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I am submitting herewith a thesis written by Philip A. Coleman entitled "Relationships between characteristics of soybean production in Tennessee : the number of contacts the producers had with extension, their farming operation, and their use of production practices." I have examined the final electronic copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science, with a major in Agriculture and Extension Education.

Cecil E. Carter Jr, Major Professor

We have read this thesis and recommend its acceptance:

Roy R. Lessly, Wayne T. Flinchum

Accepted for the Council:
Carolyn R. Hodges

Vice Provost and Dean of the Graduate School

(Original signatures are on file with official student records.)

To the Graduate Council:

I am submitting herewith a thesis written by Philip A. Coleman entitled "Relationships Between Characteristics of Soybean Production in Tennessee, the Number of Contacts the Producers Had With Extension, Their Farming Operation, and Their Use of Production Practices." I have examined the final copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science, with a major in Agricultural and Extension Education.

66

Cecil E. Carter, Jr., Major Professor

We have read this thesis
and recommend its acceptance:

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RELATIONSHIPS BETWEEN CHARACTERISTICS OF SOYBEAN PRODUCTION IN TENNESSEE, THE NUMBER OF CONTACTS THE PRODUCERS HAD WITH EXTENSION, THEIR FARMING OPERATION, AND THEIR USE OF PRODUCTION PRACTICES

A Thesis

Presented for the

Master of Science

Degree

The University of Tennessee, Knoxville

Philip A. Coleman

August 1990

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ABSTRACT

The main purpose of this study was to obtain information that might be useful in developing Extension plans and programs for the soybean producers in Tennessee, characterize soybean production in Tennessee, and identify variables related to the use of soybean production practices. A total of 787 soybean producers located in Tennessee provided survey data in 1986. Tennessee County Extension agents conducted personal interviews with the producers. The "n^{th}" number method of sampling was used to select the producers to be surveyed. According to the guidelines of the survey, producers interviewed must have grown at least 25 acres of soybeans in 1986. Information was obtained regarding the general production practices and the number of contacts the producers had with Extension agents over a 12 month period.

The data was coded and computations were made by the University of Tennessee Computing Center. Chi square and analysis of variance F tests were used to determine the relationships between the dependent and independent variables. Chi square and F values of .05 were accepted as significant.

Major findings include the following:

Over 76 percent of the soybean producers were characterized as full-time farmers in 1986, over 64 percent were 41 years of age and over, and over 66 percent reported row crop as major source of farm income. Over 50 percent of the producers reported size of operation of under 200 acres. The mean size of operation was 341 acres.

Full-time producers had more Extension contacts than part-time producers. Younger producers had more Extension contacts than older producers. Row crop farmers received more farm visits than other producers.

Yields produced by soybean farmers were significantly related to 8 of the 12 production practices. Soybean producers who fertilized or limed by soil test, applied fungicide to seed, used crop rotation to control disease, applied inoculant to seed, and used crop rotation to control weeds had significantly higher yields than those that did not.

Producers who planted resistant varieties to control cyst nematode or disease produced significantly lower yields than those who did not.

Full-time farmers were more likely than part-time farmers to lime land by soil test or use crop rotation to control weeds.

Younger producers were no more likely than older producers to use the 12 production practices.

Row crop farmers were more likely than other producers to apply molybdenum to seed, apply fungicide to seed, plant disease resistant varieties, plant resistant varieties to control cyst nematode and to check harvesting loss.

Larger producers were more likely than smaller producers to apply inoculant, molybdenum, or fungicide to seed, plant disease resistant varieties, plant resistant varieties to control cyst nematode, check harvesting loss, and fertilize or lime land by soil test.

Soybean producers who had a higher number of Extension contacts were more likely than producers who had a smaller number of Extension contacts to apply inoculant or molybdenum to seed, and to fertilize or lime by soil test, to apply fungicide to seed, use crop rotation to control disease, cyst nematode and weeds, plant disease resistant varieties to control cyst nematode.

Row crop farmers and larger producers used a significantly higher number of the 12 production practices than other farmers and smaller producers.

Soybean producers who attended meetings, made office visits, made telephone calls, received farm visits or contacted their Extension agent used a significantly higher number of the 12 production practices.

Implication and recommendations also were made.

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CHAPTER I

THE PROBLEM AND ITS SETTING

I. INTRODUCTION

Soybean production plays an important role in the agricultural economy in Tennessee. In 1986, cash receipts from soybeans produced were 173 million dollars, totaling 9 percent of the state's agricultural receipts (13:25).* This ranked soybean production first in cash received by agricultural producers from 1986 crop sales in Tennessee. Tennessee ranked 14 among the states in the nation in soybean production in 1986, producing 37.5 million bushels (12:14).

Soybeans has been a major export commodity for the United States. With increased competition from foreign countries, soybean producers today must become more efficient to maintain profitability. Soybean producers must utilize available management tools to maximize yields and profits.

In Tennessee, the Agricultural Extension Service plays a vital role in Tennessee's agricultural industry. The Extension Service has a responsibility to educate soybean producers, supplying dealers, and farm leaders with updated information and working with the media to effectively disseminate information. Through the local county Extension agent, producers learn the latest in agricultural research and methods to apply practical information

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*Numbers in parenthesis refer to alphabetically numbered references in the Bibliography; those after the colon represent page numbers.

Extension agents diffuse information concerning soybean production using many contact methods (e.g., meetings, office visits, telephone calls, farm visits, demonstrations, and mass media). The use of this information will vary among soybean producers.

This study was conducted to characterize Tennessee soybean producers as to the nature of their farming operation, their use of production practices, yields and the number of contacts soybean producers had with Extension agents over a 12 month period. This information should be useful to state Extension specialists and to county staffs in assessing the needs and planning educational programs for Tennessee soybean producers.

II. NEED FOR THE STUDY

The Agricultural Extension Service is continually trying to improve the effectiveness and acceptance of their educational programs. One major objective of the Tennessee Agricultural Extension Service is to encourage the adoption of recommended agricultural production practices. Like most government agencies serving the public, the Extension Service is striving for increased accountability to taxpayers, legislators, and others. This study was needed to assist county Extension agents in determining priorities and the direction for future educational programs for soybean producers.

III. PURPOSE AND OBJECTIVE OF THE STUDY

The purpose of this study was to characterize Tennessee soybean producers as to their farming operations, their use of recommended

production practices, their contacts with Extension agents, and to determine the relationships among these variables.

The specific objectives of this study were:

1. To characterize soybean production in Tennessee.

2. To determine the relationships between soybean producers personal and farm characteristics and the number of contacts with Extension agents.

3. To determine the relationship between the use of production practices by soybean producers and yield per acre.

4. To determine the relationship between the farming status of soybean producers and their use of production practices.

5. To determine the relationship between the age of soybean producers and their use of production practices.

6. To determine the relationship between soybean producers major source of farm income and their use of production practices.

7. To determine the relationships between soybean producers size of operation and their use of production practices.

8. To determine the relationships between the number of contacts soybean producers had with Extension agents and their use of production practices.

9. To determine the relationships between soybean producers personal and farm characteristics and the number of Extension contacts and the number of production practices used.

IV. LIMITATIONS OF THE STUDY

This study was limited to the analysis of data from the 1986 Tennessee Agricultural Extension Service Soybean Production Survey conducted in the fall of 1986. The data were obtained by Extension agents through personal interviews with 787 soybean producers in major soybean producing counties of Tennessee. The number of producers interviewed varied from county to county, depending on the number of soybean producers in the county.

V. METHOD OF INVESTIGATION

Population and Sample

The population of this study was soybean producers in Tennessee who grew 25 or more acres of soybeans in 1986. Data were obtained through personal interviews by Extension agents using interview schedules developed by specialists at the University of Tennessee. Each agent was instructed to use the "n^{th}" number of randomly select individual soybean producers. The number of producers interviewed per county was determined as follows:

1. Counties with under 25,000 acres interviewed 20 producers.
2. Counties with 25,000 to 75,000 acres interviewed 25 producers.
3. Counties with over 75,000 acres interviewed 30 producers.

Completed surveys were returned to the Agricultural Extension Education Office.

Survey Instrument

The 1986 Soybean Production Survey was developed by the Tennessee Agriculture Extension Specialist Staff in the Plant and Soil Science and Extension Education departments. Questions dealt with producers use of production and marketing practices and the number of Extension contacts the producers had with Extension agents. Data also were obtained regarding the size of their soybean operation and yields per acre of soybeans grown.

Method of Analysis

The 1986 survey data were processed for computer analysis. The University of Tennessee Computer Center facilities were used in the analysis of data.

Responses to survey questions were summarized using means and frequency counts of producers responses regarding the use of production practices, the number of acres harvested, yield per acre, and the number of Extension contacts.

The chi square test and analysis of variance were used to determine the strength of the relationship between dependent and independent variables. Chi square and F values which achieved the .05 level of probability were accepted as statistically significant.

VI. DEFINITION OF TERMS

1. Soybean Producer. An individual making management decisions pertaining to at least 25 acres of soybeans in 1986. These producers constitute the target audience of this study.

2. Extension Contacts. The number of Extension group meetings attended, visits made to the Extension office, farm visits received from Extension agents, and telephone calls made to the Extension office during the previous 12 months.

3. Variable (Dependent). The variable which one wishes to explain as a function of other variables.

4. Variable (Independent). The explanatory variable in a statistical analysis.

5. Practice. A research verified and commonly accepted procedure which, if performed correctly and on a regular basis, will increase or help insure a desired outcome or return.

CHAPTER II

REVIEW OF RELATED STUDIES

Available studies were reviewed concerning the relationships of the characteristics of producers, farming operations, contacts with Extension, and the use of recommended production practices by producers.

Review of related studies cited in this chapter are reported under the following headings: (1) characteristics of producers and their farm operations, (2) relationships between producers use of recommended production practices and yield per acre, (3) relationships between characteristics of producers and the contacts producers had with Extension agents, and (4) relationships between producers use of recommended production practices and the contacts producers had with Extension agents.

I. CHARACTERISTICS OF PRODUCERS AND THEIR FARM OPERATIONS

In a 1978 study, Freeman found that the average Tennessee Grade A dairyman was 50 years old and a high percentage owned their own farm (2).

In a 1977 study of soybeans producers, Jenkins found that 16 percent were 60 years old or older. The mean age of the soybean producer in his study was 46.5 years old (4).

In a 1988 study of corn producers, Jones found that 74 percent of the producers were characterized as being full-time farmers in 1985.

Jones also found that more than half (51.7 percent) of the producers were under 47 years of age. The mean age was 46 years old (6).

Rutter, in a 1982 study of beef producers, found that 53.2 percent were full-time farm operators, while 46.8 percent were part-time farm operators (11).

Jenkins reported in his 1977 study of soybean producers that 86 percent of the producers were full-time farmers, 12 percent were employed part-time off the farm, and 2 percent reported employment to other businesses (4).

II. RELATIONSHIPS BETWEEN PRODUCERS USE OF RECOMMENDED PRODUCTION PRACTICES AND YIELDS PER ACRE

Officer, in his 1987 study of soybean producers, found that the yield per acre which soybean producers had was significantly influenced by 38 out of 54 production practices (8).

In 1980, Bradley found on his study of cotton producers that cotton yields increased as the total use of nine recommended production practices increased (1).

Johnson (1982) found that corn producers using more recommended practices had higher yields per acre (5).

Perry found in his 1980 study of swine producers that 60 percent of swine producers used at least eight of the recommended practices (9).

In a 1978 study, Yabaya reported corn yields were significantly related to each of the eight production practices studied. Producers

using the recommended production practices harvested significantly more bushels of corn per acre than producers not using the practice (14).

McCallie (1985) found, in his study of wheat producers, that the percent of acreage soil tested for wheat production increased as the number of total contacts producers had with Extension increased (7).

III. RELATIONSHIPS BETWEEN CHARACTERISTICS OF PRODUCERS AND THE CONTACTS PRODUCERS HAD WITH EXTENSION AGENTS

Freeman's (1978) Grade A dairy producers study showed that as age of the producer increased, the number of Extension contacts decreased (2).

Jones' (1988) study of corn producers found that there was a significant relationship between farming status and the number of contacts producers had with Extension. Full-time farmers tended to have more Extension contacts than did part-time farmers (6).

Jenkins (1977) found that full-time soybean producers tend to have more contacts with Extension than part-time soybean producers (4).

Yabaya (1979) found in his study of corn producers that the size of the farming operation increased as the number of the Extension contacts increased (14).

IV. RELATIONSHIPS BETWEEN PRODUCERS USE OF RECOMMENDED PRODUCTION PRACTICES AND THE CONTACTS PRODUCERS HAD WITH EXTENSION AGENTS

Robinson (1981) found in his study of burley tobacco producers that the use of recommended practices increased as the number of contacts producers had with Extension increased (10).

In the 1988 study of corn producers, Jones found that 16 of the 20 production practices were significantly related to the number of contacts corn producers had with Extension agents over a 12 month period (6).

Hall (1971) found that Extension bulletins, newspapers, radio programs, farm meetings, commercial bulletins, field days, and television were listed as important sources of information by all the high-yielding soybean producers (3).

Bradley (1980) found that there was a significant relationship between the use of the nine of the recommended cotton practices studied and the number of contacts producers had with Extension (1).

In 1987, Officer found in his study of soybean producers that the number of contacts soybean producers had with Extension was significantly related to the use of 22 of the 54 production practices (8).

CHAPTER III

FINDINGS REGARDING CHARACTERISTICS OF SOYBEAN PRODUCTION IN TENNESSEE AND RELATIONSHIPS BETWEEN SOYBEAN PRODUCERS EXTENSION CONTACTS, AND THEIR PERSONAL AND FARM CHARACTERISTICS AND THE USE OF PRODUCTION PRACTICES

The purpose of this chapter is to describe characteristics of soybean production in Tennessee and relationships between soybean producers mean number of Extension contacts and their personal and farm characteristics and the use of production practices by producers and yield per acre.

Chapter III is organized into three sections:

Section I presents findings regarding characteristics of soybean production in Tennessee.

Section II presents findings regarding relationships between the soybean producers personal and farm characteristics and the number of contacts with Extension agents over the past 12 months.

Section III presents findings regarding relationships between the use of production practices by soybean producers and yield per acre.

I. CHARACTERISTICS OF SOYBEAN PRODUCTION IN TENNESSEE

This section presents findings regarding the characteristics of soybean production in Tennessee. Findings were organized into four sub-sections: (1) personal and farm characteristics, (2) general

production information, (3) production practices, and (4) Extension contacts. Findings regarding these characteristics are summarized in Table 1.

Personal and Farm Characteristics

Four personal and farm characteristics presented in Table 1 include farming status, age of operator, major source of farm income, and size of operation. Over 76 percent of the soybean producers responding, reported farming status as full-time. Over 64 percent of the producers were 41 years of age and over. Over 66 percent reported major source of farm income as row crop and over 50 percent reported size of operation of under 200 acres. The mean size of soybean operation was 341 acres.

General Production Information

Findings regarding the 15 variables selected to characterize Tennessee soybean producers farm operations are presented in Table 1. Almost 38 percent of the soybean producers reported yields under 25 bushels per acre, almost 33 percent reported 25-30 bushels, and over 27 percent reported 31-40 bushels. Only slightly over 2 percent reported yields of 41 bushels and over. The mean yield of producers reporting in 1986 was 26.6 bushels per acre. Over 92 percent of the producers reported planting single crop soybeans while nearly 59 percent reported planting double crop soybeans and over 22 percent reported planting broadcast soybeans.

Almost 88 percent of the producers reported planting conventional till and only 36.6 percent reported planting no-till.

Table 1. Characteristics of Soybean Production in Tennessee

Name of Variable	Number of Producers Responding	Valid Percent of Producers
PERSONAL AND FARM CHARACTERISTICS		
Farming Status		
Full-time	598	76.3
Part-time	186	23.7
No Response	3	Missing
TOTAL	787	100.0
Age of Operator		
Under 40	279	35.6
41 and Over	504	64.4
No Response	4	Missing
TOTAL	787	100.0
Major Source of Farm Income		
Row Crop	520	66.3
Other	264	33.7
No Response	3	Missing
TOTAL	787	100.0
Size of Operation		
Under 200 Acres	396	50.3
200 Acres and Over	391	49.7
TOTAL	787	100.0
Mean = 341		
GENERAL PRODUCTION INFORMATION		
Yield Per Acre		
Under 25 Bushel	293	37.7
25-30 Bushel	256	32.9
31-40 Bushel	212	27.3
41 Bushel and Over	16	2.1
No Response	10	Missing
TOTAL	787	100.0
Mean = 26.6		
Planted Single Crop Beans		
No	62	7.9
Yes	725	92.1
TOTAL	787	100.0
Planted Double Crop Beans		
No	326	44.1
Yes	461	58.6
TOTAL	787	100.0
Planted Seed Broadcast		
No	611	77.6
Yes	176	22.4
TOTAL	787	100.0
Plant Seed Conventional-Till		
No	96	12.2
Yes	691	87.8
TOTAL	787	100.0
Planted Seed No-Till		
No	499	63.4
Yes	288	36.6
TOTAL	787	100.0
Applied Nitrogen on Land Not Soil Tested		
No	595	75.6
Yes	192	24.4
TOTAL	787	100.0
Mean = 17 pounds		

Table 1. (Continued)

Name of Variable	Number of Producers Responding	Valid Percent of Producers
Applied Phosphate on Land Not Soil Tested		
No	351	44.6
Yes	436	55.4
TOTAL	787	100.0
Mean = 47 pounds		
Applied Potash on Land Not Soil Tested		
No	330	41.9
Yes	457	58.1
TOTAL	787	100.0
Mean = 53 pounds		
Used Cultivation to Control Weeds		
No	235	30.5
Yes	536	69.5
No Response	16	Missing
TOTAL	787	100.0
Used Pre-Plant Chemicals		
No	157	20.3
Yes	615	79.7
No Response	15	Missing
TOTAL	787	100.0
Used Pre-Emerge Chemicals		
No	314	40.2
Yes	468	59.8
No Response	5	Missing
TOTAL	787	100.0
Used Post-Emerge Chemicals		
No	117	15.0
Yes	662	85.0
No Response	8	Missing
TOTAL	787	100.0
Stored Grain on Farm		
No	403	51.2
Yes	384	48.8
TOTAL	787	100.0
How Was Grain Marketed		
Sold Before Harvest	52	6.7
Sold After Harvest	323	41.4
Stored	146	18.7
Combination	260	33.3
No Response	6	Missing
TOTAL	787	100.0
PRODUCTION PRACTICES		
Planted Certified or Registered Seed		
No	217	27.6
Yes	570	72.4
TOTAL	787	100.0
Inoculant Applied to Seed		
No	373	47.4
Yes	414	52.6
TOTAL	787	100.0
Molybdenum Applied to Seed		
No	274	34.8
Yes	513	65.2
TOTAL	787	100.0

Table 1. (Continued)

Name of Variable	Number of Producers Responding	Valid Percent of Producers
Land Fertilized by Soil Test		
No	349	44.3
Yes	438	55.7
TOTAL	787	100.0
Land Limed by Soil Test		
No	399	50.7
Yes	388	49.3
TOTAL	787	100.0
Fungicide Applied to Seed		
No	385	48.9
Yes	402	51.1
TOTAL	787	100.0
Used Crop Rotation to Control Disease		
No	183	23.3
Yes	604	76.7
TOTAL	787	100.0
Planted Disease Resistant Varieties		
No	337	42.8
Yes	450	57.2
TOTAL	787	100.0
Used Crop Rotation to Control Cyst Nematodes		
No	233	29.6
Yes	554	70.4
TOTAL	787	100.0
Planted Resistant Varieties to Control Cyst Nematodes		
No	304	38.6
Yes	483	61.4
TOTAL	787	100.0
Used Crop Rotation to Control Weeds		
No	204	25.9
Yes	583	74.1
TOTAL	787	100.0
Checked Harvesting Loss		
No	491	62.4
Yes	296	37.6
TOTAL	787	100.0
EXTENSION CONTACTS		
Number of Extension Meetings Attended		
None	212	26.9
1 or More	575	73.1
TOTAL	787	100.0
Mean = 1.7		
Number of Extension Office Visits		
None	225	28.5
1 or More	562	71.5
TOTAL	787	100.0
Mean = 1.8		

Table 1. (Continued)

Name of Variable	Number of Producers Responding	Valid Percent of Producers
Number of Extension Telephone Calls Made		
None	120	15.2
1 or More	667	84.8
TOTAL	787	100.0
Mean = 4.1		
Number of Extension Farm Visits Received		
Not Any	126	16.1
1 or More	661	83.9
TOTAL	787	100.0
Mean = 2.5		
Total Number of Extension Contacts		
7 and Under	386	49.0
Over 7	401	51.0
TOTAL	787	100.0
Mean = 9.9		

Over 24 percent of the soybean producers reported applying nitrogen to land that had not been soil tested. The mean of 17 pounds of nitrogen was applied. Over 55 percent reported applying phosphate on land not soil tested. The mean number of pounds applied was 47 pounds per acre. Also, slightly over 58 percent reported applying potash on land not soil tested. A mean of 53 pounds of potash was applied per acre.

Almost 70 percent of the producers reported using cultivation to control weeds. Nearly 80 percent reported using a pre-plant chemical, almost 60 percent used a pre-emerge chemical, and 85 percent used a post-emerge chemical to control weeds.

Almost 49 percent of the soybean producers reported storing grain on the farm. Almost 7 percent of the producers reported selling grain before harvest, over 41 percent sold grain after harvest, almost 19 percent stored grain, and over 33 percent reported using a combination of marketing alternatives.

Production Practices

Findings regarding 12 variables selected to characterize Tennessee soybean producers use of production practices are presented in Table 1. Over 72 percent of the producers reported planting certified or registered seed, almost 53 percent applied inoculant to seed, and over 65 percent applied molybdenum to seed. Almost 56 percent of the producers reported fertilizing land by soil test while over 49 percent limed land by soil test.

Over 51 percent of the producers reported applying fungicide to seed, almost 77 percent used crop rotation to control disease and over 57 percent planted disease resistant varieties.

Over 70 percent of the producers reported using crop rotation to control cyst nematodes and over 61 percent planted resistant varieties to control cyst nematodes. Over 74 percent of the producers reported using crop rotation to control weeds. Almost 38 percent reported checking harvesting loss.

Extension Contacts

Findings regarding five variables were used to characterize soybean producers as to the number of contacts made with Extension agents during the past 12 months.

Over 73 percent of the producers reported attending one or more Extension meetings (mean = 1.7), almost 72 percent made one or more office visits (mean = 1.8), almost 85 percent made one or more telephone calls to Extension agents (mean = 4.1), and almost 84 percent received one or more farm visits from Extension agents (mean = 2.5). Fifty-one percent of the soybean producers reported over 7 contacts with Extension (mean = 9.9).

Table Summary

Over 76 percent of the soybean producers were characterized as full-time farmers in 1986, over 64 percent were 41 years of age and over, and over 66 percent reported row crop as major source of farm income. Over 50 percent of the producers reported size of operation of under 200 acres. The mean size of operation was 341 acres.

II. RELATIONSHIPS BETWEEN SOYBEAN PRODUCERS PERSONAL AND FARM CHARACTERISTICS AND THE NUMBER OF CONTACTS WITH EXTENSION AGENTS OVER THE PAST 12 MONTHS

Section II presents findings regarding personal and farm characteristics of Tennessee soybean producers in 1986 and the number of contacts they had with Extension agents over the past 12 months. The number of Extension contacts were used as the dependent variable. Extension contacts were analyzed in four categories, by recording the number of meetings attended, the number of office visits made, the number of telephone calls made, and the number of farm visits received over the past 12 months.

Personal and farm characteristics were used as the independent variable. The analysis of variance F-test was used to determine the strength of relationship between the variables. The probability level .05 was used to determine the significance of the relationship. Data regarding these relationships are presented in Table 2.

Full-time producers reported attending 1.9 meetings, made 2.0 office visits, made 4.4 telephone calls, and received 2.7 farm visits compared to 1.1 meetings attended, 1.5 office visits made, 3.3 telephone calls made, and 1.9 farm visits received by part-time producers. The F-test indicated a significant relationship between farming status and Extension contacts. Full-time producers attended more meetings, made more office visits, made more telephone calls, and received more farm visits than part-time producers.

Table 2. Relationships Between Soybean Producers Personal and Farm Characteristics and the Number of Contacts With Extension Agents Over the Past 12 Months

Personal and Farm Characteristics	Mean Number of Extension Contacts							
	Number of Producers	Meetings Attended	Number of Producers	Office Visits Made	Number of Producers	Telephone Calls Made	Number of Producers	Farm Visits Received
Farming Status								
Full-time	597	1.9	594	2.0	598	4.4	589	2.7
Part-time	185	1.1	182	1.5	186	3.3	184	1.9
TOTAL	782		776		784		773	
	F=27.585 p=0.0001		F=8.872 p= .0030		F=7.913 p= .0050		F=18.939 p= 0.0001	
Age of Operator								
Under 40	278	1.9	273	2.1	279	4.6	272	2.8
41 and Over	503	1.5	502	1.7	504	3.9	500	2.4
TOTAL	781		775		783		772	
	F= 7.994 p= 0.0048		F=5.441 p=0.0199		F=4.43 p=0.0356		F= 8.638 p= 0.0034	
Major Source of Farm Income								
Row Crop	518	1.7	516	1.9	520	4.2	512	2.6
Other	264	1.6	260	1.7	264	4.0	261	2.3
TOTAL	782		776		784		773	
	F= 0.970 p= 0.3252		F=1.886 p=0.1701		F=0.275 p=0.5999		F= 5.661 p=0.0176	
Size of Operation								
Under 200 Acres	395	1.5	390	1.7	396	3.5	391	2.0
200 Acres and Over	390	1.8	389	2.0	391	4.7	385	2.9
TOTAL	785		779		787		776	
	F= 6.149 p= 0.0134		F=6.580 p=0.0105		F=14,906 p=0.0001		F=37.816 p= 0.0001	

Producers 40 years of age and under reported attending 1.9 meetings, made 2.1 office visits, made 4.6 telephone calls, and received 2.8 farm visits compared to 1.5 meetings attended, 1.7 office visits, 3.9 telephone calls made, and 2.4 farm visits received by the producers 41 and over. The F-test indicated a significant relationship between age of operator and Extension contacts. Younger producers attended more meetings, made more office visits, made more telephone calls, and received more farm visits than older producers.

Producers who reported major source of farm income as row crop attended 1.7 meetings, made 1.9 office visits, made 4.2 telephone calls, and received 2.6 farm visits compared to 1.6 meetings attended, 1.7 office visits made, 4.0 telephone calls, and 2.3 farm visits received by producers who reported major source of farm income as other. Row crop producers tended to have a higher number of contacts than other producers, although only the number of farm visits received was significant as tested by the F-test. Row crop producers received more farm visits than other producers. Row crop producers were no more likely than other producers to attend meetings, make office visits, and make telephone calls.

Soybean producers whose size of operation was 200 acres and over attended 1.8 meetings, made 2.0 office visits, made 2.7 telephone calls, and received 2.9 farm visits compared to 1.5 meetings attended, 1.7 office visits made, 3.5 telephone calls made, and 2.0 farm visits received by producers whose size of operation was under 200 acres. The F-test indicated a significant relationship between size of operation

and Extension contacts. Larger producers attended more meetings, made more office visits, made more telephone calls, and received more farm visits than smaller producers.

Table Summary

Three of the four personal and farm characteristics were significantly related to each type of Extension contact. The Extension contacts included meetings attended, office visits made, telephone calls made, and farm visits received. Full-time producers had more Extension contacts than part-time producers. Younger producers had more Extension contacts than older producers. Larger producers had more Extension contacts than smaller producers. Row crop farmers received more farm visits than other farmers.

Row crop farmers were no more likely than other farmers to attend meetings, make office visits, or make telephone calls.

III. RELATIONSHIPS BETWEEN THE USE OF PRODUCTION PRACTICES BY SOYBEAN PRODUCERS AND YIELD PER ACRE

This section presents findings regarding the relationships between the use of the 12 production practices by soybean producers in Tennessee and the yield per acre. Yield per acre was used as the dependent variable. The mean yield per acre of the soybean producers surveyed was 26.6 bushels with a range from 10 to 49 bushels.

The 12 production practices included in this section were used as independent variables. The major purpose of this section was to determine the relationship between soybean producers use of the 12

production practices and their yield per acre. The analysis of variance F-test was used to determine the strength of the relationship between the variables. The probability level .05 was used to determine the significance of the relationship.

According to the data in Table 3, soybean producers in 1986 who planted certified or registered seed tended to have slightly lower yields (26.8 bushels) than producers who did not plant certified or registered seed (27.0 bushels). These differences were not significant as tested by the F-test. Soybean producers who planted certified or registered seed did not have significantly higher yields than those who did not.

Two variables, (1) inoculant applied to seed, and (2) molybdenum applied to seed, were used to determine the relationships between seed treatments and yields. Producers who applied inoculant to seed yielded over 27 bushels as compared to yields of slightly over 26 bushels for those who did not apply inoculant to seed. The F-test indicated a significant relationship between inoculant applied to seed and yield. Soybean producers who applied inoculant to seed had significantly higher yields than those who did not. Also, soybean producers who applied molybdenum to seed yielded over 27 bushels as compared to over 26 bushels for those who did not apply molybdenum. These differences were not significant as tested by the F-test. Soybean producers who applied molybdenum to seed did not have significantly higher yields than those who did not.

Two variables, (1) land fertilized by soil test, and (2) land limed by soil test, were used to determine the relationship between

Table 3. Relationships Between the Use of Production Practices By Soybean Producers and the Yield Per Acre

Production Practices	Yield Per Acre			
	Number of Producers	Mean	F Value	p
Planted Certified or Registered Seed				
No	215	27.0		
Yes	561	26.8	.196	.6584
Total Responding	776			
Inoculant Applied to Seed				
No	365	26.2		
Yes	411	27.4	5.215	.0227
Total Responding	776			
Molybdenum Applied to Seed				
No	267	26.4		
Yes	509	27.1	1.890	.1696
Total Responding	776			
Land Fertilized by Soil Test				
No	342	25.0		
Yes	434	28.4	43.756	.0001
Total Responding	776			
Land Limed by Soil Test				
No	392	25.2		
Yes	384	28.6	44.811	.0001
Total Responding	776			
Fungicide Applied to Seed to Control Disease				
No	376	25.7		
Yes	400	28.0	19.998	.0001
Total Responding	776			
Used Crop Rotation to Control Disease				
No	183	25.6		
Yes	593	27.2	7.200	.0074
Total Responding	776			
Planted Disease Resistant Varieties				
No	333	27.6		
Yes	443	26.3	5.731	.0169
Total Responding	776			
Used Crop Rotation to Control Cyst Nematode				
No	227	27.0		
Yes	549	26.8	0.135	.7139
Total Responding	776			
Planted Resistant Varieties to Control Cyst Nematode				
No	296	27.8		
Yes	480	26.3	7.652	.0058
Total Responding	776			
Used Crop Rotation to Control Weeds				
No	201	25.9		
Yes	575	27.2	4.289	.0387
Total Responding	776			
Checked Harvesting Loss				
No	483	26.6		
Yes	293	27.3	1.751	.1861
Total Responding	776			

soil fertility and yield. Producers who fertilized by soil test in 1986 yielded over 28 bushels while producers who did not fertilize by soil test yielded 25 bushels. The F-test indicated a significant relationship between land fertilized by soil test and yields. Soybean producers who fertilized land by soil test had significantly higher yields than those who did not. Also, soybean producers who limed land by soil test yielded nearly 29 bushels while producers who did not lime land by soil test yielded just over 25 bushels. There was a significant relationship between land limed by soil test and yield. Soybean producers who limed land by soil test had significantly higher yields than those who did not.

Three variables, (1) fungicide applied to seed, (2) used crop rotation to control disease, and (3) planted disease resistant varieties, were used to determine the relationship between producers use of disease control practices and yields. Soybean producers who applied fungicide to seed yielded 28 bushels as compared to nearly 26 bushels for those who did not apply fungicide to seed. The F-test indicated a significant relationship between the use of fungicide applied to seed and yields. Producers who applied fungicide to seed had significantly higher yields than those who did not. Also, producers who used crop rotation to control disease produced yields of over 27 bushels compared to nearly 26 bushels for those who did not use crop rotation to control disease. The F-test indicated a significant relationship between the use of crop rotation and yields. Producers who used crop rotation to control disease had significantly higher yields than

those who did not. Also, producers who planted disease resistant varieties yielded over 26 bushels compared to nearly 28 bushels for those who did not plant disease resistant varieties. The F-test indicated a significant relationship between planting disease resistant varieties and yields. Soybean producers who planted disease resistant varieties had significantly lower yields than those who did not.

Two variables, (1) used crop rotation to control cyst nematode, and (2) planted resistant varieties to control cyst nematode, were used to determine the relationships between cyst nematode control and yields. Soybean producers in 1986 who used crop rotation to control cyst nematode yielded 26.8 bushels as compared to 27 bushels for those who did not use crop rotation to control cyst nematode. These differences were not significant as tested by the F-test. Soybean producers who used crop rotation to control cyst nematode did not have significantly higher yields than those who did not use the practice; whereas, producers who planted resistant varieties to control cyst nematodes yielded over 26 bushels compared to almost 28 bushels for those who did not plant resistant varieties to control cyst nematode. The F-test indicated a significant relationship between planting resistant varieties to control cyst nematode and yields. Soybean producers who planted disease resistant varieties to control cyst nematode had significantly lower yields than those who did not.

Soybean producers who used crop rotation to control weeds produced yields of over 27 bushels compared to nearly 26 bushels for those who did not use crop rotation to control weeds. The F-test indicated a

significant relationship between the use of crop rotation to control weeds and yields. Soybean producers who used crop rotation to control weeds had significantly higher yields than those who did not.

Soybean producers who checked harvesting loss yielded 27.3 bushels compared to 26.6 bushels produced by the producers who did not check harvesting loss. Although the data shows a slight tendency for the producers who checked harvesting loss as producing higher yields, these differences were not significant as tested by the F-test. Soybean producers who checked harvesting loss did not have significantly higher yields than those who did not use the practice.

Table Summary

Eight of the 12 production practices studied were significantly related to yields. Producers who fertilized land by soil test, limed land by soil test, applied fungicide to seed, used crop rotation to control disease, applied inoculant to seed, or used crop rotation to control weeds produced significantly higher yields than those that did not.

Producers who planted resistant varieties to control disease or cyst nematodes produced significantly lower yields.

Soybean producers who planted certified or registered seed, applied molybdenum to seed, used crop rotation to control cyst nematodes, or checked harvesting loss did not produce significantly higher or lower yields than those that did not.

CHAPTER IV

FINDINGS REGARDING RELATIONSHIPS BETWEEN TENNESSEE SOYBEAN PRODUCERS USE OF RECOMMENDED PRODUCTION PRACTICES AND THEIR FARMING STATUS, AGE, MAJOR SOURCE OF FARM INCOME, SIZE OF OPERATION, AND CONTACTS WITH EXTENSION AGENTS

One purpose of this chapter was to present findings regarding relationships between the use of production practices by Tennessee soybean producers and their farming status, their age, their major source of farm income, their size of operation, and the total number of contacts they had with Extension agents. Another purpose was to determine relationships between soybean producers personal and farm characteristics, the number of Extension contacts, and the number of production practices used. Findings are summarized in six tables and discussed under six sections.

Section I presents findings regarding relationships between farming status of soybean producers and their use of soybean production practices.

Section II presents findings regarding relationships between age of soybean producers and their use of soybean production practices.

Section III presents findings regarding relationships between major source of farm income and soybean producers use of production practices.

Section IV presents findings regarding relationships between soybean producers size of operation and their use of soybean production practices.

Section V presents findings regarding relationships between soybean producers total number of Extension contacts and their use of production practices.

Section VI presents findings regarding the relationships between soybean producers personal and farm characteristics and the number of Extension contacts and the number of soybean production practices used.

I. RELATIONSHIPS BETWEEN FARMING STATUS OF SOYBEAN PRODUCERS AND THEIR USE OF PRODUCTION PRACTICES

Section I presents findings regarding relationships between farming status of soybean producers and their use of 12 production practices. The 12 production practices were used as the dependent variables while farming status was used as the independent variable. Farming status was categorized as: (1) full-time, or (2) part-time. The chi square test was used to determine the strength of relationships between the variables. The probability level .05 was used to determine the significance of the relationship. Findings regarding these relationships are summarized in Table 4.

Almost 71 percent of soybean producers who farmed full-time planted certified or registered seed compared to almost 77 percent of producers who farmed part-time. These differences were not significant as tested

Table 4. Relationships Between Farming Status of Soybean Producers and Their Use of Production Practices

Production Practices	Farming Status: Full-Time Number of Producers	Full-Time Percent of Producers	Part-Time Number of Producers	Part-Time Percent of Producers
Planted Certified or Registered Seed				
No	174	29.1	43	23.1
Yes	424	70.9	143	76.9
Total Responding	598	100.0	186	100.0
Statistical test $x^2 = 2.244$; $p = .1342$				
Inoculant Applied to Seed				
No	276	46.2	95	51.1
Yes	322	53.8	91	48.9
Total Responding	598	100.0	186	100.0
Statistical test $x^2 = 1.188$; $p = .2757$				
Molybdenum Applied to Seed				
No	210	35.1	62	33.3
Yes	388	64.9	124	66.7
Total Responding	598	100.0	186	100.0
Statistical test $x^2 = .128$; $p = .7202$				
Land Fertilized by Soil Test				
No	255	42.6	94	50.5
Yes	343	57.4	92	49.5
Total Responding	598	100.0	186	100.0
Statistical test $x^2 = 3.268$; $p = .0706$				
Land Limed by Soil Test				
No	290	48.5	108	58.1
Yes	308	51.5	78	41.9
Total Responding	598	100.0	186	100.0
Statistical test $x^2 = 4.822$; $p = .0281$				
Fungicide Applied to Seed				
No	282	47.2	101	54.3
Yes	316	52.8	85	45.7
Total Responding	598	100.0	186	100.0
Statistical test $x^2 = 2.617$; $p = .1056$				
Used Crop Rotation to Control Disease				
No	130	21.7	52	28.0
Yes	468	78.3	134	72.0
Total Responding	598	100.0	186	100.0
Statistical test $x^2 = 2.738$; $p = .0980$				
Planted Disease Resistant Varieties				
No	256	42.8	80	43.0
Yes	342	57.2	106	57.0
Total Responding	598	100.0	186	100.0
Statistical test $x^2 = 0.000$; $p = 1.0000$				
Used Crop Rotation to Control Cyst Nematode				
No	172	28.8	60	32.3
Yes	426	71.2	126	67.7
Total Responding	598	100.0	186	100.0
Statistical test $x^2 = 0.673$; $p = .4121$				
Planted Resistant Varieties to Control Cyst Nematode				
No	231	38.6	72	38.7
Yes	367	61.4	114	61.3
Total Responding	598	100.0	186	100.0
Statistical test $x^2 = 0.000$; $p = 1.0000$				
Used Crop Rotation to Control Weeds				
No	143	23.9	61	32.8
Yes	455	76.1	125	67.2
Total Responding	598	100.0	186	100.0
Statistical test $x^2 = 5.363$; $p = .0206$				
Checked Harvesting Loss				
No	378	63.2	110	59.1
Yes	220	36.8	76	40.9
Total Responding	598	100.0	186	100.0
Statistical test $x^2 = 0.835$; $p = .3609$				

by the chi square test. Full-time farmers were no more likely than part-time farmers to plant certified or registered seed.

Two variables, (1) inoculant applied to seed, and (2) molybdenum applied to seed, were used to determine the relationship between seed treatment and farming status. Almost 54 percent of producers who farmed full-time applied inoculant to seed compared to almost 49 percent of producers who farmed part-time. These differences were not significant when tested by the chi square test. Full-time farmers were no more likely than part-time farmers to apply inoculant to seed. Also, nearly 65 percent of producers who farmed full-time applied molybdenum to seed compared to almost 67 percent of producers who farmed part-time. These differences were not significant. Full-time farmers were no more likely than part-time farmers to apply molybdenum to seed.

Two variables, (1) land fertilized by soil test, and (2) land limed by soil test, were used to determine the relationship between soil fertility and farming status. Over 57 percent of producers who farmed full-time fertilized land by soil test compared to almost 50 percent of producers who farmed part-time. These differences were not significant as tested by the chi square test. Full-time farmers were no more likely than part-time farmers to fertilize land by soil test; whereas, almost 52 percent of producers who farmed full-time limed land by soil test compared to almost 42 percent of producers who farmed part-time. The chi square test indicated a significant relationship between farming status and land limed by soil test. Full-time farmers were more likely than part-time farmers to lime land by soil test.

Three variables, (1) fungicide applied to seed, (2) used crop rotation to control disease, and (3) planted disease resistant varieties, were used to determine the relationship between disease control and farming status. Almost 53 percent of producers who farmed full-time applied fungicide to seed compared to almost 46 percent of producers who farmed part-time. These differences were not significant as tested by the chi square test. Full-time farmers were no more likely than part-time farmers to apply fungicide to seed. Also, over 78 percent of producers who farmed full-time used crop rotation to control disease compared to 72 percent of producers who farmed part-time. These differences were not significant. Full-time farmers were no more likely than part-time farmers to use crop rotation to control disease; whereas, over 57 percent of producers who farmed full-time planted disease resistant varieties compared to 57 percent of producers who farmed part-time. These differences were not significant when tested by the chi square test. Full-time farmers were no more likely than part-time farmers to plant disease resistant varieties.

Two variables, (1) used crop rotation to control cyst nematode, and (2) planted resistant varieties to control cyst nematode, were used to determine the relationship between cyst nematode control and farming status. Over 71 percent of producers who farmed full-time used crop rotation to control cyst nematode compared to almost 68 percent of producers who farmed part-time. These differences were not significant as tested by the chi square test. Full-time farmers were no more likely than part-time farmers to use crop rotation to control cyst

nematode. Over 61 percent of producers who farmed full-time planted resistant varieties to control cyst nematode compared to over 61 percent of producers who farmed part-time. These differences were not significant. Full-time farmers were no more likely than part-time farmers to plant resistant varieties to control cyst nematode.

Over 76 percent of producers who farmed full-time used crop rotation to control weeds compared to over 67 percent of producers who farmed part-time. The chi square test indicated a significant relationship between farming status and the use of crop rotation to control weeds. Full-time farmers were more likely than part-time farmers to use crop rotation to control weeds.

Almost 37 percent of producers who farmed full-time checked harvesting loss compared to almost 41 percent of producers who farmed part-time. These differences were not significant when tested by the chi square test. Full-time farmers were no more likely than part-time farmers to check harvesting loss.

Table Summary

Only 2 of the 12 production practices studied were significantly related to farming status. Full-time farmers were more likely than part-time farmers to lime land by soil test and use crop rotation to control weeds.

Full-time farmers were no more likely than part-time farmers to apply inoculant to seed, apply molybdenum to seed, fertilize land by soil test, apply fungicide to seed, use crop rotation to control disease,

plant disease resistant varieties, use crop rotation to control cyst nematode, plant resistant varieties to control cyst nematode, check harvesting loss, and plant certified or registered seed.

II. RELATIONSHIPS BETWEEN THE AGE OF SOYBEAN PRODUCERS AND THEIR USE OF PRODUCTION PRACTICES

Section II presents findings regarding relationships between the age of soybean producers and their use of production practices. The 12 production practices were used as the dependent variables while the age of producers were used as the independent variable. The age of producers were categorized as: (1) 40 years of age and under, or (2) 41 years of age and over.

The chi square test was used to determine the strength of relationships between the variables. The .05 probability level was used to determine the significance of the relationship. Findings regarding these relationships are summarized in Table 5.

Almost 73 percent of the soybean producers 40 years of age and under planted certified or registered seed compared to 72 percent of producers 41 and over. These differences were not significant as tested by the chi square test. Younger producers were no more likely than older producers to plant certified or registered seed.

Two variables, (1) inoculant applied to seed, and (2) molybdenum applied to seed, were used to determine the relationship between seed treatments and age of producer. Almost 55 percent of producers 40 years of age and under applied inoculant to seed compared to almost

Table 5. Relationships Between the Age of Soybean Producer and Their Use of Production Practices

Production Practices	Age of Soybean Producer: Under 40 Years of Age — Number of Producers	Under 40 Years of Age — Percent of Producers	41 Years of Age and Over — Number of Producers	41 Years of Age and Over — Percent of Producers
Planted Certified or Registered Seed				
No	76	27.2	141	28.0
Yes	203	72.8	363	72.0
Total Responding	279	100.0	504	100.0
Statistical test $x^2 = 0.019$; $p = .8910$				
Inoculant Applied to Seed				
No	127	45.5	244	48.4
Yes	152	54.5	260	51.6
Total Responding	279	100.0	504	100.0
Statistical test $x^2 = 0.492$; $p = 0.4829$				
Molybdenum Applied to Seed				
No	109	39.1	163	32.3
Yes	170	60.9	341	67.7
Total Responding	279	100.0	504	100.0
Statistical test $x^2 = 3.294$; $p = .0695$				
Land Fertilized by Soil Test				
No	113	40.5	236	46.8
Yes	166	59.5	268	53.2
Total Responding	279	100.0	504	100.0
Statistical test $x^2 = 2.656$; $p = .1031$				
Land Limed by Soil Test				
No	141	50.5	257	51.0
Yes	138	49.5	247	49.0
Total Responding	279	100.0	504	100.0
Statistical test $x^2 = 0.002$; $p = .9624$				
Fungicide Applied to Seed				
No	131	47.0	251	49.8
Yes	148	53.0	253	50.2
Total Responding	279	100.0	504	100.0
Statistical test $x^2 = 0.475$; $p = .4909$				
Used Crop Rotation to Control Disease				
No	57	20.4	125	24.8
Yes	222	79.6	379	75.2
Total Responding	279	100.0	504	100.0
Statistical test $x^2 = 1.686$; $p = .1941$				
Planted Disease Resistant Varieties				
No	117	41.9	219	43.5
Yes	162	58.1	285	56.5
Total Responding	279	100.0	504	100.0
Statistical test $x^2 = 0.112$; $p = .7374$				
Used Crop Rotation to Control Cyst Nematode				
No	76	27.2	156	31.0
Yes	203	72.8	348	69.0
Total Responding	279	100.0	504	100.0
Statistical test $x^2 = 1.016$; $p = .3136$				
Planted Resistant Varieties to Control Cyst Nematode				
No	117	41.9	186	36.9
Yes	162	58.1	318	63.1
Total Responding	279	100.0	504	100.0
Statistical test $x^2 = 1.710$; $p = .1910$				
Used Crop Rotation to Control Weeds				
No	73	26.2	131	26.0
Yes	206	73.8	373	74.0
Total Responding	279	100.0	504	100.0
Statistical test $x^2 = 0.000$; $p = 1.0000$				
Checked Harvesting Loss				
No	170	60.9	318	63.1
Yes	109	39.1	186	36.9
Total Responding	279	100.0	504	100.0
Statistical test $x^2 = 0.272$; $p = .6022$				

52 percent of producers 41 years of age and over. These differences were not significant as tested by the chi square test. Younger producers were no more likely than older producers to apply inoculant to seed. Also, nearly 61 percent of producers 40 years of age and under applied molybdenum to seed compared to almost 68 percent of producers 41 years of age and over. These differences were not significant. Younger producers were no more likely than older producers to apply molybdenum to seed.

Two variables, (1) land fertilized by soil test, and (2) land limed by soil test, were used to determine the relationship between soil fertility and age of producer. Almost 60 percent of producers 40 years of age and under fertilized land by soil test compared to over 53 percent of producers 41 years of age and over. These differences were not significant as tested by the chi square test. Younger producers were no more likely than older producers to fertilize land by soil test. Also, almost 50 percent of producers limed land by soil test compared to 49 percent of producers 41 years of age and over. These differences were not significant as tested by the chi square test. Younger producers were no more likely than older producers to lime land by soil test.

Three variables, (1) fungicide applied to seed, (2) used crop rotation to control disease, and (3) planted disease resistant varieties, were used to determine the relationship between disease control and age of producer. Fifty-three percent of producers 40 years of age and under applied fungicide to seed compared to over 50 percent

of producers 41 years of age and over. When tested by the chi square test, these differences were not significant. Younger producers were no more likely than older producers to apply fungicide to seed. Also, nearly 80 percent of producers 40 years of age and under used crop rotation to control disease compared to slightly over 75 percent of producers 41 years of age and over. These differences were not significant. Younger producers were no more likely than older producers to use crop rotation to control disease. Also, over 58 percent of producers 40 years of age and over planted disease resistant varieties compared to almost 57 percent of producers 41 years of age and over. These differences were not significant as tested by the chi square test. Younger producers were no more likely than older producers to plant disease resistant varieties.

Two variables, (1) used crop rotation to control cyst nematodes, and (2) planted resistant varieties to control cyst nematode, were used to determine the relationship between cyst nematode control and age of producer. Almost 73 percent of producers 40 years of age and under used crop rotation to control cyst nematode compared to 69 percent of producers 41 years of age and over. These differences were not significant as tested by the chi square test. Younger producers were no more likely than older producers to use crop rotation to control cyst nematodes. Also, over 58 percent of producers 40 years of age and under planted resistant varieties to control cyst nematode compared to over 63 percent of producers 41 years of age and over. These differences were not significant. Younger producers were no

more likely than older producers to plant resistant varieties to control cyst nematode.

Almost 74 percent of soybean producers 40 years of age and under used crop rotation to control weeds compared to 74 percent of producers 41 years of age and over. These differences were not significant as tested by the chi square test. Younger producers were no more likely than older producers to use crop rotation to control weeds.

Over 39 percent of producers 40 years of age and under checked harvesting loss compared to almost 37 percent of producers 41 years of age and over. These differences were not significant as tested by the chi square test. Younger producers were no more likely than older producers to check harvesting loss.

Table Summary

None of the 12 production practices were significantly related to age of producer. Therefore younger producers were no more likely than older producers to use the 12 production practices. These practices include: (1) planting certified or registered seed, (2) inoculant applied to seed, (3) molybdenum applied to seed, (4) land fertilized by soil test, (5) land limed by soil test, (6) fungicide applied to seed, (7) used crop rotation to control disease, (8) planted disease resistant varieties, (9) used crop rotation to control cyst nematode, (10) planted resistant varieties to control cyst nematode, (11) used crop rotation to control weeds, and (12) checked harvesting loss.

III. RELATIONSHIPS BETWEEN THE MAJOR SOURCE OF FARM INCOME AND THE SOYBEAN PRODUCERS USE OF PRODUCTION PRACTICES

Section III presents findings regarding relationships between soybean producers major source of farm income and their use of 12 production practices. The 12 production practices were used as the dependent variable while producers major source of farm income were used as independent variables. Producers major source of farm income were categorized as: (1) row crop, and (2) other.

The chi square test was used to determine the strength of relationships between the variables. The .05 probability level was used to determine the significance of the relationship. Findings regarding these relationships are summarized in Table 6.

About 73 percent of soybean producers who reported major source of farm income as row crop planted certified or registered seed compared to almost 71 percent of producers who reported other as their major sosurce of farm income. These differences were not significant as tested by the chi square test. Row crop farmers were no more likely than other farmers to plant certified or registered seed.

Two variables, (1) inoculant applied to seed, and (2) molybdenum applied to seed, were used to determine the relationship between seed treatment and major source of farm income. Over 54 percent of producers who reported row crop as their major source of farm income applied inoculant to seed compared to slightly over 49 percent of producers who reported other as major source of farm income. These differences

Table 6. Relationships Between the Major Source of Farm Income and the Soybean Producers Use of Production Practices

Production Practices	Major Source of Farm Income: Row Crop — Number of Producers	Row Crop — Percent of Producers	Other — Number of Producers	Other — Percent of Producers
Planted Certified or Registered Seed				
No	140	26.9	77	29.2
Yes	380	73.1	187	70.8
Total Responding	520	100.0	264	100.0
Statistical test $x^2 = 0.335$; $p = .5625$				
Inoculant Applied to Seed				
No	237	45.6	134	50.8
Yes	283	54.4	130	49.2
Total Responding	520	100.0	264	100.0
Statistical test $x^2 = 1.683$; $p = .1945$				
Molybdenum Applied to Seed				
No	165	31.7	107	40.5
Yes	355	68.3	157	59.5
Total Responding	520	100.0	264	100.0
Statistical test $x^2 = 5.602$; $p = .0179$				
Land Fertilized by Soil Test				
No	229	44.0	120	45.5
Yes	291	56.0	144	54.5
Total Responding	520	100.0	264	100.0
Statistical test $x^2 = 0.091$; $p = .7634$				
Land Limed by Soil Test				
No	261	50.2	137	51.9
Yes	259	49.8	127	48.1
Total Responding	520	100.0	264	100.0
Statistical test $x^2 = 0.140$; $p = .7078$				
Fungicide Applied to Seed				
No	239	46.0	144	54.5
Yes	281	54.0	120	45.4
Total Responding	520	100.0	264	100.0
Statistical test $x^2 = 4.826$; $p = .0280$				
Used Crop Rotation to Control Disease				
No	125	24.0	57	21.6
Yes	395	76.0	207	78.4
Total Responding	520	100.0	264	100.0
Statistical test $x^2 = 0.459$; $p = .4980$				
Planted Disease Resistant Varieties				
No	190	36.5	146	55.3
Yes	330	63.5	118	44.7
Total Responding	520	100.0	264	100.0
Statistical test $x^2 = 24.415$; $p = .0001$				
Used Crop Rotation to Control Cyst Nematode				
No	156	30.0	76	28.8
Yes	364	70.0	188	71.2
Total Responding	520	100.0	264	100.0
Statistical test $x^2 = 0.072$; $p = .7882$				
Planted Resistant Varieties to Control Cyst Nematode				
No	.170	32.7	133	50.4
Yes	350	67.3	131	49.6
Total Responding	520	100.0	264	100.0
Statistical test $x^2 = 22.360$; $p = .0001$				
Used Crop Rotation to Control Weeds				
No	134	25.8	70	26.5
Yes	386	74.2	194	73.5
Total Responding	520	100.0	264	100.0
Statistical test $x^2 = 0.019$; $p = .8896$				
Checked Harvesting Loss				
No	305	58.7	183	69.3
Yes	215	41.3	81	30.7
Total Responding	520	100.0	264	100.0
Statistical test $x^2 = 8.026$; $p = .0046$				

were not significant at the .05 level of probability. Row crop farmers were no more likely than other farmers to apply inoculant to seed; whereas, over 68 percent of producers who reported row crop as their major source of farm income applied molybdenum to seed compared to almost 60 percent of producers who reported other as their major source of farm income. The chi square test indicated a significant relationship between major source of farm income and applying molybdenum to seed. Row crop farmers were more likely than other farmers to apply molybdenum to seed.

Two variables, (1) land fertilized by soil test, and (2) land limed by soil test, were used to determine the relationship between soil fertility and major source of farm income. Fifty-six percent of producers who reported row crop as their major source of farm income fertilized land by soil test compared to almost 55 percent of producers who reported other as their major sources of farm income. These differences were not significant as tested by the chi square test. Row crop farmers were no more likely than other producers to fertilize land by soil test. Also, almost 50 percent of producers who reported row crop as their major source of farm income limed land by soil test compared to just over 48 percent of producers who reported other as major source of farm income. These differences were not significant at the .05 level of probability. Row crop farmers were no more likely than other farmers to lime land by soil test.

Three variables, (1) fungicide applied to seed, (2) used crop rotation to control disease, and (3) planted disease resistant varieties,

were used to determine the relationship between disease control and major source of farm income. Fifty-four percent of producers who reported row crop as their major source of farm income applied fungicide to seed compared to over 45 percent of producers who reported other as major source of farm income. The chi square test indicated a significant relationship between major source of farm income and fungicide applied to seed. Row crop farmers were more likely than other farmers to apply fungicide to seed; whereas, 76 percent of producers who reported row crop as their major source of farm income used crop rotation to control disease compared to over 78 percent of producers who reported other as major source of farm income. These differences were not significant when tested by the chi square test. Row crop farmers were no more likely than other farmers to use crop rotation to control disease.

Almost 64 percent of soybean producers who reported row crop as their major source of farm income planted disease resistant varieties compared to almost 45 percent of producers who reported other as major source of farm income. The chi square test indicated a significant relationship between major source of farm income and planting disease resistant varieties. Row crop farmers were more likely than other farmers to plant disease resistant varieties.

Two variables, (1) used crop rotation to control cyst nematode, and (2) planted resistant varieties to control cyst nematode, were used to determine the relationship between cyst nematode control and major source of farm income. Seventy percent of producers who reported

row crop as their major source of farm income and used crop rotation to control cyst nematode compared to over 71 percent of producers who reported other as major source of farm income. These differences were not significant at the .05 level of probability. Row crop producers were no more likely than other farmers to use crop rotation to control cyst nematode; whereas, over 67 percent of the producers who reported row crop as their major source of farm income planted resistant varieties to control cyst nematode compared to almost 50 percent of producers who reported other as major source of farm income. The chi square test indicated a significant relationship between major source of farm income and planting resistant varieties to control cyst nematode. Row crop farmers were more likely than other farmers to plant resistant varieties to control cyst nematode.

Over 74 percent of producers who reported row crop as major source of farm income used crop rotation to control weeds compared to almost 74 percent of producers who reported other as major source of farm income. These differences were not significant as tested by the chi square test. Row crop farmers were no more likely than other farmers to use crop rotation to control weeds.

Over 41 percent of producers who reported row crop as their major source of farm income checked harvesting loss compared to almost 31 percent of producers who reported other as major source of farm income. The chi square test indicated a significant relationship between major source of farm income and checking harvesting loss. Row crop farmers were more likely than other farmers to check harvesting loss.

Table Summary

Five of the 12 production practices were significantly related to major source of farm income. Row crop farmers were more likely than other farmers to apply molybdenum to seed, apply fungicide to seed, and plant disease resistant varieties. Row crop farmers were more likely than other farmers to plant resistant varieties to control cyst nematode and to check harvesting loss.

Row crop farmers were no more likely than other farmers to plant certified or registered seed or apply inoculant to seed. Row crop farmers were no more likely to fertilize or lime land by soil test than other farmers. Row crop farmers were no more likely than other farmers to use crop rotation to control disease, cyst nematode, or weeds.

IV. RELATIONSHIPS BETWEEN SOYBEAN PRODUCERS SIZE OF OPERATION AND THEIR USE OF PRODUCTION PRACTICES

Section IV presents findings regarding relationships between soybean producers size of operation and their use of 12 production practices. The 12 production practices were used as dependent variables while size of operation were used as the independent variable. The size of operation were categorized as: (1) under 200 acres, or (2) 200 acres and over. These categories were chosen based upon the computed median size of operation.

The chi square test was used to determine the strength of relationships between the variables. The .05 probability level was used to

determine the significance of the relationship. Findings regarding these relationships are summarized in Table 7.

Nearly 73 percent of the producers whose size of operation was under 200 acres planted certified or registered seed; whereas, over 72 percent of the producers whose size of operation was 200 acres and over planted certified or registered seed. These differences, however, were not significant as tested by the chi square test. Larger producers were no more likely than smaller producers to plant certified or registered seed.

Two variables, (1) inoculant applied to seed, and (2) molybdenum applied to seed, were used to determine the relationship between seed treatments and size of operation. Forty-seven percent of the producers whose size of operation was under 200 acres applied inoculant to seed as compared to over 58 percent of those whose size of operation was 200 acres and over. There was a significant relationship between size of operation and inoculant applied to seed. Larger producers were more likely than smaller producers to apply inoculant to seed. Also, almost 59 percent of producers whose size of operation was under 200 acres applied molybdenum to seed as compared to nearly 72 percent whose size of operation was 200 acres and over. The chi square test indicated a significant relationship between size of operation and applying molybdenum to seed. Larger producers were more likely than smaller producers to apply molybdenum to seed.

Two variables, (1) land fertilized by soil test, and (2) land limed by soil test, were used to determine the relationships between

Table 7. Relationships Between the Soybean Producers Size of Operation and Their Use of Production Practices

Production Practices	Size of Operation: Under 200 Acres — Number of Producers	Under 200 Acres — Percent of Producers	200 Acres and Over — Number of Producers	200 Acres and Over — Percent of Producers
Planted Certified or Registered Seed				
No	108	27.3	109	27.9
Yes	288	72.7	282	72.1
Total Responding	396	100.0	391	100.0
Statistical test $x^2 = 0.012$; $p = .9124$				
Inoculant Applied to Seed				
No	210	53.0	163	41.7
Yes	186	47.0	228	58.3
Total Responding	396	100.0	391	100.0
Statistical test $x^2 = 9.702$; $p = .0018$				
Molybdenum Applied to Seed				
No	163	41.2	111	28.4
Yes	233	58.8	280	71.6
Total Responding	396	100.0	391	100.0
Statistical test $x^2 = 13.586$; $p = .0002$				
Land Fertilized by Soil Test				
No	202	51.0	147	37.6
Yes	194	49.0	244	62.4
Total Responding	396	100.0	391	100.0
Statistical test $x^2 = 13.806$; $p = .0002$				
Land Limed by Soil Test				
No	223	56.3	176	45.0
Yes	173	43.7	215	55.0
Total Responding	396	100.0	391	100.0
Statistical test $x^2 = 9.604$; $p = .0019$				
Fungicide Applied to Seed				
No	239	60.4	146	37.3
Yes	157	39.6	245	62.7
Total Responding	396	100.0	391	100.0
Statistical test $x^2 = 40.783$; $p = .0001$				
Used Crop Rotation to Control Disease				
No	91	23.0	92	23.5
Yes	305	77.0	299	76.5
Total Responding	396	100.0	391	100.0
Statistical test $x^2 = .010$; $p = .9218$				
Planted Disease Free Varieties				
No	194	49.0	143	36.6
Yes	202	51.0	248	63.4
Total Responding	396	100.0	391	100.0
Statistical test $x^2 = 11.887$; $p = .0006$				
Used Crop Rotation to Control Cyst Nematode				
No	127	32.1	106	27.1
Yes	269	67.9	285	72.9
Total Responding	396	100.0	391	100.0
Statistical test $x^2 = 2.091$; $p = .1481$				
Planted Resistant Varieties to Control Cyst Nematode				
No	194	49.0	110	28.1
Yes	202	51.0	281	71.9
Total Responding	396	100.0	391	100.0
Statistical test $x^2 = 35.227$; $p = .0001$				
Used Crop Rotation to Control Weeds				
No	110	27.8	94	24.0
Yes	286	72.2	297	76.0
Total Responding	396	100.0	391	100.0
Statistical test $x^2 = 1.243$; $p = .2649$				
Checked Harvesting Loss				
No	266	67.2	225	57.5
Yes	130	32.8	166	42.5
Total Responding	396	100.0	391	100.0
Statistical test $x^2 = 7.366$; $p = .0066$				

soil fertility and size of operation. Forty-nine percent of producers whose size of operation was under 200 acres fertilized land by soil test as compared to over 62 percent whose size of operation was 200 acres and over. The chi square test indicated a significant relationship between size of operation and land fertilized by soil test. Larger producers were more likely than smaller producers to fertilize land by soil test. Also, almost 44 percent of producers whose size of operation was under 200 acres limed land by soil test as compared to 55 percent whose size of operation was 200 acres and over. The chi square test indicated a significant relationship between size of operation and land limed by soil test. Larger producers were more likely than smaller producers to lime land by soil test.

Three variables, (1) fungicide applied to seed, (2) used crop rotation to control disease, and (3) planted disease resistant varieties, were used to determine the relationships between disease control and size of operation. Almost 40 percent of producers whose size of operation was under 200 acres applied fungicide to seed as compared to almost 63 percent whose size of operation was 200 acres and over. There was a significant relationship between the size of operation and fungicide applied to seed as indicated by the chi square test. Larger producers were more likely than small producers to apply fungicide to seed; whereas, 77 percent of producers whose size of operation was under 200 acres used crop rotation to control disease compared to almost 77 percent whose size of operation was 200 acres and over. These differences were not significant as tested by the

chi square test. Larger producers were no more likely than smaller producers to use crop rotation to control disease. Also, 51 percent of soybean producers planted disease resistant varieties compared to over 63 percent whose size of operation was 200 acres and over. The chi square test indicated a significant relationship between size of operation and planting disease resistant varieties. Larger producers were more likely than smaller producers to plant disease resistant varieties.

Two variables were used to determine the relationship between cyst nematode control and size of operation: (1) used crop rotation to control cyst nematode, and (2) planted resistant varieties to control cyst nematode. Almost 68 percent of producers whose size of operation was under 200 acres used crop rotation to control cyst nematode compared to over 79 percent whose size of operation was 200 acres and over. These differences were not significant when tested by the chi square test. Larger producers were no more likely than smaller producers to use crop rotation to control cyst nematode. Fifty-one percent of producers whose size of operation was under 200 acres planted resistant varieties to control cyst nematode compared to almost 72 percent whose size of operation was 200 acres and over. The chi square test indicated a significant relationship between size of operation and planting resistant varieties to control cyst nematode. Larger producers were more likely than smaller producers to plant resistant varieties to control cyst nematode.

Over 72 percent of producers whose size of operation was under 200 acres used crop rotation to control weeds compared to 76 percent

whose size of operation was 200 acres and over. These differences were not significant when tested by the chi square test. Larger producers were no more likely than smaller producers to use crop rotation to control weeds.

Almost 33 percent of producers whose size of operation was under 200 acres checked harvesting loss as compared to almost 43 percent whose size of operation was 200 acres and over. The chi square test indicated a significant relationship between size of operation and checking harvesting loss. Larger producers were more likely than smaller producers to check harvesting loss.

Table Summary

Eight of the 12 production practices studied were significantly related to size of operation. Larger Producers were more likely than smaller producers to apply inoculant or molybdenum to seed. Larger producers were more likely than smaller producers to fertilize or lime land by soil test. Larger producers were more likely than smaller producers to apply fungicide to seed or plant disease resistant varieties. Larger producers were more likely than smaller producers to plant resistant varieties to control cyst nematode. Larger producers were more likely than smaller producers to check harvesting loss.

Larger producers were no more likely than smaller producers to plant certified or registered seed. Larger producers were no more likely than smaller producers to use crop rotation to control disease, cyst nematode, or weeds.

V. RELATIONSHIPS BETWEEN SOYBEAN PRODUCERS TOTAL NUMBER OF EXTENSION CONTACTS AND THEIR USE OF PRODUCTION PRACTICES

Section V presents findings regarding relationships between the total number of contacts soybean producers had with Extension agents over a 12 month period and producers use of 12 production practices. The 12 production practices were used as the dependent variables while the total number of Extension contacts were used as the independent variable. The total number of Extension contacts were computed by summing the number of Extension meetings attended, number of Extension office visits made, number of Extension telephone calls made, and number of Extension farm visits received over the past 12 months.

The chi square test was used to determine the strength of relationship between variables. The .05 probability level was used to determine the significance of the relationship. Findings regarding these relationships are summarized in Table 8.

Just over 71 percent of the producers with over seven Extension contacts planted certified or registered seed compared to almost 74 percent of the producers who had seven and under. These differences were not significant as tested by the chi square test. Producers with a higher number of Extension contacts were no more likely than those with a lower number of contacts to plant certified or registered seed.

Two variables, (1) inoculant applied to seed, and (2) molybdenum applied to seed, were used to determine the relationship between seed

Table 8. Relationships Between Soybean Producers Total Number of Extension Contacts and Their Use of Production Practices

Production Practices	Total Number of Extension Contacts: 7 and Under — Number of Producers	7 and Under — Percent of Producers	Over 7 — Number of Producers	Over 7 — Percent of Producers
Planted Certified or Registered Seed				
No	102	26.4	115	28.7
Yes	284	73.6	286	71.3
Total Responding	386	100.0	401	100.0
Statistical test $x^2 = 0.394$; $p = .5304$				
Inoculant Applied to Seed				
No	198	51.3	175	43.6
Yes	188	48.7	226	56.4
Total Responding	386	100.0	401	100.0
Statistical test $x^2 = 4.320$; $p = .0377$				
Molybdenum Applied to Seed				
No	156	40.4	118	29.4
Yes	230	59.6	283	70.6
Total Responding	386	100.0	401	100.0
Statistical test $x^2 = 9.985$; $p = .0016$				
Land Fertilized by Soil Test				
No	207	53.6	142	35.4
Yes	179	46.4	259	64.6
Total Responding	386	100.0	401	100.0
Statistical test $x^2 = 25.709$; $p = .0001$				
Land Limed by Soil Test				
No	224	58.0	175	43.6
Yes	162	42.0	226	56.4
Total Responding	386	100.0	401	100.0
Statistical test $x^2 = 15.724$; $p = .0001$				
Fungicide Applied to Seed				
No	228	59.1	157	39.2
Yes	158	40.9	244	60.8
Total Responding	386	100.0	401	100.0
Statistical test $x^2 = 30.425$; $p = .0001$				
Used Crop Rotation to Control Disease				
No	107	27.7	76	19.0
Yes	279	72.3	325	81.0
Total Responding	386	100.0	401	100.0
Statistical test $x^2 = 7.988$; $p = .0047$				
Planted Disease Resistant Varieties				
No	193	50.0	144	35.9
Yes	193	50.0	257	64.1
Total Responding	386	100.0	401	100.0
Statistical test $x^2 = 15.376$; $p = .0001$				
Used Crop Rotation to Control Cyst Nematode				
No	131	33.9	102	25.4
Yes	255	66.1	299	74.6
Total Responding	386	100.0	401	100.0
Statistical test $x^2 = 6.419$; $p = .0113$				
Planted Resistant Varieties to Control Cyst Nematode				
No	173	44.8	131	32.7
Yes	213	55.2	270	67.3
Total Responding	386	100.0	401	100.0
Statistical test $x^2 = 11.741$; $p = .0006$				
Used Crop Rotation to Control Weeds				
No	114	29.5	90	22.4
Yes	272	70.5	311	77.6
Total Responding	386	100.0	401	100.0
Statistical test $x^2 = 4.786$; $p = .0287$				
Checked Harvesting Loss				
No	248	64.2	243	60.6
Yes	138	35.8	158	39.4
Total Responding	386	100.0	401	100.0
Statistical test $x^2 = 0.967$; $p = .3255$				

treatment and number of Extension contacts. Over 56 percent of the producers with over seven Extension contacts over the past 12 months applied inoculant to seed compared to almost 49 percent of the producers who had seven and under. The chi square test indicated a significant relationship between number of Extension contacts and applying inoculant to seed. Producers with a higher number of contacts were more likely than those with a lower number of contacts to apply inoculant to seed. Almost 71 percent of the producers with over seven Extension contacts applied molybdenum to seed as compared to almost 60 percent of those who had seven and under. The chi square test indicated a significant relationship between the number of Extension contacts and applying molybdenum to seed. Soybean producers with a higher number of Extension contacts were more likely to apply molybdenum to seed than those with a lower number of Extension contacts.

Two variables, (1) land fertilized by soil test, and (2) land limed by soil test, were used to determine the relationship between soil fertility and number of Extension contacts. Almost 65 percent of producers with over seven contacts with Extension agents over the past 12 months fertilized land by soil test compared to over 46 percent of the producers who had seven and under. The chi square test indicated a significant relationship between the number of Extension contacts and land fertilized by soil test. Producers with a higher number of Extension contacts were more likely than the producers with a lower number of Extension contacts to fertilize land by soil test. Also, over 56 percent of producers with over seven Extension contacts limed

land by soil test compared to 42 percent of producers who had seven and under. The chi square test indicated a significant relationship between the number of Extension contacts and land limed by soil test. Soybean producers with a higher number of Extension contacts were more likely than producers with a lower number of Extension contacts to lime land by soil test.

Three variables, (1) fungicide applied to seed, (2) used crop rotation to control disease, and (3) planted disease resistant varieties, were used to determine the relationship between disease control and number of Extension contacts. Nearly 61 percent of the producers with over seven Extension contacts applied fungicide to seed compared to almost 41 percent of the producers who had seven and under. The chi square test indicated a significant relationship between the number of Extension contacts and applying fungicide to seed. Producers with a higher number of Extension contacts were more likely than producers with a lower number of Extension contacts to apply fungicide to seed. Also, 81 percent of the producers who had over seven Extension contacts used crop rotation to control disease compared to slightly over 72 percent of the producers who had seven and under. The chi square test indicated a significant relationship between the number of Extension contacts and the use of crop rotation to control disease. Producers who had a higher number of Extension contacts were more likely than producers who had a lower number of Extension contacts to use crop rotation to control disease.

Slightly over 64 percent of the soybean producers who had over seven Extension contacts planted disease resistant varieties compared

to 50 percent of the producers who had seven and under. The chi square test indicated a significant relationship between the number of Extension contacts and planting disease resistant varieties. Producers who had a higher number of Extension contacts were more likely than producers with a lower number of Extension contacts to plant disease resistant varieties.

Two variables, (1) used crop rotation to control cyst nematode, and (2) planted resistant varieties to control cyst nematode, were used to determine the relationship between cyst nematode control and number of contacts producers had with Extension agents over the past 12 months. Almost 75 percent of producers with over seven Extension contacts used crop rotation to control cyst nematode compared to slightly over 66 percent of producers with seven and under. The chi square test indicated a significant relationship between the number of Extension contacts and the use of crop rotation to control cyst nematode. Producers who had a higher number of Extension contacts were more likely than producers who had a smaller number of Extension contacts to use crop rotation to control cyst nematode. Also, over 67 percent of the producers who had over seven Extension contacts planted resistant varieties to control cyst nematode compared to over 55 percent of producers who had seven and under contacts. The chi square test indicated a significant relationship between the number of Extension contacts and planting resistant varieties to control cyst nematode. Producers who had a higher number of Extension contacts were more likely than producers who had a smaller number of Extension contacts to plant resistant varieties to control cyst nematode.

Almost 78 percent of the soybean producers who had over seven contacts with Extension agents over the past 12 months used crop rotation to control weeds compared to almost 71 percent of the producers who had seven and under contacts. The chi square test indicated a significant relationship between the number of Extension contacts and the use of crop rotation to control weeds. Producers who had a higher number of Extension contacts were more likely than the producers who had a smaller number of Extension contacts to use crop rotation to control weeds.

Over 39 percent of the producers who had over seven Extension contacts checked harvesting loss compared to almost 36 percent of the producers who had seven and under. These differences were not significant as tested by the chi square test. Producers who had a higher number of Extension contacts were no more likely than producers who had a smaller number of Extension contacts to check harvesting loss.

Table Summary

Ten of the 12 production practices studied were significantly related to the number of Extension contacts. Soybean producers who had a higher number of Extension contacts were more likely than producers who had a smaller number of Extension contacts to apply inoculant to seed, apply molybdenum to seed, fertilize land by soil test, lime land by soil test, apply fungicide to seed, use crop rotation to control disease, plant disease resistant varieties, use crop rotation to control cyst nematode, plant resistant varieties to control cyst nematode, or use crop rotation to control weeds.

Soybean producers who had a higher number of Extension contacts were no more likely than producers who had a smaller number of contacts to plant certified or registered seed or check harvesting loss.

VI. RELATIONSHIPS BETWEEN SOYBEAN PRODUCERS PERSONAL AND FARM CHARACTERISTICS AND THE NUMBER OF EXTENSION CONTACTS AND THE NUMBER OF PRODUCTION PRACTICES USED

Section VI presents findings regarding the relationships between the number of production practices used by the soybean producers and the personal and farm characteristics and the number of contacts soybean producers had with Extension agents over a 12 month period. The number of production practices used by producers is the dependent variable in Table 9. The number of production practices was completed by summing the 12 production practices.

The personal and farm characteristics and the number of contacts producers had with Extension agents over the 12 month period in 1986 are used as independent variables. The analysis of variance F-test was used to determine the strength of relationship between the variables. The probability level .05 is used to determine the significance of the relationship.

Findings in Table 9 will be reported under two subsections: (1) personal and farm characteristics, and (2) Extension contacts.

Personal and Farm Characteristics

Four variables, (1) farming status, (2) age of operator, (3) major source of farm income, and (4) size of operation, were used to determine

Table 9. Relationships Between Soybean Producers Personal and Farm Characteristics and the Number of Extension Contacts and the Number of the Production Practices Used

Personal and Farm Characteristics and Number of Extension Contacts	Number of Production Practices Used			
	Number of Producers	Mean	F Value	p
PERSONAL AND FARM CHARACTERISTICS				
Farming Status				
Full-time	598	6.2		
Part-time	186	6.0	1.150	.2839
Total Responding	784			
Age of Operator				
Under 40	279	6.2		
41 and Over	504	6.2	.159	.6904
Total Responding	783			
Major Source of Farm Income				
Row Crop	520	6.4		
Other	264	5.7	18.931	.0001
Total Responding	784			
Size of Operation				
Under 200 Acres	396	5.7		
200 Acres and Over	391	6.7	43.941	.0001
Total Responding	787			
EXTENSION CONTACTS				
Number of Meetings Attended				
None	212	5.6		
1 or More	575	6.4	25.250	.0001
Total Responding	787			
Number of Office Visits Made				
None	225	5.4		
1 or More	562	6.5	48.652	.0001
Total Responding	787			
Number of Telephone Calls Made				
None	120	5.3		
1 or More	667	6.4	27.566	.0001
Total Responding	787			
Number of Farm Visits Received				
None	126	5.2		
1 or More	661	6.4	34.538	.0001
Total Responding	787			
Total Number of Contacts				
None	35	3.9		
1 or More	733	6.3	45.476	.0001
Total Responding	768			

the relationship between characteristics and number of production practices used. Full-time producers used 6.2 of the 12 production practices compared to 6.0 used by part-time farmers. When tested by the F-test, these differences were not significant at the .05 level. Full-time producers did not use a significantly higher number of the 12 production practices than part-time farmers. Also, soybean producers 40 years of age and under used 6.2 of the 12 production practices compared to 6.2 used by producers 41 and over. These differences were not significant as tested by the F-test. Younger producers did not use a significantly higher number of the 12 production practices than older producers.

Producers who reported major source of farm income as row crop used 6.4 of the 12 production practices compared to 5.7 used by producers who reported major source of farm income as other. The F-test indicated a significant relationship between major source of farm income and number of production practices used. Row crop farmers used a significantly higher number of the 12 production practices than other farmers. Also, soybean producers who reported size of operation 200 acres and over used 6.7 of the 12 production practices compared to 5.7 used by producers who reported size of operation under 200 acres. The F-test indicated a significant relationship between size of operation and number of the 12 production practices used. Larger producers used a significantly higher number of the 12 production practices than smaller producers.

Extension Contacts

Five variables, (1) number of meetings attended, (2) number of office visits made, (3) number of telephone calls made, (4) number of farm visits received, and (5) total number of contacts, were used to determine the relationship between Extension contacts and the number of production practices used. Producers who reported attending one or more meetings used 6.4 of the 12 production practices compared to 5.6 used by producers who did not attend a meeting. The F-test indicated a significant relationship between meetings attended and number of production practices used. Producers who attended Extension meetings used a significantly higher number of the 12 production practices than those who did not attend an Extension meeting. Also, soybean producers who reported making one or more office visits used 6.5 of the 12 production practices compared to 5.4 by producers who did not make an office visit. The F-test indicated a significant relationship between office visits made and number of production practices used. Producers who made office visits used a significantly higher number of the 12 production practices than producers who did not make office visits.

Producers who made one or more telephone calls to the Extension agent used 6.4 of the 12 production practices compared to 5.3 production practices used by producers who did not telephone the Extension agent. The F-test indicated a significant relationship between telephone calls made to Extension agents and the number of the 12 production practices used. Producers who telephoned their Extension agent used a

significantly higher number of the 12 production practices than producers who did not telephone the Extension agent. Also, soybean producers who reported receiving one or more farm visits from Extension agents over the past 12 months used 6.4 of the 12 production practices compared to 5.2 of the production practices used by producers who did not receive a farm visit. The F-test indicated a significant relationship between farm visits received and the number of the 12 production practices used. Soybean producers who received farm visits used a significantly higher number of the 12 production practices than producers who did not receive a farm visit.

Producers who reported one or more Extension contacts over the past 12 months used 6.3 of the 12 production practices compared to 3.9 production practices used by producers who did not have an Extension contact. The F-test indicated a significant relationship between total Extension contacts and number of the 12 production practices used. Soybean producers who had contact with Extension agents used a significantly higher number of the 12 production practices than producers who did not have contact with Extension agents.

Table Summary

Two of the four personal and farm characteristics studied were significantly related to the number of the 12 production practices used. Row crop farmers and larger producers used a significantly higher number of the 12 production practices than other farmers and smaller producers.

Full-time producers and younger farmers did not use a significantly higher number of the 12 production practices.

All five of the Extension contacts studied were significantly related to the number of the 12 production practices used. Soybean producers who attended meetings, made office visits, made telephone calls, received farm visits, or contacted Extension agents used a significantly higher number of the 12 production practices.

CHAPTER V

SUMMARY OF MAJOR FINDINGS

This study was directed toward providing information useful to Tennessee County Extension Agents and state Extension specialists in the identification of priority audiences of soybean producers and priority soybean production practices to emphasize future Extension programs. Also, it was believed that the study would provide some evidence of the effectiveness of the Extension soybean production program in Tennessee.

I. PURPOSE AND SPECIFIC OBJECTIVES

Purpose

The purpose of this study was to characterize Tennessee soybean producers as to their farming operation, use of recommended production practices, their contacts with Extension agents, and to determine the relationships among these variables.

Specific Objectives

1. To characterize soybean production in Tennessee.
2. To determine the relationships between soybean producers personal and farm characteristics and the number of contacts with Extension agents.
3. To determine the relationship between the use of production practices by soybean producers and yield per acre.

4. To determine the relationship between the farming status of soybean producers and their use of production practices.

5. To determine the relationship between the age of soybean producers and their use of production practices.

6. To determine the relationship between soybean producers major source of farm income and their use of production practices.

7. To determine the relationships between soybean producers size of operation and their use of production practices.

8. To determine the relationships between the number of contacts soybean producers had with Extension agents and their use of production practices.

9. To determine the relationships between soybean producers personal and farm characteristics and the number of Extension contacts and the number of production practices used.

II. METHODS OF INVESTIGATION

Population and Sample

The population of this study was soybean producers in Tennessee who grew 25 or more acres of soybeans in 1986. Data were obtained through personal interviews by Extension agents using interview schedules developed by specialists at the University of Tennessee. Each agent was instructed to use the "n^{th}" number to randomly select individual soybean producers. The number of producers interviewed per county was determined as follows:

1. Counties with under 25,000 acres interviewed 20 producers.

2. Counties with 25,000 to 75,000 acres interviewed 25 producers.

3. Counties with over 75,000 acres interviewed 30 producers.

Completed surveys were returned to the Agricultural Extension Education Office.

Survey Instrument

The 1986 Soybean Production Survey was developed by the Tennessee Agriculture Extension Specialist Staff in the Plant and Soil Sciences and Extension Education departments. Questions dealt with producers use of production and marketing practices and the number of Extension contacts the producers had with Extension agents. Data also were obtained regarding the size of their soybean operation and yields per acre of soybeans grown.

Method of Analysis

The 1986 survey data were processed for computer analysis. The University of Tennessee Computer Center facilities were used in the analysis of data.

Responses to survey questions were summarized using means and frequency counts of producers responses regarding the use of production practices and the number of acres harvested and yield per acre and the number of Extension contacts.

The chi square test and analysis of variance were used to determine the strength of the relationship between dependent and independent variables. Chi square and F-values which achieved the .05 level of probability were accepted as statistically significant.

III. MAJOR FINDINGS

Characteristics of Soybean Production in Tennessee

Over 76 percent of the soybean producers were characterized as full-time farmers in 1986, over 64 percent were 41 years of age and over, and over 66 percent reported row crop as major source of farm income. Over 50 percent of the producers reported size of operation of under 200 acres. The mean size of operation was 341 acres.

Relationships Between Soybean Producers Personal and Farm Characteristics and the Number of Contacts With Extension Agents Over the Past 12 Months

Three of the four personal and farm characteristics were significantly related to all Extension contacts. The Extension contacts included meetings attended, office visits made, telephone calls made, and farm visits received. Full-time producers had more Extension contacts than part-time producers. Younger producers had more Extension contacts than older producers. Larger producers had more Extension contacts than smaller producers. Row crop farmers received more farm visits than other farmers.

Row crop farmers were no more likely than other farmers to attend meetings, make office visits, or make telephone calls.

Relationships Between the Use of Production Practices by Soybean Producers and Yield Per Acre

Eight of the 12 production practices studied were significantly related to yields. Producers who fertilized land by soil test, limed land by soil test, applied fungicide to seed, used crop rotation to control disease, applied inoculant to seed, or used crop rotation to control weeds produced significantly higher yields than those that did not.

Producers who planted resistant varieties to control disease or cyst nematodes produced significantly lower yields.

Soybean producers who planted certified or registered seed, applied molybdenum to seed, used crop rotation to control cyst nematodes, or checked harvesting loss did not produce significantly higher or lower yields than those that did not.

Relationships Between the Farming Status of Soybean Producers and Their Use of Production Practices

Only 2 of the 12 production practices studied were significantly related to farming status. Full-time farmers were more likely than part-time farmers to lime land by soil test and use crop rotation to control weeds.

Full-time farmers were no more likely than part-time farmers to apply inoculant to seed, apply molybdenum to seed, fertilize land by soil test, apply fungicide to seed, use crop rotation to control disease, plant disease resistant varieties, use crop rotation to control cyst

nematode, plant resistant varieties to control cyst nematode, check harvesting loss, and plant certified or registered seed.

Relationships Between the Age of Soybean Producers and Their Use of Production Practices

None of the 12 production practices were significantly related to age of producers. Therefore, younger producers were no more likely than older producers to use the 12 production practices. These practices include: (1) planting certified or registered seed, (2) inoculant applied to seed, (3) molybdenum applied to seed, (4) land fertilized by soil test, (5) land limed by soil test, (6) fungicide applied to seed, (7) used crop rotation to control disease, (8) planted disease resistant varieties, (9) used crop rotation to control cyst nematode, (10) planted resistant varieties to control cyst nematode, (11) used crop rotation to control weeds, and (12) checked harvesting loss.

Relationships Between the Major Source of Farm Income and the Soybean Producers Use of Production Practices

Five of the 12 production practices were significantly related to major source of farm income. Row crop farmers were more likely than other farmers to apply molybdenum to seed, apply fungicide to seed and plant disease resistant varieties. Row crop farmers were more likely than other farmers to plant resistant varieties to control cyst nematode and to check harvesting loss. Row crop farmers were no more likely than other farmers to plant certified or registered seed, apply inoculant to seed, fertilize or lime land by soil test, or use crop rotation to control disease, cyst nematode, or weeds.

Relationships Between Soybean Producers Size of Operation and Their Use of Production Practices

Eight of the 12 production practices studied were significantly related to size of operation. Larger producers were more likely than smaller producers to apply inoculant or molybdenum to seed. Larger producers were more likely than smaller producers to fertilize or lime land by soil test. Larger producers were more likely than smaller producers to apply fungicide to seed or plant disease resistant varieties. Larger producers were more likely than smaller producers to plant resistant varieties to control cyst nematode. Larger producers were more likely than smaller producers to check harvesting loss.

Larger producers were no more likely than smaller producers to plant certified or registered seed. Larger producers were no more likely than smaller producers to use crop rotation to control disease, cyst nematode, or weeds.

Relationships Between Soybean Producers Total Number of Extension Contacts and Their Use of Production Practices

Ten of the 12 production practices studied were significantly related to the number of Extension contacts. Soybean producers who had a higher number of Extension contacts were more likely than producers who had a smaller number of Extension contacts to apply inoculant to seed, apply molybdenum to seed, fertilize land by soil test, lime land by soil test, apply fungicide to seed, use crop rotation to control

disease, plant disease resistant varieties, use crop rotation to control cyst nematode, plant resistant varieties to control cyst nematode, or use crop rotation to control weeds.

Soybean producers who had a higher number of Extension contacts were no more likely than producers who had a smaller number of contacts to plant certified or registered seed or check harvesting loss.

Relationships Between Soybean Producers Personal and Farm Characteristics and the Number of Extension Contacts and the Number of Production Practices Used

Two of the four personal and farm characteristics studied were significantly related to the number of the 12 production practices used. Row crop farmers and larger producers used a significantly higher number of the 12 production practices than other farmers and smaller producers.

Full-time producers and younger farmers did not use a significantly higher number of the 12 production practices.

All five of the Extension contacts studied were significantly related to the number of the 12 production practices used. Soybean producers who attended meetings, made office visits, made telephone calls, received farm visits, or contacted the Extension agent used a significantly higher number of the 12 production practices.

IV. IMPLICATIONS AND RECOMMENDATIONS

Based upon the findings of this study, implications and recommendations are stated below:

Almost one-half of the soybean producers did not fertilize and lime land by soil test. Producers who fertilized and limed land by soil test had significantly higher yields than those who did not. This would indicate that emphasis be placed on educating producers about the need to soil test.

Larger soybean producers were using more of the 12 production practices than smaller producers. These findings suggest that educational efforts should be directed to encourage smaller producers to adopt more production practices.

Forty-nine percent of the soybean producers had seven or less total contacts with Extension agents (e.g., meetings, office visits, telephone calls, and farm visits). Findings imply that producers with a high number of Extension contacts (seven or over) used more of the 12 production practices than those with a lower number of contacts. The positive relationship between number of production practices used and Extension contacts deems it necessary to reach producers with lower number of contacts.

V. RECOMMENDATIONS FOR FURTHER STUDY

A similar study should be conducted over a period of years to determine if Tennessee soybean producers are using practices put forth by the University of Tennessee and to assist Extension Service in adjusting its teaching methods and educational programs.

Studies should be conducted to determine why some producers do not adopt recommended practices.

Studies should be conducted to determine variations in the use of production practices across Tennessee Extension districts.

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APPENDIX

AEE INFO-24 TENNESSEE AGRICULTURAL EXTENSION SERVICE

1986 Soybean Production Survey
(See Instructions on Last Page)

Card no. 1 (1) County (2) (3) (4)

Respondent no. 0 0 (5) (6)

Note to Agents: Producers may have more than one answer to some of the questions below. For example, a producer may have planted more than one variety. If more than one answer is appropriate, use the answer which applies to the largest number of acres grown.

A. Varieties Planted:

(7) ___ 1. Early? (1 = none; 2 = Mitchell; 3 = other).

(8-9) ___ ___ 2. Medium? (1 = none; 2 = ASGROW A5474; 3 = BAY: 4 = BEDFORD; 5 = DELTAPINE 105; 6 = ESSEX; 7 = FORREST: 8 = FFR561; 9 = HARTZ 5171; 10 = HARTZ 5252; 11 = PIONEER 5482; 12 = PIONEER 9561; 13 = RA 502; 14 = TN-5-85; 15 = YORK; 16 = other).

(10) ___ 3. Late? (1 = none; 2 = A6520; 3 = CENTENNIAL; 4 = COKER 156; 5 = HARTZ 6383R; 6 = JEFF; 7 = N.K. S69-96; 8 = RA604 9 = other).

(11) ___ 4. Very late? (1 = none; 2 = HARTZ 7126; 3 = N.K. S72-60; 4 = other).

(12) ___ 5. Were seeds registered, certified or bin run? (1 = registered; 2 = certified; 3 = bin run).

B. Seedbed Preparation:

(13) ___ Major equipment used? (1 = plow; 2 = disk; 3 = chisel plow; 4 = none used; 5 = other).

C. Seed Treatment Used:

(14) ___ 1. Inoculation? (1 = none; 2 = part; 3 = all).

(15) ___ 2. Fungicide? (1 = none; 2 = part; 3 = all).

(16) ___ 3. Molybdenum? (1 = none; 2 = part; 3 = all).

(17) ___ 4. Combination of above? (1 = no; 2 = yes).

D. Planting Dates:

(18) ___ 1. Single crop? (1 = before April 25; 2 = April 25 to June 15; 3 = after June 15).

(19) ___ 2. Double crop? (1 = before June 15; 2 = June 15 to July 1; 3 = after July 1).

E. Seeding Rate:

1. Conventional:

(20-21) ___ ___ a). Row width in inches?
(22-23) ___ ___ b). Seeds/ft. row:

(24-25) ___ ___ 2. Broadcast: Pounds of seed per acre?

3. No-till:

(26-27) ___ ___ a). Row width in inches?
(28-29) ___ ___ b). Seeds planted/ft. row:

Coding Instructions:
1. Fill all blanks
2. Right justify
3. Use a nine (9) in each blank when the question does not apply and when data are not available.

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F. Fertilization:

(30-32) ___ ___ ___ 1. Acres fertilized according to soil test?

(33-35) ___ ___ ___ 2. Acres limed according to soil test?

3. On land not soil tested:

(36-38) ___ ___ ___ a). Pounds N/acre?
(39-41) ___ ___ ___ b). Pounds P_2O_5/acre?
(42-44) ___ ___ ___ c). Pounds K_2O/acre?

G. Insects:

(45) ___ 1. Foliage feeders: Were foliage insects a problem? (1 = no; 2 = yes)
(46) ___ How severe? (1 = control not needed; 2 = control needed but not applied; 3 = control needed and applied; 9 = DNA).
(47) ___ 2. Pod feeders: Were pod feeder insects a problem? (1 = no; 2 = yes).
(48) ___ How severe? (1 = control not needed; 2 = control needed but not applied; 3 = control applied; 9 = DNA).

(49) ___ 3. Stem feeders: Were stem feeder insects a problem? (1 = no; 2 = yes).
(50) ___ How severe? (1 = control not needed; 2 = control needed but not applied; 3 = control applied; 9 = DNA).

H. Disease:

Methods used to control disease:
(51) ___ a). Planted disease free seed? (1 = no; 2 = yes; 9 = do not know).
(52) ___ b). Applied fungicide seed treatment? (1 = no; 2 = yes).
(53) ___ c). Crop rotation? (1 = no; 2 = yes).
(54) ___ d). Used disease resistant varieties? (1 = no; 2 = yes; 9 = do not know)
(55) ___ e). Used foliar fungicide? (1 = no. 2 = yes).

I. Soybean Cyst Nematode:

(56) ___ 1. Was either Race 3 or Race 4 or both races of Soybean Cyst Nematode a problem? (1 = no; 2 = yes; 9 = do not know).

2. Method used to control:
(57) ___ a). Crop rotation? (1 = no; 2 = yes; 9 - does not apply).
(58) ___ b). Resistant varieties? (1 = no; 2 = yes; 9 = does not apply).
(59) ___ c). Chemical control? (1 = no; 2 = yes; 9 = does not apply).

J. Weed Control:

1. Cultural methods:
(60) ___ a). Rotation with other crops? (1 = no; 2 = yes).
(61) ___ b). Rotory hoeing? (1 = no; 2 = yes).
(62) ___ c). Cultivation? (1 = no; 2 = yes).

2. Chemical methods:
(63) ___ a). Applied preplant? (1 = no; 2 = yes).
(64) ___ b). Applied preemergence? (1 = no; 2 = yes).
(65) ___ c). Applied postemergence? (1 = no; 2 = yes).

(66) ___ 3. How effective were the control methods used? (1 = not very effective; 2 = effective; 3 = very effective; 9 = had no weed problem).

Card no. 2 (1)
Respondent no. 0 0 (5) (6)
County (2) (3) (4)

K. Harvesting:

(7) ___ 1. Moisture content? (1 = don't know; 2 = above 12% on all crop; 3 = above 12% on part of crop; 4 = 12% or below on all of of crop).

2. Harvesting loss:
(8) ___ a). Was this a major problem? (1 = no; 2 = yes).
(9) ___ b). Was the amount of loss checked? (1 = no; 2 = yes)

(10) ____ L. Farm storage: (1 = none stored; 2 = part stored; 3 = all stored).

(11) ____ M. Marketing? (1 = sold before harvest; 2 = sold at harvest; 3 = stored; 4 = combination).

N. General Production Information:

(12-15) ____ ____ ____ ____ 1. Total acres harvested?

(16-17) ____ ____ 2. Yield per acre?

O. Extension contacts: (Note: Agent and/or farmer should estimate the number of contacts the producers had with Extension over the past 12-months).

(18) ____ a). Meetings attended?
(19) ____ b). Office visits made?
(20) ____ c). Farm visits received?
(21-22) ____ ____ d). Telephone calls made?

P. Farm and Personal Characteristics

(23) ____ 1. Major source of farm income? (1 = dairy; 2 = livestock; 3 = row crops; 4 = other).

(24) ____ 2. Do you farm full-time or part-time? (1 = full-time; 2 = part-time).

(25) ____ 3. Age of operator? Agent estimate. (1 = under 40; 2 = 41-60; 3 = over 60).

General Instructions for 1986 Soybean Survey

1. Date due: December , 1986.
2. Disposition: To Associate District Supervisor.
3. Counties to be Surveyed: Counties where at least 10,000 acres grown annually.. District I; All counties. District II; Bedford, Giles, Lawrence, Lincoln, Maury, Montgomery, Robertson, Rutherford, Sumner, Wayne and Williamson. District III; Coffee, Franklin, Marion, Warren. District IV; Cannon and DeKalb. Other counties also may want to conduct the survey.
4. Sample Size:
   a. Counties with under 25,000 acres soybeans interview 20 producers.
   b. Counties with 25,000 to 75,000 acres interview 25.
   c. Counties with over 75,000 acres interview 30.
5. Survey Population: Producers who grew at least 25 acres of soybeans in 1986.
6. Sampling Procedure: Use the Nth number technique.

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VITA

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He earned an Associate of Science Degree in Agriculture from Columbia State Community College in 1981. He earned a Bachelor of Science Degree in Agriculture from the University of Tennessee at Martin in 1983.

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He is married to the former Virginia L. Chisholm of Memphis, Tennessee, and they have four children, Michelle, Teresa, Keith, and James.