not to use up all of the resources like the soil and water and to be healthier through less use of chemicals. (20) Because we have to preserve our environment but at the same time we must make a living. (21) Protect human health, the environment, and long term returns. (22) Lower input will use less natural resources. (23) Important to life in general. (24) The future of our world depends on sustainable agriculture. (25) It is necessary that all students be aware of how and why food is produced in the future as well as the past. Environmental concerns affect all of us both socially and economically in the way food is produced, packaged, and marketed worldwide.

No negative responses were given concerning why students should not learn sustainable agriculture as it relates to the environment.

Positive responses concerning why students should learn sustainable agriculture that fell into the economics category were: (1) Economic reasons. (2) So they may have a part in preserving economic factors, health factors, and other long range factors. (3) Mostly because of economic importance. (4) To understand alternatives in agriculture and other world economics. (5) It is important for our students to realize the economics of agriculture. (6) Diversification and the number of opportunities to make money. (7) This may be how farmers stay in business. (8) If they are going to stay in business or gain employment it is a must. (9) To try to make a living. (10) So we can be

productive and profitable from now on. (11) If it is economically feasible so you can promote environemental concerns and still stay in farming. (12) It is becoming more interesting to people as they try to find new ways to cut costs and increase profits. (13) To find economıcal and environmentally safe production practices. (14) It ıs needed. (15) It has long term value.

No negative responses were lısted in the economics category.

A majority of the responses were grouped into the social category. Positive responses concerning socıal reasons why students should learn sustainable agriculture were: (1) To show students how survival off a farm can benefit people. (2) It ıs important for survival. (3) Students need advanced information in today's society. (4) Important for learning about careers. (5) We must gıve them a choice. It will probably be law later on. (6) Students need to be exposed to new ideas. (7) So that students may meet the needs of the future. (8) Small rural communitıes are dieing out. (9) Life and the world changes every day. (10) In order to learn long term social impact of productıon agriculture. (11) They may need ıt later in life. (12) We must help all students, not just farm kids. (13) To survıve life as we know it. (14) They will be the future that may be more easily persuaded than those already set in their ways. (15) 99% of my students live in town. (16) Much pressure being placed on agriculture to change. (17) Because it ıs

getting tougher for these kids to go home and make it in farming. (18) Because this is what will keep American agriculture strong. (19) As a rural community who depends solely on agriculture, we must work to make it where we are not damaging our own existence. (20) Students need to know that these are important issues. (21) We should teach it but not to the extreme we perceive, there should be a happy medium. (22) It is important but it should not be an all consuming educational unit. By teaching it the students will be offered a broader base for future decision making. (23) Agriculture is in need of a shot in the arm and awareness at a young age can make the biggest difference. (24) Agriculture is what keeps the world turning. (25) We need sustainable agriculture to feed a growing population. (26) Changes in agriculture dictate a change if you are to persue a career. (27) Because it will be of major importance in the future for agriculture to stay a leader in the world. (28) A good background is needed for alot of concepts used in other areas of agriculture. We need to teach a broader area. (29) farming is for the long term and what we do in the short term determines our future in agriculture. (30) For a stronger, self supportive community due to self reliance and business knowledge. (31) Survival of the fittest. (32) Because of the needs within the community. (33) To provide knowledge for future production agriculture employees to decide if it is for them. (34) For basic survival of rural communities. (35) They need to realize the

alternatives to common production practices. (36) To deal with the changing times. (37) To make them aware of the changes that are taking place today. (38) Because there is a great demand for changing agricultural practices. (39) There is a need to prepare for the future. (40) It promotes safety, etc. and shows them what a commitment in agriculture can be. (41) Mainly to increase their awareness. (42) Because production agriculture is on the decline, this might increase some awareness in these areas. (43) So they will know how to feed the world in the future. (44) It is essential for the future of production agriculture. (45) Because it is vital to rural America. (46) Our students are tomorrow's future and they need to be exposed to these problems and how to control them. (47) The future is now. (48) So that we may have better educated students in the area of agriculture. (49) It is the success or failure of society to be able to continually produce food for itself. (49) A knowledge of the socioeconomic impact of agriculture is a must for all FFA students. (50) They need to be aware of alternatives.

Three teachers gave negative responses in the social category. Responses indicating social reasons why sustainable agriculture should not be taught were: (1) It is taking us backward. (2) Dumb idea that will go away as pressure increases for food production. (3) Very few farmers in my community. It is important but not to the students in my community.

The final category included responses as to why students should learn sustainable agriculture which could not be logically grouped as environmental, economics, or social. Responses in the miscellaneous category were: (1) It is needed. (2) It has long term value. (3) It is a lifetime commitment for everyone. (4) It is much needed. (5) Everyone should have a basic knowledge of a different area. (6) All types of agricultural practices should be observed. (7) They should see new procedures. (8) It is coming. (9) They need to know about all areas of agriculture. (10) Students need advanced information. (11) To help them understand how it works. (12) It is becoming more important all the time. (13) We need to look at all the alternatives available.

No negative comments were observed in the miscellaneous category concerning why students should not learn sustainable agriculture.

Teachers' Knowledge of Sustainable Agriculture

Teachers' ratings of their perceived knowledge in selected sustainable agriculture topic areas is shown in Table XXIII. Teachers rated their perceived knowledge of integrated pest management below average (M=2.24). Knowledge of rural community development and sustainability was rated average (M=2.65), as well as alternative enterprises (M=2.93), conservation practices (M=3.48), and environmental concerns (M=3.37).

TABLE XXIII

MEAN RESPONSE OF TEACHER PERCEPTION CONCERNING THEIR PERSONAL KNOWLEDGE LEVEL OF SUSTAINABLE AGRICULTURE TOPICS

Topic	State Total Mean	SD	Interpretation (N=368)
Environmental Concerns	3.37	.85	Average
Conservation Practices	3.48	.84	Average
Alternative Enterprises	2.93	.88	Average
Rural Development	2.65	.89	Average
Integrated Pest Mgmt.	2.24	.89	Below Average

Table XXIV shows the comfort level that teachers indicated they would possess in teaching selected sustainable agriculture topics. Teachers indicated that they would feel very uncomfortable teaching integrated pest management (M=1.93) and uncomfortable teaching rural development (M=2.43). Note that integrated pest management had a significantly higher standard deviation (SD=1.02) than the other responses indicating a great deal of variation in the responses. Alternative enterprises (M=2.68), conservation practices (M=3.08), and environmental concerns (M=2.90) were indicated to be those topic areas in which teachers would feel comfortable teaching.

Use of Sustainable Agriculture Practices

Figure 3 illustrates the frequency of responses teachers gave concerning sustainable agriculture practices used by producers in their areas. Of the 25 sustainable agriculture practices listed the highest frequency of responses were in the areas of soil erosion control, soil testing, livestock parasite monitoring, and pasture rotation. Soil erosion control was cited by 335 (91.03%) teachers as a sustainable agriculture practice used by producers in their areas. Soil testing was indicated by 298 (80.98%), livestock parasite monitoring by 294 (79.89%), and pasture rotation by 293 (79.62%) teachers as being sustainable agriculture practices used by producers in their areas. The lowest frequency of responses was observed in

TABLE XXIV

MEAN RESPONSE OF TEACHERS PERCEPTIONS CONCERNING THEIR COMFORT LEVEL IN TEACHING SUSTAINABLE AGRICULTURE TOPICS

Topic	State Total Mean	SD	Interpretation (N=368)
Conservation Practices	3.08	.73	Comfortable
Environmental Concerns	2.90	.81	Comfortable
Alternative Enterprises	2.68	.83	Comfortable
Rural Development	2.43	.87	Uncomfortable
Integrated Pest Mgmt.	1.93	1.02	Very Uncomfortable

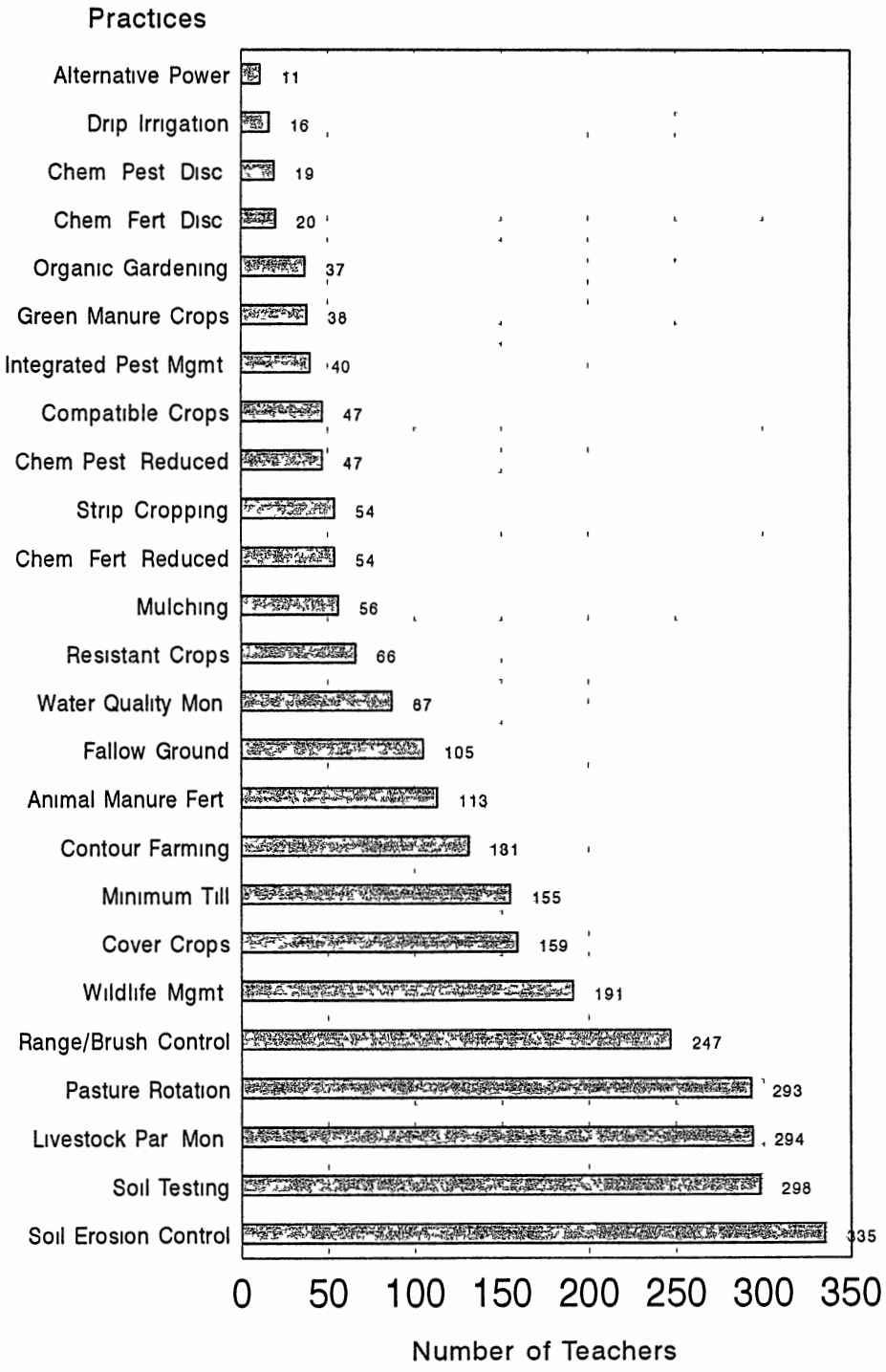

Figure 3 Frequency of Responses Concerning Sustainable Practices Perceived by Teachers as Being Used by Producers

the areas of chemical fertilizer discontinued, chemical pesticide discontinued, drip irrigation, and alternative power. Chemical fertilizer discontinued was noted by 20 (5.43%), chemical pesticide discontinued by 19 (5.16%), drip irrigation by 16 (4.35%), and alternative power by 11 (2.99%) teachers as being sustainable agriculture practices used by producers in their areas.

Teachers were also asked to rank, in order of importance, the major agricultural products produced in their areas. Beef cattle was ranked first by 189 (51.36%) teachers, wheat by 69 (18.75%), and peanuts by 22 (5.98%). Beef cattle was ranked second by 82 (22.28%), wheat by 75 (20.38%), hay by 54 (14.67%), and peanuts by 20 (5.43%). Hay was ranked third by 43 (11.68%), beef cattle by 41 (11.14%), wheat by 40 (10.87%), and hogs by 34 (9.24%). Hay was ranked fourth by 38 (10.33%) teachers, hogs by 38 (10.33%), wheat by 32 (8.70%), and milo by 27 (7.34%). Hogs were ranked fifth by 43 (11.68%) teachers, hay by 26 (7.07%), sheep by 15 (4.08%), and alfalfa by 14 (3.80%). Hogs were ranked sixth by 28 (7.61%) teachers, sheep by 20 (5.43%), milo by 14 (3.80%), and hay by 14 (3.80%). Some of the agricultural products that were ranked first, second, or third in importance by two or fewer teachers included: horticulture, milo, sod, horses, lakes, oil, cow/calf, dogs, recreation, wildlife, pasture, pecans, and agricultural mechanics.

Need for In-Service Over Sustainable Agriculture

Table XXV provides a summary of the mean responses concerning teachers' perceptions about the need for in-service in sustainable agriculture topic areas. The area of integrated pest management (M=2.17) was rated to be an in-service topic for which there was a moderate need. All other topics listed, rural community development (M=2.78), alternative enterprises (M=2.71), conservation practices (M=2.57), and environmental concerns (M=2.90), were rated as being those topic areas for which there was a moderately high need for in-service.

Figure 4 illustrates the frequency of responses teachers gave concerning the need for in-service over specific sustainable agriculture topics. The highest frequency of teachers indicated that inservice was needed over water quality monitoring, wildlife management, livestock parasite monitoring, soil testing. Water quality monitoring was indicated by 213 (57.88%) teachers, wildlife management by 197 (53.53%), livestock parasite monitoring by 180 (48.91%), and soil testing by 170 (46.20%) as being topics over which in-service was needed. While all topics listed received a significant frequency of responses those topics over which the fewest teachers thought in-service should be held were: strip cropping selected by 31 (8.42%) teachers, contour farming by 31 (8.42%), and mulching by 38 (10.33%).

TABLE XXV

MEAN RESPONSE OF TEACHERS PERCEPTIONS CONCERNING THE NEED FOR IN-SERVICE DEALING WITH SELECTED SUSTAINABLE AGRICULTURE TOPICS

Topic	State Total Mean	SD	Interpretation (N=368)
Environmental Concerns	2.90	.94	Mod. High Need
Rural Development	2.78	1.05	Mod. High Need
Alternative Enterprises	2.71	1.01	Mod. High Need
Conservation Practices	2.57	.97	Mod. High Need
Integrated Pest Mgmt.	2.17	1.20	Mod. Need

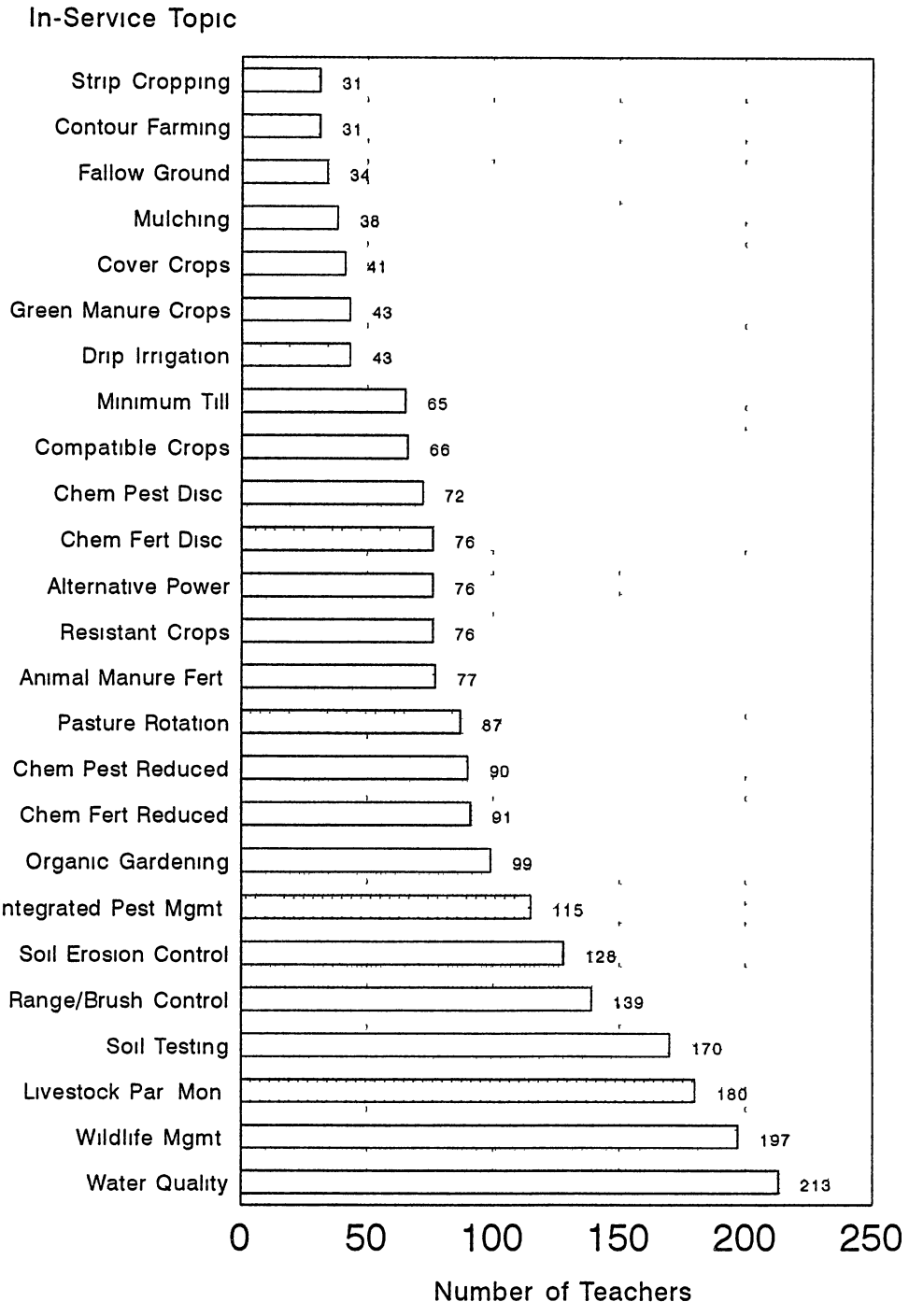

Figure 4 Frequency of Responses Concerning the Need for In-Service on Specific Sustainable Agriculture Topics

Teachers' Opinions of Sustainable Agriculture

In order to determine teachers' overall perceptions about sustainable agriculture they were asked to respond to an open ended question concerning their personal opinion of the sustainable agriculture movement. Responses were first categorized by their negative or positive nature. Responses were then grouped into one of four categories, environmental responses, economic responses, social responses, and miscellaneous responses. This grouping process gave rise to eight categories. The categories of responses concerning teachers' personal opinions of the sustainable agriculture movement are as follows:

1. Positive environmental responses;
2. Negative environmental responses;
3. Positive economic responses;
4. Negative economic responses;
5. Positive social responses;
6. Negative social responses;
7. Positive miscellaneous responses; and
8. Negative miscellaneous responses.

In fairness to the respondents and to ensure unbiased reporting of data, all responses concerning teachers' personal opinions of the sustainable agriculture movement are presented here.

The first category of responses pertaining to teachers' personal opinions about sustainable agriculture was made up of positive responses dealing with the

environement. Responses in this category were: (1) If we don't initiate sustainable agriculture, there will eventually be an end to life as we know it. (2) It should help agriculture and the environment in the future. (3) We should have a concern for the environment and safety practices. (4) I believe we must become aware of new products to lessen the need for commercial chemicals. (5) We must move toward environmental protection. (6) In today's society we need to be aware of the environmental impacts and I feel this is one way. (7) Hopefully water quality will not become such a problem that the practices that are used today cannot continue or improve. (8) It needs to be taught to educate people of the safe ways agriculture is being redirected to promote a better environment. (9) Natural resource class is an excellent tool, because the success or failure of agriculture lies in this area. (10) It is necessary if common practices are harmful to the environment, common sense and dollars are the bottom line. (11) Sustainable agriculture is a viable way to protect our environment in the future and in the present it will have a positive influence on various environmental groups' opinions of American agriculture and the importance it places on our natural resources. (12) Producing agricultural commodities without harming the environment.

Two responses were collected in the negative environmental category. These responses were: (1) The environment concepts can be misleading. We really aren't as

bad as environmental concerns would have you believe. (2) I think some are carried away on it. I am for protecting the environment and promoting health and safety.

In the positive economic category responses were as follows: (1) I think we need to become more LISA minded to cut down on inputs. (2) Without a worldwide movement the U.S. producers will have to bear too much of the economic burden and will have a disadvantage on the world market because of too many restrictions and regulations. (3) It is a necessity if we are to stay in business. (4) Economics must be kept in mind. (5) It is useful in that it saves money and time. (6) It is a good source of supplemental income. (7) It means becoming more diversified. (8) Sustainable agriculture must be made practical for farmers economically. (9) It can be a positive situation for farmers if feasible agricultural practices will allow a profitable solution for farmers. (10) Stresses more outside sales and service. (11) Good idea if it is economically feasible in an area. (12) It is very important for farmers to make a living. (13) If production agriculture is to remain profitable sustainable agriculture must be practiced. (14) Sustainable agriculture to most farmers in our area would be those practices that keep them in business.

Negative responses in the economic category were given by three teachers. these responses were: (1) Won't work because of yield and money reductions (less crop). (2) If we had to depend entirely on sustainable farming methods, at

best food prices would triple, at worst we would starve. (3) Makes it tough to make a living.

Positive responses in the social category concerning teachers' opinions of the sustainable agriculture movement were: (1) The idea is good but it seems to me that we have gotten away from traditional agriculture. (2) Needed, but must first be introduced to the community. (3) Needs to be brought to more people's attention, along with myself on furthering knowledge in these areas. (4) Like anything else, some try to go overboard. It is good within limits. (5) Good if all producers take part. (6) It sounds like a good future. (7) Positive, but large chemical companies will resist it. (8) It has a place in some areas, mostly urban. (9) Good, we need to think about tomorrow. (10) It is a good idea for farmers to lead the way of change. (11) Good idea, need to change marketing strategies and consumer ideas. (12) We must change with the times and demands that are put before us. (13) I think it means whatever is viable for the students and community. (14) It is necessary for survival. (15) I think it will be increasingly important to our young people as these are the things that they are going to have to deal with in the future. There are some great ideas here, but they won't be worth a dime if we don't introduce them to students. (16) If taken in a sensible manner it is a good idea. (17) Sustainable agriculture is the way we will be forced to go in the future. It is needed, but we can't forget chemicals and other practices that allowed us to get

to this point. (18) It is important to stay ahead of the game so you can stay on top.' (19) Why be in the business if you don't plan to stay due to financial failure. Small communities need stable and slow growth. (20) Farmers must remain competitive to survive. (21) I think that it is probably a good thing, but it will be hard to change people from the old ways. (22) It is great for the future. (23) It is necessary for the agricultural industry. (24) I feel that it is an area that needs to be tended to in the near future. (25) It may be feasible in the future.

Negative social responses were received from three teachers. These responses were: (1) Environmental movement to help protect the environment, not necessarily the best for farmers. (2) I feel they are like some of the animal rights people, but haven't got the foothold yet. (3) It is a high dollar government project to blow tax money.

A number of responses were grouped into the positive miscellaneous category. These responses were: (1) I like it. (2) It is needed. (3) It is a good concept. (4) It should have started sooner. (5) It is excellent. (6) It should have been in effect 20 years ago. (7) It needs to be emphasized. (8) It is headed in the right direction. (9) It is of great importance. (10) It would prove very hard to make the farm payment without intensive farm practices. (11) It may soon be a factor to deal with. (12) We will be seeing more of it in the coming years. (13) It is becoming more important every year. (14) I believe that parts of it can be

incorporated to help make any operation better. (15) I really don't think sustainable agriculture is a new idea, there are alot of agriculturalists who have been doing this for years. (16) It is very worthwhile and has been needed for a long time. (17) Reduction of inputs is possible, but not the total removal of herbicides, pesticides, and chemical fertilizer. (18) It is important that young people be involved in this area. (19) We need to be concerned about sustainable agriculture. (20) It could be conducted in a way valuable to everyone. (21) Some will work, some won't, we need more knowledge. (22) We need to work to conserve agriculture and convince the public of the good job the producers are doing.

Six teachers indicated that their opinions of sustainable agriculture were negative in the miscellaneous category. These responses were: (1) Some of it is not feasible. (2) I don't like it. (3) I am just not comfortable with it. (4) I think it is overdone and exagerated. (5) It is disorganized. (6) It will be very boring to teach. I don't think the students will be very interested.

CHAPTER V

SUMMARY, FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

Introduction

The modern agricultural industry is faced with many problems and must constantly answer accusations regarding resource depletion, environmental destruction, rural community breakdown, and a host of other societal concerns. Most of these problems have been brought about by a lack of understanding on the part of society of exactly what agriculturalists are doing to improve the industry as a whole. An example of some of the innovations being applied by modern agriculturalists is sustainable agriculture. Society should be informed about the benefits of sustainable agriculture and given a reason to, once again, believe in the American agricultural industry. One area in which the task of educating society may begin is the secondary agricultural education classroom.

It was the intent of the author to determine the extent to which agricultural education teachers (hereafter referred to as teachers) were currently or would in the future be teaching sustainable agriculture topics in their classes. The purpose of this chapter is to present the purpose and objectives of the study, as well as to summarize the

rationale, design, methodology, and findings of the study. Finally, the conclusions and recommendations of the study will be presented.

Purpose of the Study

The primary purpose of this study was to determine the extent to which Oklahoma agricultural education instructors were teaching sustainable agriculture topics in their classes. A secondary purpose of this study was to assess the availability and usefulness of curricular and teaching materials in this area.

Objectives of the Study

The objectives of this study were to:

1. Determine the age, years teaching experience, locale, and specific classes being taught by Oklahoma agricultural education instructors currently teaching in Oklahoma;
2. Determine the amount of emphasis placed on teaching sustainable agriculture topics, the classes in which they were being taught, and those in which the topics would be taught in the future.
3. Determine the perceived quality of curriculum material available to those agricultural education instructors who taught or would teach sustainable agriculture topics in their classes;

4. Determine why Oklahoma agricultural education instructors were or were not teaching sustainable agriculture topics in their classes.
5. Determine the perceived knowledge of Oklahoma Agricultural Education Teachers concerning sustainable agriculture.
6. Determine the perceived need for in-service concerning sustainable agriculture.
7. Determine the overall perceptions of Oklahoma Agricultural Education Teachers concerning sustainable agriculture.
8. Determine the perceived local importance of sustainable agriculture in Oklahoma communities.

Procedures

A written survey was distributed to teachers at the five Oklahoma FFA District Chapter Officer Leadership Training (COLT) Conferences which were held in October of 1991. The survey was designed to gather information concerning the extent to which teachers were teaching or were planning to teach sustainable agriculture topics in their classes and factors affecting their decisions about the teaching of such topics. The population for the study was the 446 secondary agricultural education teachers currently employed in public schools in Oklahoma. Of the population 368 teachers responded to the survey at either the COLT Conferences or by mail after a follow-up mailing

was conducted. T-test and Chi square procedures were conducted to determine the difference between early and late respondents. No significance difference was observed between early and late respondents. The survey procedure resulted in an 82.51% response rate.

A researcher developed instrument was utilized to gather the data necessary for the conduct of this study. Sixteen items were developed to address each of the objectives set forth in the study. A brief description of the item formats and objectives they address follows.

The first four items were designed to gather demographic information about the teachers being surveyed, including years teaching experience, age, locale, and courses taught. These items address objective number one.

The fifth and eleventh items were meant to solicit data concerning the amount of emphasis teachers placed upon sustainable agriculture concepts and the specific classes in which these topics were or would most likely be taught. These items address objective number two.

Item number six uses a likert-type scale to solicit the teachers' response to the question of the adequacy of curricular material for teaching broad sustainable agriculture concepts.

The fourteenth and fifteenth items ask teachers to identify reasons they did or did not teach sustainable agriculture concepts in their classes and to provide qualitative information concerning why sustainable

agriculture was or was not important to their students. These items address objective number four.

Items seven and nine use likert-type scales to gather data on the perceived knowledge and comfort level of agricultural education teachers with regard to teaching topics in five broad areas related to sustainable agriculture. These items address objective number five.

The eighth and tenth items ask teachers to identify the important agricultural products produced in their districts and the approximate level of utilization of sustainable agriculture practices by producers in their areas. These items address objective number six.

Items twelve and thirteen address the need for in-service in various topics related to sustainable agriculture. These items address objective number seven.

Item sixteen is an open-ended question designed to solicit qualitative information concerning the teachers' personal opinions regarding sustainable agriculture. This item addresses objective number eight.

The instrument was developed and then reviewed by the advisory committee for this study, other graduate students, and experts in the field in attendance at a meeting concerning sustainable agriculture at Oklahoma State University. Content and construct validity was established for the instrument through these review processes. The instrument was then pilot tested on twenty agricultural

education teachers in Texas to further determine validity and appropriateness.

Nominal and ordinal data gathered was recorded on a computer spreadsheet and database. All statistical analysis was conducted via the formula functions of the spreadsheet and database. Qualitative data was recorded in a database and sorted according to logical categories.

Summary of Findings

Objective One: Demographic Information

Oklahoma Agricultural Education teachers had a mean of 12.54 years teaching experience and averaged 36.41 years of age.

Of the 368 respondents 64 were located in the Central district, 95 in the Northeast district, 50 in the Northwest district, 76 in the Southeast district, and 83 in the Southwest district.

Agriculture I was taught by 344 (93.48%) of the teachers, Agriculture II by 221 (60.05%), Production Management I by 169 (45.92%), Production Management II by 38 (10.33%), Forestry by 11 (2.99%), Horticulture I by 78 (21.20%), Horticulture II by 22 (5.98%), Equine Management and Production by 31 (8.42%), Natural Resources by 242 (65.76%), Agricultural Sales and Service by 61 (16.58%), Agricultural Products and Marketing by 19 (5.16%), Principles of Agricultural Technology by 9 (2.45%),

Employment in Agribusiness by 30 (8.15%), Agricultural Mechanics I by 264 (71.74%), Agricultural Mechanics II by 56 (15.22%), and Eighth Grade Agriculture by 160 (43.48%).

Objective Two: Emphasis Placed on Sustainable Agriculture Topics

The overall amount of emphasis placed on teaching sustainable agriculture topics was observed to be mostly moderate. Of the twenty-three topics listed, only six were shown to be given high emphasis by teachers. These six topics were alternative enterprises (M=2.63), rural community development (M=2.61), pasture rotation (M=2.77), range and brush control (M=2.62), water quality (M=3.15), and soil erosion (M=3.15). Only one of the topics listed, drip irrigation (M=1.44), was shown to be given low emphasis by teachers.

Table XXVI provides a summary of the most frequently identified sustainable agriculture topics that would be taught in specific Oklahoma Agricultural Education Courses. In the Agriculture I course the topic most frequently identified was alternative enterprises which was identified by 79 (21.47%) teachers. Cover crops was identified by 137 (37.23%) teachers as a topic which would be taught in the Agriculture II course. One hundred forty four (39.13%) teachers identified pasture rotation as a topic that would be taught in the Production Management I course. In the

TABLE XXVI

Most Frequently Identified Sustainable Agriculture Topics That Would be Taught in Specific Agricultural Education Courses

Course	Topic Most Frequently Identified	N = 368	
		N	%
Natural Resources	Wildlife Management	270	(73.37)
Production Management I	Pasture Rotation	144	(39.13)
Agriculture II	Cover Crops	137	(37.23)
Horticulture I	Organic Gardening	123	(33.42)
Agriculture I	Alternative Enterprises	79	(21.47)
Production Management II	Resistant Crops	78	(21.20)
Horticulture II	Organic Gardening	34	(9.24)
8th Grade Ag.	Alternative Enterprises	34	(9.24)
Agricultural Sales and Service	Rural Community Development	21	(5.71)
Employment in Agribusiness	Rural Population Sustainability	19	(5.16)
Agricultural Mechanics I	Alternative Power	16	(4.35)
Agricultural Products and Mktng	Alternative Enterprises	16	(4.35)
Agricultural Mechanics II	Alternative Power	15	(4.08)
Agricultural Career Orientation	Rural Population Sustainability	15	(4.08)
Forestry	Wildlife Management	12	(3.26)
Equine Management	Alternative Power	10	(2.72)

TABLE XXVI (Continued)

Course	Topic Most Frequently Identified	N = 368	
		N	%
FFA	Rural Population Sustainability	23	(6.25)
SAE	Alternative Enterprises	10	(2.72)

Production Management II course the topic most frequently identified was resistant crops which was identified by 78 (21.20%) teachers. Wildlife management was identified most frequently in the Forestry and Natural Resources courses as the sustainable agriculture topic that would most likely be taught in those courses. In the Agricultural Mechanics I and II courses alternative power was identified most frequently as being the sustainable agriculture topic that would most likely be taught in those courses. Organic gardening was identified most frequently as being the sustainable agriculture topic that would most likely be taught in the Horticulture I and II courses. In the 8th Grade Agriculture course alternative enterprises was identified by 34 (9.24%) teachers as being a topic that would be taught in that course. Alternative power was identified by 10 (2.72%) teachers as being that topic that would most likely be taught in the Equine Management course. In the Agricultural Sales and Service course 21 (5.71%) teachers identified rural community development as the topic that would most likely be taught in that course. Alternative enterprises was identified by 16 (4.35%) teachers as the topic that would most likely be taught in Agricultural Products and Marketing. Rural population sustainability was identified most frequently as being the topic that would be taught in Employment in Agribusiness, Agricultural Career Orientation, and as a part of the FFA program. Finally, alternative enterprises was identified as

being the topic that would most likely be taught as a part of the SAE program.

Objective Three: Curriculum Material

When asked to rate the adequacy of curriculum material for teaching sustainable agriculture concepts teachers indicated that for most concepts it was fair. One sustainable agriculture concept, conservation practices, was rated as being good (M=2.53) in the current curriculum material. Integrated pest management, on the other hand, was rated as being poor in the current curriculum material.

Objective Four: Reasons for Teaching or Not Teaching Sustainable Agriculture

Teachers were asked whether or not they would teach sustainable or had taught sustainable agriculture topics in their classes. Those who indicated that they had taught or would teach these topics were asked to select, from a list of responses, those reasons that influenced them to teach sustainable agriculture topics in their classes. Figure 5 provides a summary of the four most frequently cited reasons for teaching or planning to teach sustainable agriculture topics. Of the 368 teachers responding to the survey, 178 (48.37%) stated that they had taught sustainable agriculture because of a personal interest in the area. The next most frequently identified reasons for teaching sustainable

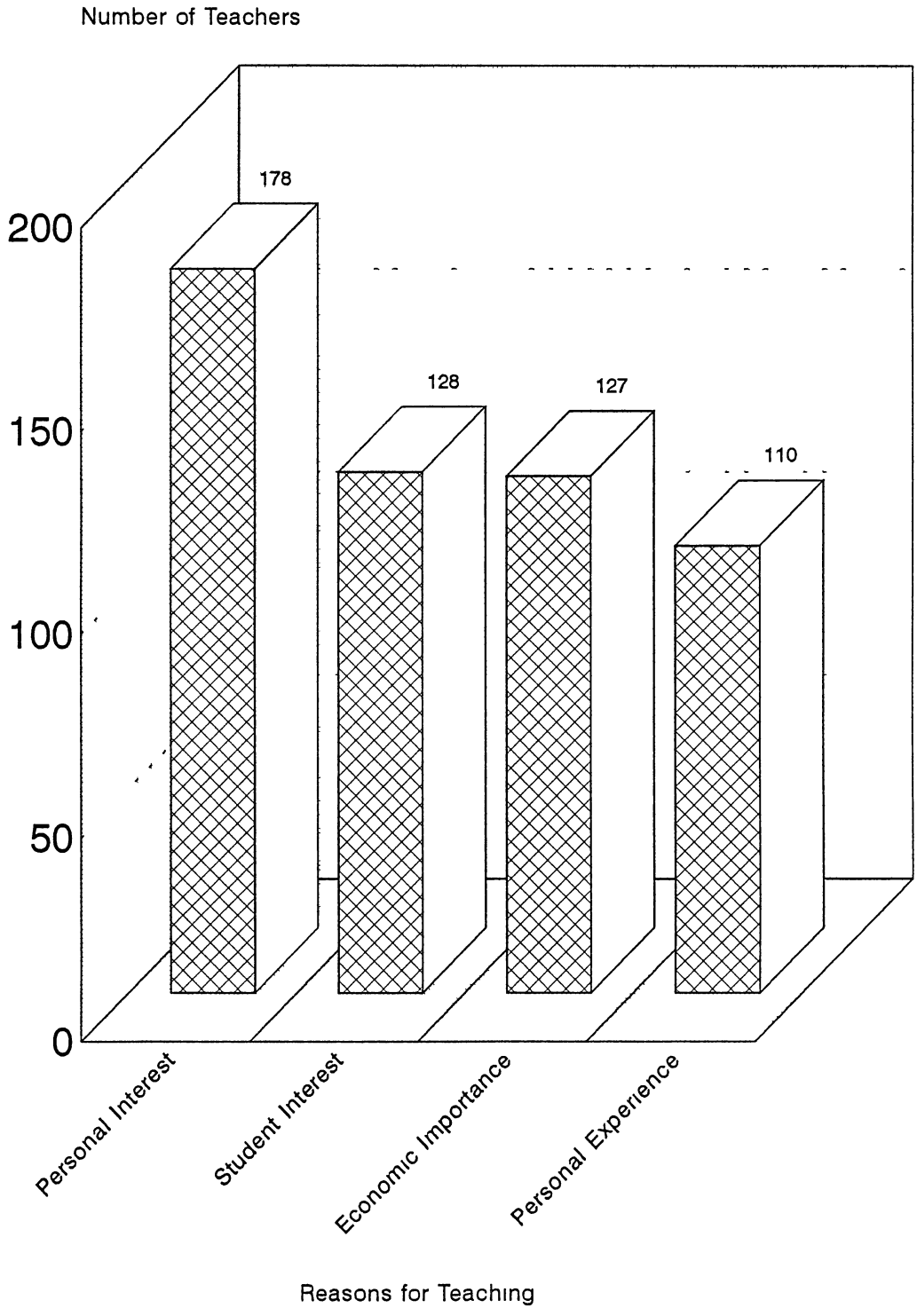

Figure 5 Most Frequently Cited Reasons for Teaching or Planning to Teach Sustainable Agriculture Topics

agriculture topics were student interest and economic importance with 128 (34.78%) and 127 (34.51%) teachers responding respectively. Personal experience was cited by 110 (29.89%) teachers as the reason that they chose to teach sustainable agriculture topics in their classes. The remaining reasons were cited by fewer than 100 teachers and thus were not listed here, but may be examined in the preceeding chapter.

The teachers who indicated that they had not or would not teach sustainable agriculture topics in their classes were also asked to identify reasons for this decision. While there was a lower total number of teachers who indicated that they would not or had not taught sustainable agriculture topics in their classes it was determined that their reasons for not doing so were important to note. It is also important to note that 75 teachers who indicated that they would not or had not taught sustainable agriculture topics listed no reasons for this decision. Figure 6 provides a summary of the four most frequently cited reasons for not teaching or planning to teach sustainable agriculture topics. Of the teachers surveyed, 68 (18.48%) indicated that they would not or had not taught sustainable agriculture topics because of a lack of curriculum material available on the subject. Lack of student interest was cited by 50 (13.59%) as being the reason for not teaching sustainable agriculture topics. Forty-seven (12.77%) teachers cited lack of personal

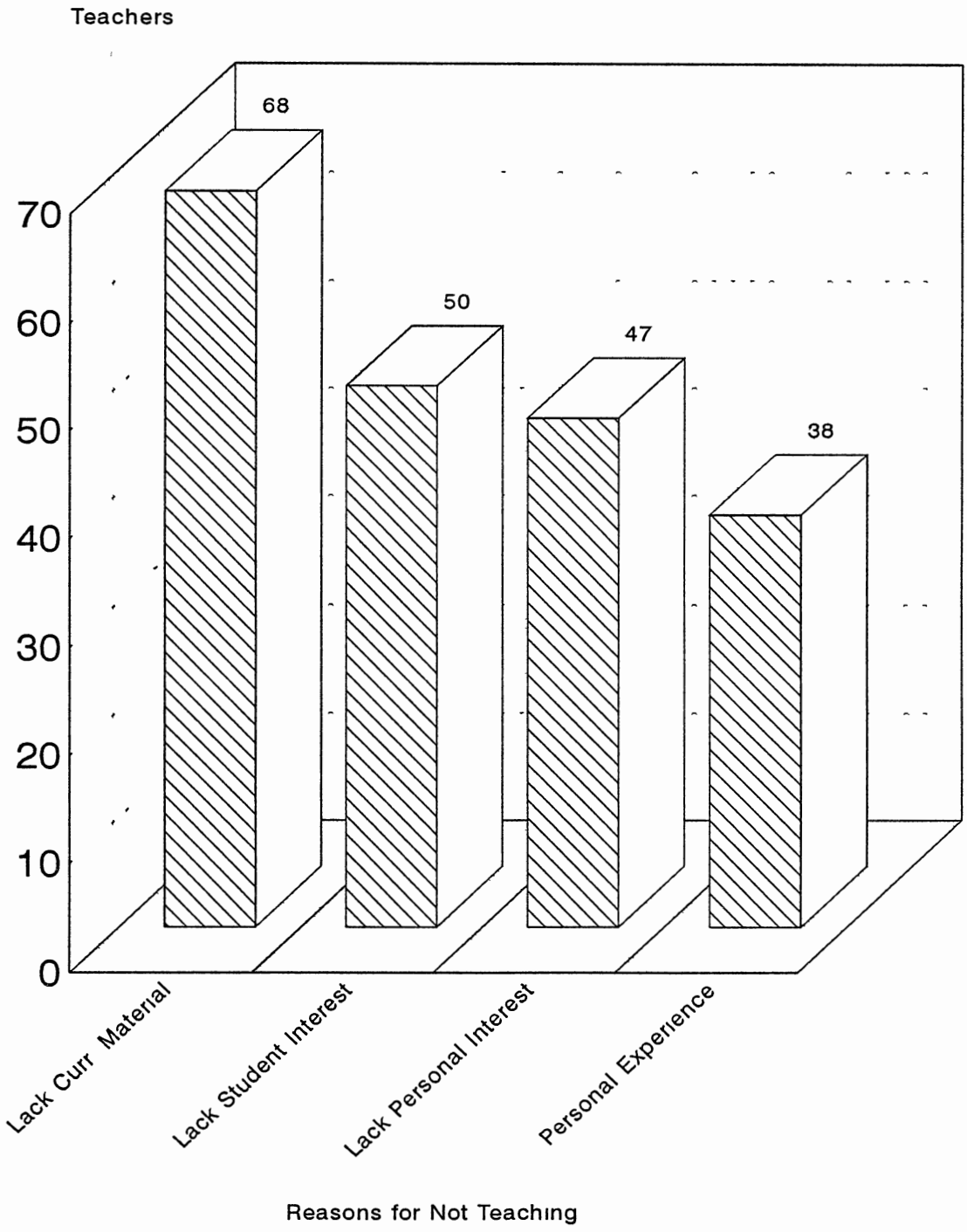

Figure 6 Most Frequently Cited Reasons for Not Teaching or Planning to Teach Sustainable Agriculture Topics

interest as the reason for not teaching or planning to teach sustainable agriculture topics. Finally, personal experience was indicated by 38 (10.33%) as the reason for not teaching sustainable agriculture topics.

Teachers were asked to provide reasons, in an open-ended question, for why they did or did not think it was important for students to learn sustainable agriculture. These responses were categorized into groups based upon the concern they addressed and the positive or negative nature of the response. Categories into which responses were grouped were:

1. Positive environmental responses;
2. Negative environmental responses;
3. Positive economic responses;
4. Negative economic responses;
5. Positive social responses;
6. Negative social responses;
7. Positive miscellaneous responses; and
8. Negative miscellaneous responses;

Figure 7 provides a summary of the number of responses in each of the above listed categories. The complete statements made by all respondents completing this item can be reviewed in the preceeding chapter. Of the 106 teachers who chose to respond to this item, 25 (23.58%) provided positive environmental responses, no negative environmental responses were given, 15 (14.15%) positive economic

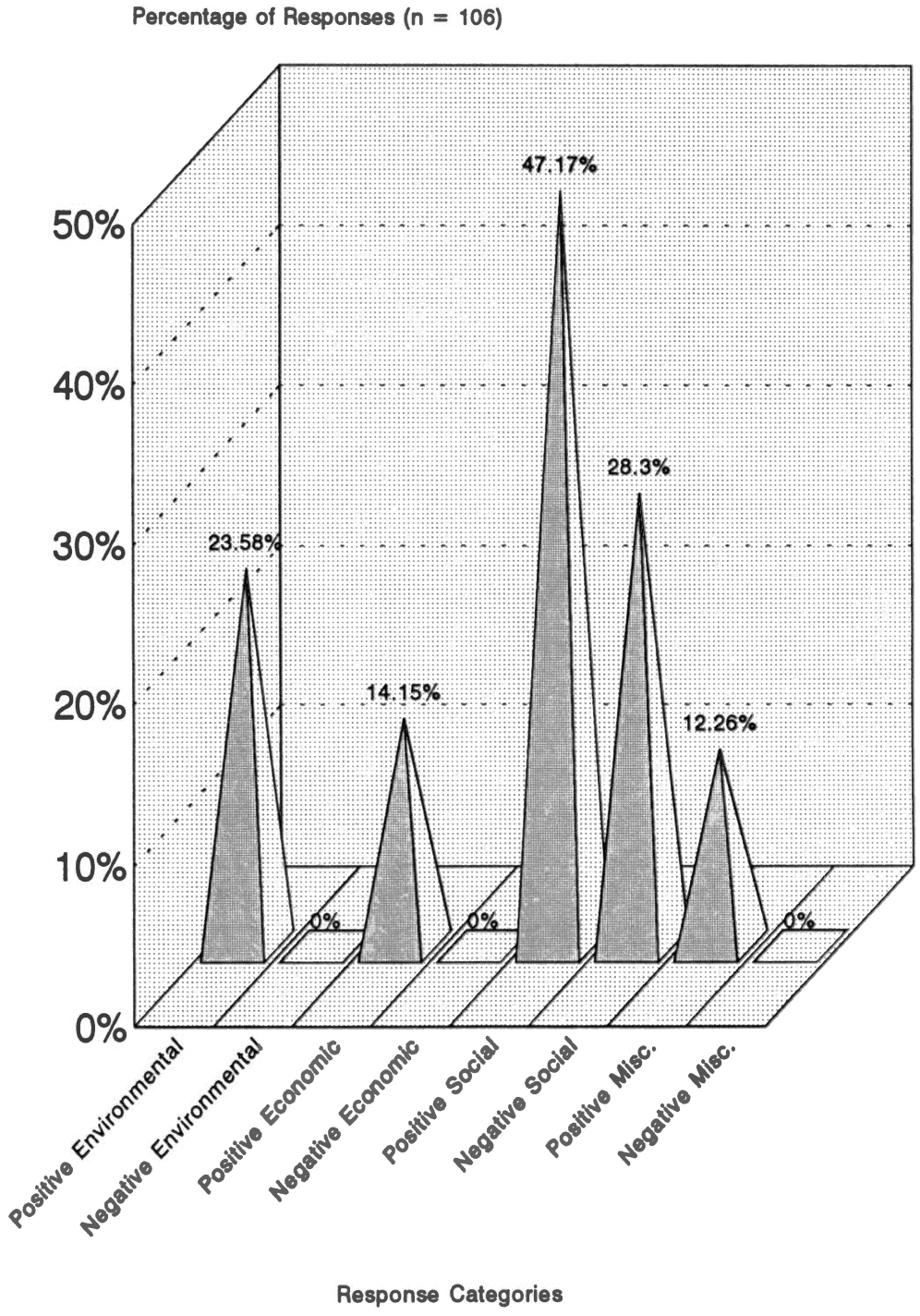

Figure 7. Responses Concerning Why Students Should or Should not be Taught Sustainable Agriculture Topics

responses were listed, no negative economic responses, 50 (47.17%) provided positive social responses, 3 (2.83%) gave negative social responses, and 13 (12.26%) gave positive miscellaneous responses.

Objective Five: Teachers' Knowledge of Sustainable Agriculture

In order to determine the perceived knowledge level of teachers in sustainable agriculture topics, teachers were asked to rate their knowledge in five broad areas that have been identified as being related to sustainable agriculture. Teachers rated their knowledge below average in only one area. Integrated pest management was given a mean rating of 2.24 which placed it in the below average category. Knowledge in all other areas was rated as average with conservation practices and environmental concerns being rated closest to the above average category. Teachers generally felt that their knowledge level in sustainable agriculture was average with the exception of the area of integrated pest management in which teachers perceived their knowledge to be below average.

Teachers were also asked to rate their comfort level in teaching topics in the various sustainable agriculture areas. Respondents rated their comfort level to be very uncomfortable in the area of integrated pest management (M=1.93) and uncomfortable in the area of rural development (M=2.43). Teachers stated that they would be comfortable

teaching in the areas of alternative enterprises, conservation practices, and environmental concerns. Figure 8 shows the relationship between knowledge level and comfort level. A Pearson Product Moment correlation confirmed a correlation of .93 between knowledge level and comfort level.

Objective Six: Importance of Sustainable Agriculutre

In an effort to determine the extent to which sustainable agriculture was locally adaptable as a feasible subject area to teach, teachers were asked to list, in order of importance, the six most important agricultural products produced in their respective school districts. Overall, beef cattle was ranked as most important by 189 (51.36%) teachers. Wheat was ranked second, followed by hay, and milo. Other agricultural products listed as being important were peanuts, hogs, sheep, horticulture, wıldlife, sod, horses, lakes, oil, dogs, recreation, pasture, pecans, and agricultural mechanics.

Teachers were also asked to identify sustaınable agriculture practices commonly used by farmers in their respective areas. The six most frequently identified sustainable agriculture practices used by farmers as perceived by the teachers were soil erosion control, soil testing, livestock parasite monitorıng, pasture rotation, range and brush control, and wildlife management. Figure 9

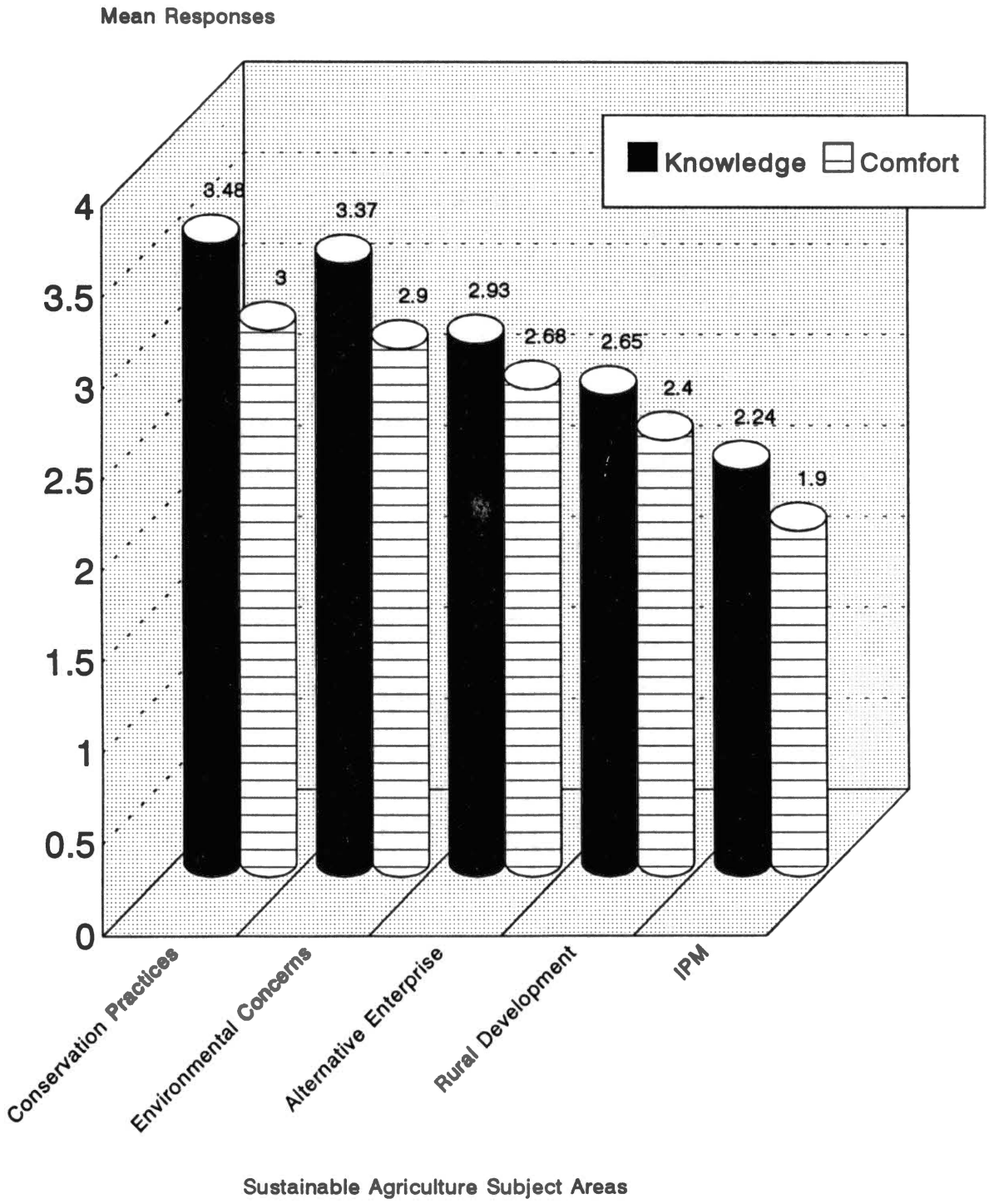

Figure 8. Relationship Between Knowledge of and Comfort Level for Teaching Sustainable Agriculture Subjects

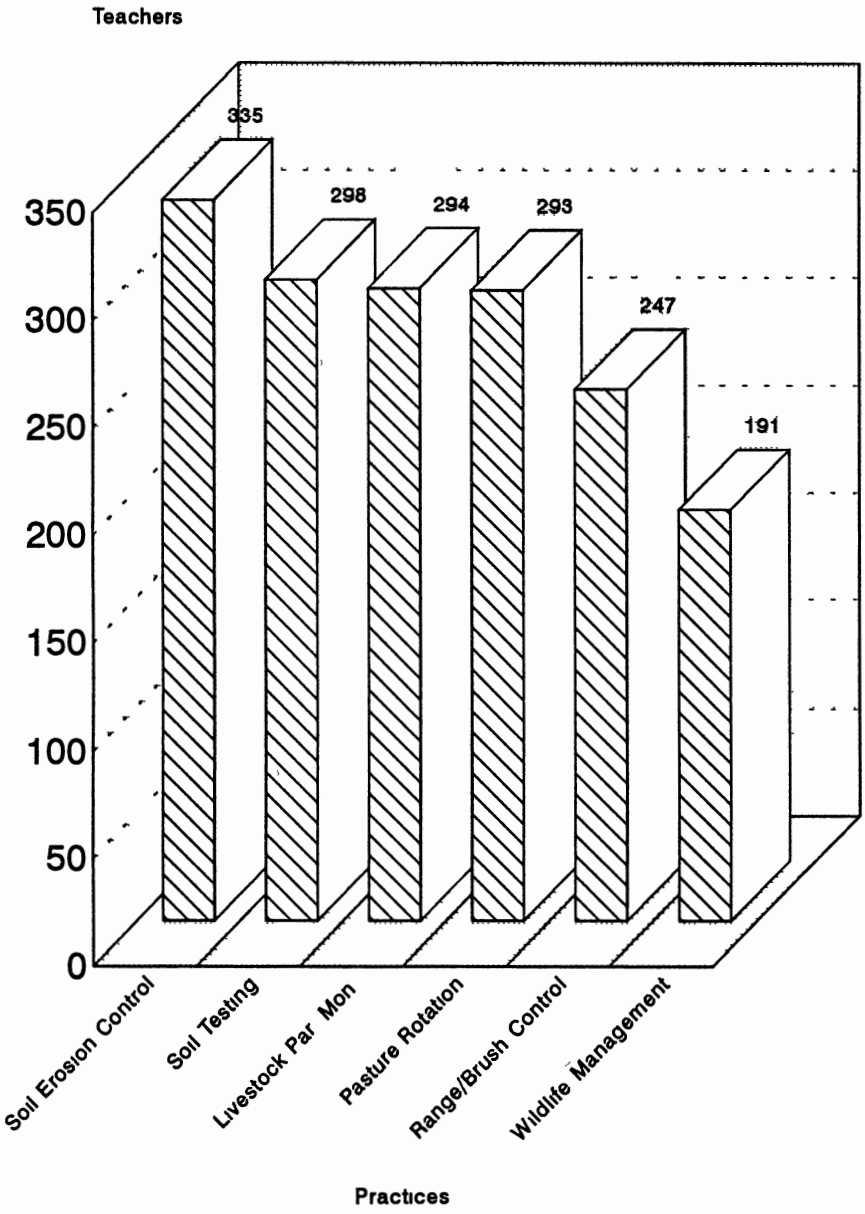

Figure 9 Most Frequently Identified Sustainable Agriculture Practices Perceived by Teachers as Being Used by Producers

provides a summary of the frequency of responses to these practices.

Objective Seven: Need for In-Service

As it was deemed important to determine teachers' perceptions as to the needs for in-service in sustainable agriculture, teachers were asked to rate the need for in-service on the five identified sustainable agriculture subject areas of integrated pest management, rural development, alternative enterprises, conservation practices, and environmental concerns. All subject areas were rated as having a moderately high need for in-service with the exception of integrated pest management which was rated as only having a moderate need (M=2.17). This finding seems to be contradictory to the teachers' responses concerning their knowledge and comfort level in the area of integrated pest management.

Teachers were also asked to identify the specific sustainable agriculture production practices over which in-service was needed. Figure 10 illustrates the seven most frequently identified in-service topics. Water Quality was identified by 213 (57.88%), wildlife management by 197 (53.53%), livestock parasite monitoring by 180 (48.91%), soil testing by 170 (46.20%), range and brush control by 139 (37.77%), soil erosion control by 128 (34.78%), and integrated pest management by 115 (31.25%) teachers as being those specific practices over which in-service was needed.

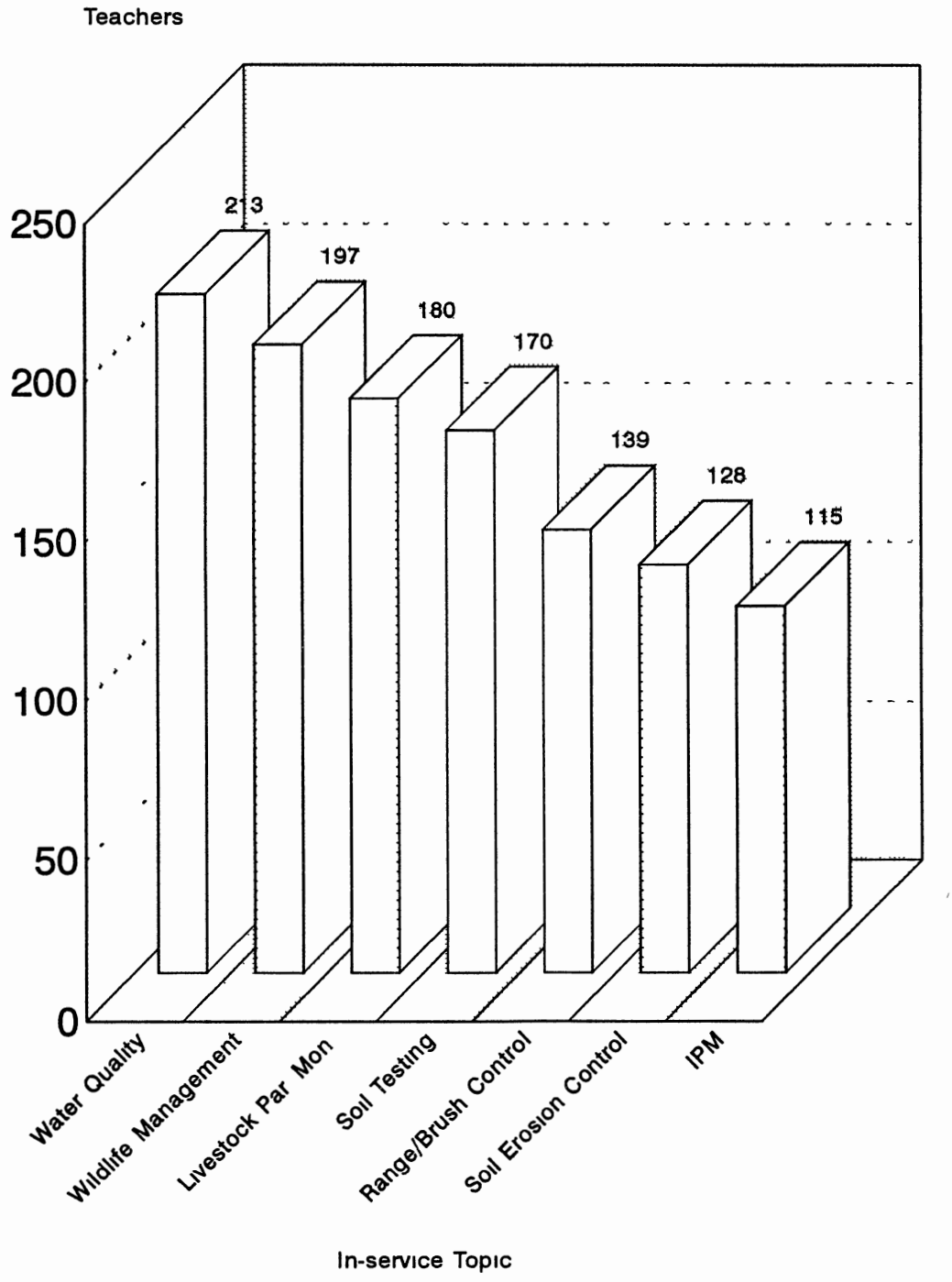

Figure 10 Most Frequently Identified Sustainable Agriculture In-service Topics Needed

Objective Eight: Teachers' Opinions

In order to determine teachers' overall perceptions about sustainable agriculture they were asked to respond to an open ended question concerning their personal opinion of the sustainable agriculture movement. Responses were first categorized by their negative or positive nature. Responses were then grouped into one of four categories, environmental responses, economic responses, social responses, and miscellaneous responses. This grouping process gave rise to eight categories. The categories of responses concerning teachers' personal opinions of the sustainable agriculture movement are as follows:

1. Positive environmental responses;
2. Negative environmental responses;
3. Positive economic responses;
4. Negative economic responses;
5. Positive social responses;
6. Negative social responses;
7. Positive miscellaneous responses; and
8. Negative miscellaneous responses.

A total of 87 teachers chose to respond to this item. Figure 11 shows the proportion of responses in each category of these respondents. In the positive environmental category 12 (13.79%) of the 87 respondents gave their opinions. Two (2.30%) teachers responded in the negative environmental category. Positive economic responses were given by 14 (16.09%) of the teachers responding. Negative

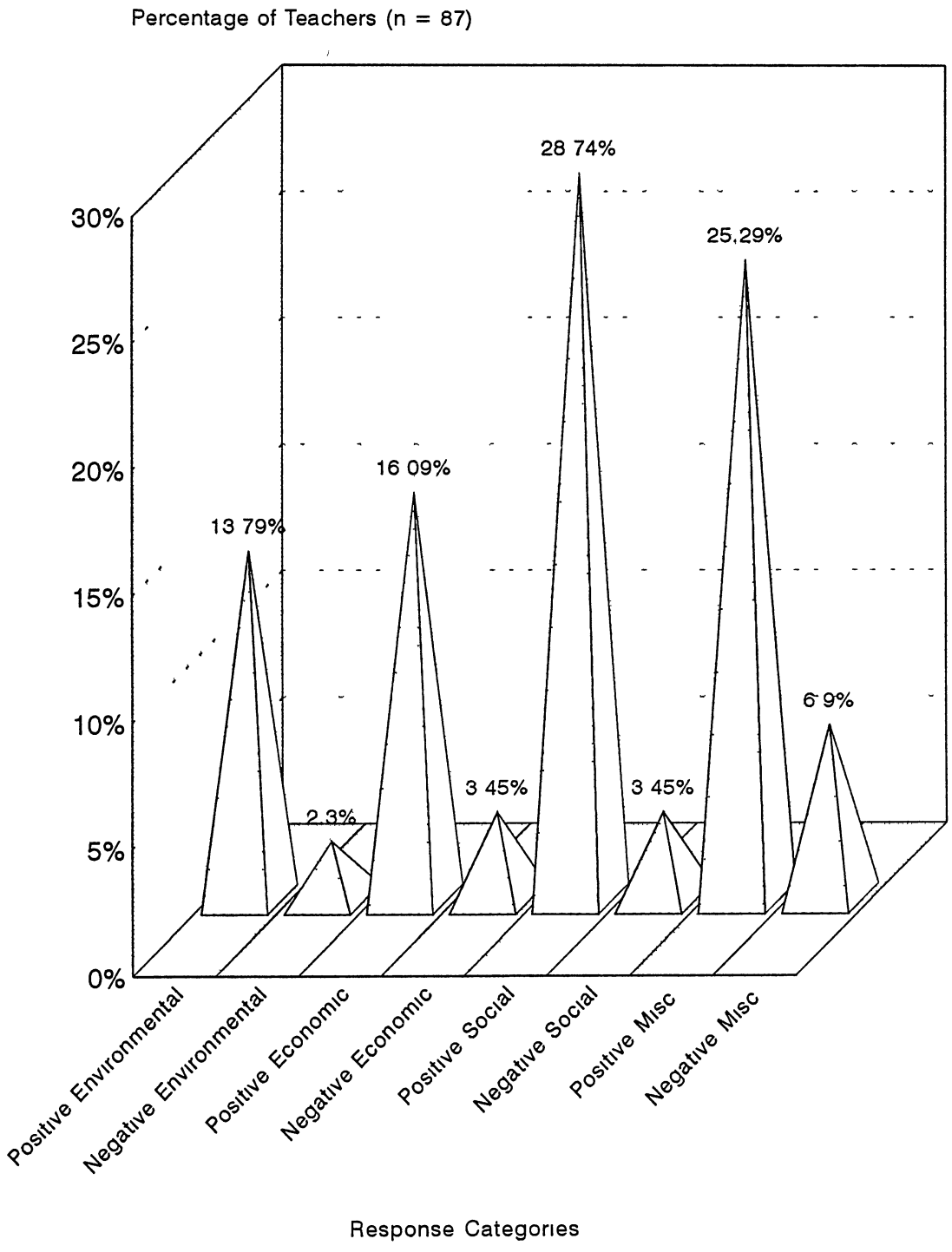

Figure 11 Responses Concerning Teachers' Opinions of Sustainable Agriculture by Category

economic responses were given by 3 (3.45%) teachers. Twenty-five (28.74%) teachers listed opinions that could be categorized as positive social responses and 3 (3.45%) gave negative social responses. In the positive miscellaneous category 22 (25.29%) teachers provided opinions and 6 (6.90%) responded in the negative miscellaneous category.

Conclusions

It was concluded:

1. Since survey respondents represented all areas of the state in relative equality, that teachers were familiar with the diversified agricultural industry throughout the state of Oklahoma and, therefore, had the opportunity to observe and appraise a wide variety of agricultural and rural practices that could be related to sustainable agriculture. It was also concluded that teachers taught a variety of the courses offered in the Agricultural Education programs in Oklahoma, but tended to more often teach those courses that could be considered traditional and/or production based.

2. That teachers emphasized those sustainable agriculture topics that could be considered more traditional since many stated that they had always taught the topics, just not under the title of sustainable agriculture. Topic areas dealing with rural development were observed as being more highly emphasized in Agricultural Education courses than was expected. Most of the sustainable agriculture

topics were viewed by teachers as being best suited to the production oriented courses and little evidence was seen of a concerted effort to integrate the teaching of these topics into courses in which they were not traditionally taught.

3. That curriculum material dealing with sustainable agriculture was, in the eyes of the teachers, mostly fair at best. The one subject area that was rated as having good curriculum material was consrevation practices and it was concluded that this rating stemmed from the fact that a high percentage of teachers taught the Natural Resources course, the core curriculum of which contaıns a great deal of information over conservation practices. It was further concluded that teachers are somewhat unwilling to teach topics that are not specifically covered in the core curriculum material for a particular course.

4. That teachers generally believed that sustainable agriculture should be taught to secondary Agricultural Education students because of personal interest of the teacher, student interest, and economic importance. The main reason that teachers would not teach sustaınable agriculture was concluded to be a lack of quality curriculum materıal over the subject. It was further concluded that teachers believed that the importance of sustainable agriculutre was due to the impact that the movement would have on societal and environmental concerns of the agricultural industry. Many teachers stated that it ıs a good way to help students combat the unfavorable

stereotyping of the agricultural industry at present and in the future.

5. That teachers perceived their knowledge of sustainable agriculture to be average in all areas with the exception of integrated pest management and that they would feel comfortable teaching topics in all areas except rural development and integrated pest management. It was further concluded that many teachers were confused as to how sustainable agriculture could be considered a holistic management concept and that many aspects of it could be integrated into all facets of agriculture and rural life.

6. That teachers perceived beef cattle and wheat to be the major agricultural products produced in Oklahoma and that some sustainable agriculture practices were being utilized by the majority of producers in the state. It was further concluded that most of the sustainable practices identified as being important were viewed, by teachers, as those practices that had always been done to meet the demands of a particular enterprise and that the holistic management concept inherent in sustainable agriculture was not being adopted by Oklahoma agriculturalists.

7. That teachers were interested in participating in in-service training covering those topics with which they already felt comfortable and perceived their knowledge level to be average. The area of integrated pest management, in which teachers perceived their knowledge to be below average and their comfort level to be low was not rated as a highly

needed in-service topic. It was further concluded that teachers felt a need for in-service over those sustainable agriculture practices that were commonly used by Oklahoma producers.

8. That teachers generally had a positive opinion of sustainable agriculture, but were somewhat pensive about the long-range value of all of the views and practices included under the sustainable agriculture concept.

Recommendations

The following list of recommendations is provided to assist the users of this document in making decisions regarding the inclusion of sustainable agriculture in future educational and agricultural endeavors. It is therefore recommended that:

1. An effort should be made to develop various information resources such as videotapes, computer programs, and written materials dealing with the diversified nature of agriculture in Oklahoma. This material should emphasize the ways in which various sustainable agriculture concepts and practices might be used in all parts of the state and the integration of sustainable agriculture into all farming operations as a holistic management design.

2. In-service and teacher education programs should more strongly emphasize ways in which the core curriculum for specific courses may be supplemented with current and cutting-edge technology and information over sustainable

agriculture as a holistic management approach that is applicable in all facets of the agricultural industry.

3. Specific curriculum material should be developed which deals with the holistic management philosophy of sustainable agriculture and should include ways in which sustainable agriculture impacts rural community development and rural population sustainability.

4. In-service and teacher education programs should strive to show teachers the importance of teaching all aspects of agriculture including, but not limited to sustainable agriculture.

5. University courses designed to prepare Agricultural Education teachers should include those that stress subjects in integrated pest management, rural development, alternative enterprises, conservation practices, and environmental concerns dealing with the agricultural industry.

6. In-service programs should be designed and implemented over all aspects of sustainable agriculture with special attention being paid to the topics of integrated pest management and rural development.

7. Further research should be conducted to determine student interest and knowledge in the various aspects of sustainable agriculture.

8. Research should be conducted to determine the interest in and need for adult education programs over sustainable agriculture.

9. Research should be conducted to determine the extent to which the Cooperative Extension Service is teaching or providing information about sustainable agriculture.

10. Research should be conducted to determine the impact of sustainable agriculture on the economic condition of Oklahoma agriculture and rural communities.

Implications

The findings of this research indicate that a majority of teachers believe that sustainable agriculture is a worthwhile subject to be taught to secondary agricultural education students in the state of Oklahoma. With this in mind, it is important to realize that the findings also seem to show that many teachers do not fully understand the concept of sustainable agriculture. Viewed in its entirety, this study implies that teachers and other agriculturalists need to be more fully grounded in the various aspects of sustainable agriculutre.

With the environment, human health, and rural economic decline on society's mind at present it is up to educators to try to make some headway in bringing about a greater understanding of the agricultural industry in the United States and the World. If this task can be accomplished, more of the general public will come to appreciate the things that agriculturalists do to provide food for an ever-growing population. While this research initiative dealt

only with secondary agriculture teachers, its implications go much further.

The secondary agricultural education classroom is a good place to start in the process of educating society about "better ways for better days" in the agricultural industry. If educators can instill a more acute sense of urgency and importance concerning the interrelationship between agriculture and society in the minds of young people the industry will be successful fo many years to come. In order to make this happen, the areas of sustainable agriculture in-service, curriculum development, and course content must be addressed. The holistic concept of sustainable agriculture implemented in cooperation with other areas of the new fields of agriculture will go a long way toward keeping agriculture on the cutting edge.

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APPENDICES

APPENDIX A

SURVEY INSTRUMENT

1 Years teaching experience _____ 2 Age_____

3 PI Group _____

4 Please check the courses that you taught last year

_____Ag I

_____Production Management I

_____Forestry

_____Horticulture II

_____Equine Mgmt and Production

_____Principles of Ag Technology

_____Ag Mechanics I

_____8th Grade Ag

_____Ag II

_____Production Management II

_____Horticulture I

_____Natural Resources

_____Ag Sales and Service

_____Ag Products and Marketing

_____Employment in Agri-Business

_____Ag Mechanics II

5 Rate the amount of emphasis you place on each of the following concepts
1=low 2=moderate 3=high 4=extreme

Crop Rotation	1	2	3	4	Fallow Ground	1	2	3	4
Integrated Pest Management	1	2	3	4	Cover Crop's	1	2	3	4
Drip Irrigation	1	2	3	4	Pasture Rotation	1	2	3	4
Green Manure Crops	1	2	3	4	Range/Brush Control	1	2	3	4
Minimum/No Till	1	2	3	4	Water Quality	1	2	3	4
Strip Cropping	1	2	3	4	Soil Erosion	1	2	3	4
Contour Farming	1	2	3	4	Compatible Crops	1	2	3	4
Alternative Enterprises	1	2	3	4	Resistant Crops	1	2	3	4
Rural Community Development	1	2	3	4	Rural Population Sustainability	1	2	3	4
Mulching	1	2	3	4	Organic Gardening	1	2	3	4
Animal Manure Fertilizer	1	2	3	4	Parasite Monitoring	1	2	3	4
					Alternative Power (ie animal power)	1	2	3	4

6 How adequate is the current curriculum material for teaching the following topics?

0=none available 1=poor 2=fair 3=good
4=excellent

Integrated Pest Management	0	1	2	3	4
Rural Development	0	1	2	3	4
Alternative Enterprises	0	1	2	3	4
Conservation Practices	0	1	2	3	4
Environmental Concerns	0	1	2	3	4

7 How would you rate your knowledge in the following subject areas?

1=very low 2=below average 3=average
4=above average 5=very high

Integrated Pest Management	1	2	3	4	5
Rural Community Development and Sustainability	1	2	3	4	5
Alternative Enterprises	1	2	3	4	5
Conservation Practices	1	2	3	4	5
Environmental Concerns	1	2	3	4	5

8 What are the major agricultural products produced in your school district? List in order of economic importance to your community (1=Greatest importance)

1 _____ 4 _____

2._____ 5 _____

3 _____ 6 _____

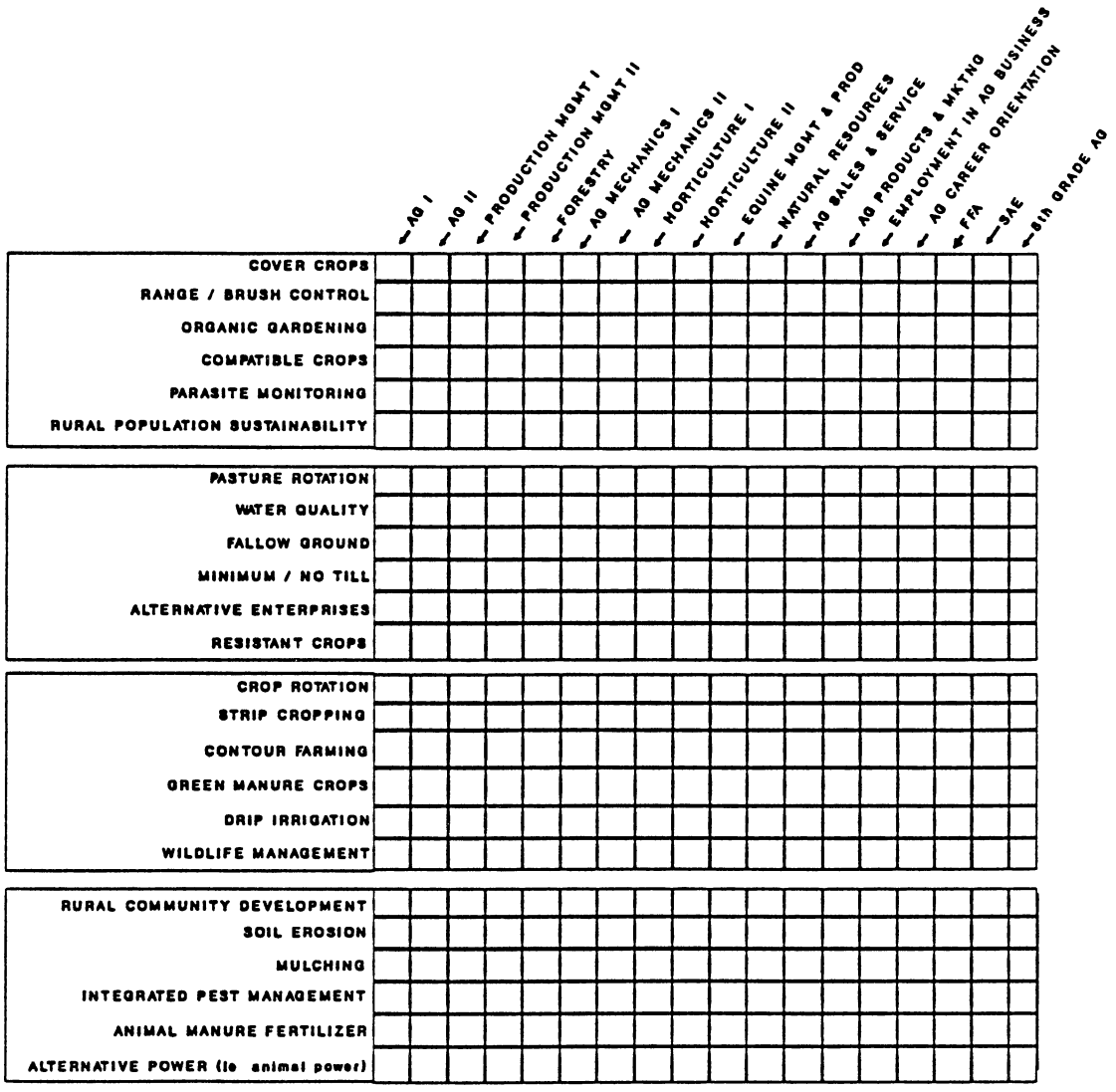
9 How comfortable would you be teaching the following topics

0=Would not teach at all 1=Very Uncomfortable
2=Uncomfortable 3=Comfortable
4=Very Comfortable

Integrated Pest Management	0	1	2	3	4
Rural Development	0	1	2	3	4
Alternative Enterprises	0	1	2	3	4
Conservation Practices	0	1	2	3	4
Environmental Concerns	0	1	2	3	4

10 Identify the following practices that are most commonly used by farmers in your area

_____Fallow Ground
_____Pasture Rotation
_____Green Manure Crops
_____Water Quality Monitoring
_____Soil Erosion Control
_____Resistant Crops
_____Livestock Parasite Monitoring
_____Wildlife Mgmt
_____Integrated Pest Management
_____Drip Irrigation
_____Chemical Fertilizer Discontinued
_____Chemical Pesticide Discontinued
_____Cover Crops
_____Minimum Till
_____Range / Brush Control
_____Strip Cropping
_____Contour Farming
_____Compatible Crops
_____Organic Gardening
_____Mulching
_____Animal Manure Fertilizer
_____Alternative Power (animal power)
_____Chemical Fertilizer Reduction
_____Chemical Pesticide Reduction
_____Soil Testing


AG I
AG II
PRODUCTION MGMT I
PRODUCTION MGMT II
FORESTRY
AG MECHANICS I
AG MECHANICS II
HORTICULTURE I
HORTICULTURE II
EQUINE MGMT & PROD
NATURAL RESOURCES
AG SALES & SERVICE
AG PRODUCTS & MKTNG
EMPLOYMENT IN AG BUSINESS
AG CAREER ORIENTATION
FFA
SAE
6th GRADE AG
COVER CROPS
RANGE / BRUSH CONTROL
ORGANIC GARDENING
COMPATIBLE CROPS
PARASITE MONITORING
RURAL POPULATION SUSTAINABILITY
PASTURE ROTATION
WATER QUALITY
FALLOW GROUND
MINIMUM / NO TILL
ALTERNATIVE ENTERPRISES
RESISTANT CROPS
CROP ROTATION
STRIP CROPPING
CONTOUR FARMING
GREEN MANURE CROPS
DRIP IRRIGATION
WILDLIFE MANAGEMENT
RURAL COMMUNITY DEVELOPMENT
SOIL EROSION
MULCHING
INTEGRATED PEST MANAGEMENT
ANIMAL MANURE FERTILIZER
ALTERNATIVE POWER (ie animal power)

12 How would you rate the need for in-service in the following areas?

0=No need 1=minimum need 2=moderate need
3=moderately high need 4=high need

Integrated Pest Management	0	1	2	3	4
Rural Community Development	0	1	2	3	4
Alternative Enterprises	0	1	2	3	4
Conservation Practices	0	1	2	3	4
Environmental Concerns	0	1	2	3	4

13 Identify all of the following practices in which in-service is needed (Please check all that apply)

_____Fallow Ground
_____Pasture Rotation
_____Green Manure Crops
_____Water Quality Monitoring
_____Soil Erosion Control
_____Resistant Crops
_____Livestock Parasite Monitoring
_____Wildlife Mgmt
_____Integrated Pest Management
_____Drip Irrigation
_____Chemical Fertilizer Discontinued
_____Chemical Pesticide Discontinued
_____Cover Crops
_____Minimum Till
_____Range / Brush Control
_____Strip Cropping
_____Contour Farming
_____Compatible Crops
_____Organic Gardening
_____Mulching
_____Animal Manure Fertilizer
_____Alternative Power (animal power)
_____Chemical Fertilizer Reduction
_____Chemical Pesticide Reduction
_____Soil Testing

Current knowledge and research supports the following definition of sustainable agriculture

Sustainable agriculture is the selection of agricultural practices which produce long-term economic returns, protect the environment, maintain or enhance rural communities, and promote social values including human health and safety

14 Do you or have you taught sustainable agriculture concepts in your classes? **YES / NO**

If yes, please check the factors that influenced you to teach these concepts.

_____Curriculum Material Available
_____Personal Interest
_____Student Interest
_____Economic Importance
_____Recent Literature
_____Personal Teaching Material Available
_____Personal Experience
_____Course Changes
_____Importance of Concepts
_____Community Interest
_____Courses in College
_____Concepts have always been taught

If no, please check the factors that influenced you not to teach these concepts.

_____No Curriculum Material Available
_____Personal Interest
_____Student Interest
_____No Economic Importance
_____Recent Literature
_____Lack Personal Teaching Material
_____Personal Experience
_____Course Changes
_____Unimportance of Concepts
_____No Community Interest
_____No Courses in College
_____Concepts have never been taught

15 Do you think it is important for your students to learn the concepts of sustainable agriculture? **YES / NO**

Why or why not?

16 What is your own personal opinion of the sustainable agriculture movement?

17 Are there any sustainable agriculture practices or concepts that are not listed in this survey that you teach in your classes? YES / NO

If yes, please list

APPENDIX B

INSTITUTIONAL REVIEW BOARD APPROVAL

OKLAHOMA STATE UNIVERSITY
INSTITUTIONAL REVIEW BOARD
FOR HUMAN SUBJECTS RESEARCH

Proposal Title: An Assessment of the Teaching of Sustainable Agriculture Topics in Secondary Agricultural Education Programs in Oklahoma

Principal Investigator J Key/ B Shaw, Jr

Date 1-15-92 IRB # AG-92-008

This application has been reviewed by the IRB and

Processed as Exempt [X] Expedite [ ] Full Board Review [ ]

Renewal or Continuation [ ]

Approval Status Recommended by Reviewer(s)

Approved [X] Deferred for Revision [ ]

Approved with Provision [ ] Disapproved [ ]

Approval status subject to review by full Institutional Review Board at next meeting, 2nd and 4th Thursday of each month

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Comments, Modifications/Conditions for Approval or Reason for Deferral or Disapproval.

Signature. _____ Date: 1-21-92
Chair of Institutional Review Board

VITA

Benjamin Franklin Shaw, Jr.

Candidate for the Degree of

Doctor of Education

Thesis: PERCEPTIONS OF OKLAHOMA AGRICULTURAL EDUCATION TEACHERS OF SELECTED ASPECTS OF SUSTAINABLE AGRICULTURE

Major Field: Agricultural Education

Biographical:

Personal Data: Born in Memphis, Tennessee, April 13, 1962

Education: Graduated from Lancaster High School, Lancaster, Texas, in May, 1980; received Bachelor of Science degree in Agricultural Education from Texas A&M University in December of 1984; received Master of Education degree in Agricultural Education from Texas A&M University in August of 1990; enrolled in the doctoral program at Oklahoma State University, 1990-92; completed the requirements for the Doctor of Education degree at Oklahoma State University in July, 1992.

Professional Experience: Graduate Assistant, Texas A&M University, 1985; Agricultural Science Teacher, Canyon, Texas, 1985-90; Graduate Assistant, Texas A&M University, 1990; Graduate Research Associate, Oklahoma State University, 1990-91; Graduate Teaching Associate, Oklahoma State University, 1991-92.