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Date November 22, 1985

CHARACTERISTICS OF TENNESSEE BLUEBERRY PRODUCERS AND THEIR FARM OPERATIONS

A Thesis

Presented for the

Master of Science

Degree

The University of Tennessee, Knoxville

Rodney L. Davis

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DEDICATION

This thesis is dedicated to my wife Carol, and sons Matthew and Clinton. They have shared my enthusiasm for blueberry culture and supported me during the preparation of this thesis.

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The author is grateful for the assistance and guidance given him by his graduate committee chairman, Dr. Cecil E. Carter, Jr. and committee member, Dr. Alvin D. Rutledge. The author also recognizes committee member and acting Extension Education Department Head, Dr. Lewis Dickson.

The author expresses particular appreciation to the blueberry producers who provided the information to complete the survey instrument and to the Extension Agents in the individual counties who assisted in gathering the data.

ABSTRACT

The major purpose of this study was to describe Tennessee blueberry producers, their farms, and marketing and production practices. It was believed that this information would assist Tennessee Extension Agents and Specialists in planning and implementing educational programs and information for current and potential commercial producers as well as home owners and gardners. Twenty Tennessee blueberry producers were interviewed and a survey instrument developed by the researcher, with the assistance of the graduate committee, was completed.

Data were coded and punched on computer cards and computations were made by the University of Tennessee Computing Center. The analysis of variance F test and chi-square test were used to determine the strength of relationships between variables. F values and X^2 values which achieved the .05 probability level were accepted as significant.

Major findings included the following:

1. The mean age of Tennessee blueberry producers was 51 years.
2. The majority of Tennessee's blueberry plantings are located in East Tennessee.
3. The average size of Tennessee blueberry plantings was 3.1 acres.
4. The average blueberry yield in Tennessee in 1984 was 1,338.4 pounds per acre.

5. Tennessee blueberry producers sold 96 percent of their 1984 crop U-pick for an average price of $0.80 per pound.

6. When taken individually, the production practices of age of plant at setting, container size, average mulch depth, pounds of nitrogen, potash and phosphate applied on mature plants, frequency of soil test, whether or not a soil test was taken prior to planting and whether or not irrigation was used were not significantly related to yield.

7. For the most part, producer and farm characteristics were not significantly related to age of plants at setting, container size, average mulch depth, pounds of applied nitrogen per acre on mature plants, frequency of soil test, use of irrigation, cultivars planted, type of mulch materials used, taking a soil test prior to planting or the total number of Tennessee Extension recommended practices used.

Implications and recommendations also were included in the study.

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CHAPTER I

THE PROBLEM AND ITS SETTING

I. INTRODUCTION

The blueberry industry varies widely in economic importance among individual states and regions throughout the United States and Canada. The Proceedings of the Tenth Annual Meeting of the Blueberry Council reports that approximately 73,150,000 pounds of cultivated berries were harvested by its members in 1975. An additional 34,250,000 pounds of wild berries were harvested that year in Maine and the neighboring Canadian provinces of New Brunswick, Nova Scotia, Quebec, Prince Edward Island and Newfoundland (7).*

According to the University of Tennessee Extension Plant Science Department all areas of Tennessee have soil and climatic conditions suitable for commercial blueberry production. Currently only 50 acres (3) of commercial berries are being grown in Tennessee in 13 of its 95 counties.

The Tennessee Extension Service through the years has been involved, to at least some degree, in assisting blueberry producers. Neighboring states of North Carolina, Georgia and Arkansas (3) have developed a thriving blueberry industry, supplying U-Pick, fresh and processed markets. Since geographic and climatic conditions of

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*Numbers in parentheses refer to alphabetically listed items in the Bibliography; those after the colon are page numbers.

Tennessee replicate those found in these neighboring states, and in view of the increased economic pressure for new sources of income for small farms in Tennessee, it is justified to consider the expansion of Tennessee's blueberry industry.

Limited research relative to production practices has been carried out at the University of Tennessee's Experiment Stations at Crossville and Columbia. To present, however, no attempt has been made to describe Tennessee's blueberry producers, their farms, or the extent to which they are or are not using current Extension or U.S.D.A. recommendations. Before encouraging further expansion of Tennessee's blueberry industry it is important to establish a benchmark relative to the characteristics of Tennessee's current blueberry producers, their farms, and use of production and marketing practices.

II. PURPOSES AND SPECIFIC OBJECTIVES

Purpose

The major purpose of this study was to describe Tennessee blueberry producers, their farms, and marketing and production practices. It was believed that this information would assist Tennessee Extension Agents and Specialists in planning and implementing educational programs and information for current and potential commercial producers as well as home owners and gardners.

Specific Objectives

The specific objectives of this study were:

1. To describe Tennessee blueberry producers with regard to their personal and farm characteristics.

2. To describe Tennessee blueberry producers' production practices.

3. To describe Tennessee blueberry producers' marketing practices.

4. To determine relationships between Tennessee blueberry producers' plans for expansion and their personal and farm characteristics.

5. To determine relationships between Tennessee blueberry producers' personal and farm characteristics and yield.

6. To determine the relationships between producers' use of 10 Tennessee production practices and yield.

7. To rank according to frequency used 10 selected Tennessee Extension recommended practices.

8. To determine relationships between the age of Tennessee blueberry producers and the use of 10 selected Tennessee production practices.

9. To determine relationships between the primary source of family income and the use of 10 selected Tennessee production practices.

10. To determine relationships between the percent of total farm income producers received from blueberries and the use of 10 production practices.

11. To determine relationships between the employment status of Tennessee blueberry producers and the use of 10 production practices.

12. To determine relationships between acres owned and rented by Tennessee blueberry producers and the use of 10 selected Tennessee production practices.

13. To determine relationships between acres of blueberries managed by Tennessee blueberry producers and the use of 10 selected Tennessee production practices.

III. LIMITATIONS OF THE STUDY

This study was limited to data collected during personal interviews with 20 blueberry producers who managed at least one-half acre of commercial blueberries in 1984 and lived in the state of Tennessee.

IV. METHOD OF INVESTIGATION

Population

The population of this study included blueberry producers in Tennessee who were managing at least one-half acre of berries for commercial use. Five of the producers did not yet have plants that were in production.

Sample

Twenty of the 22 known commercial blueberry producers in Tennessee were surveyed in April of 1985. Producers were identified by the University of Tennessee Extension Plant and Soil Science Department and/or membership in the Tennessee Fruit and Vegetable Grower's Association.

Instrument

The interview schedule was designed to obtain information regarding the personal and farm characteristics of Tennessee blueberry producers, and production and marketing practices. It was developed in cooperation with the graduate committee consisting of members from the U.T. Extension Education Department as well as Extension Plant Science Department. It consisted of 88 questions divided into 13 major sections which included: general information about the producer, acreage, cultivars, establishment, fertilization, mulch, weed control, insects, birds, plant spacing, irrigation, disease, and marketing. A copy of the interview schedule is included in the Appendix.

Interview Technique

Interviews were conducted using the described instrument. The researcher conducted all interviews in April of 1985. All interviews were conducted on the farm of the producer, the survey instrument was completed and all data recorded.

Method of Analysis

The data from the survey were coded and punched on computer cards. Computations were made by the University of Tennessee Computing Center. The analysis of variance F test and Chi-square test were included where appropriate to demonstrate the strength of relationships between dependent and independent variables. While F values and Chi-square values which achieve the probability level of 0.05 are generally accepted as indicating a significant relationship between

variables, it should be remembered that a sample of only 20 greatly limits statistical analysis. The 0.05 probability level was used to reject assumed null hypotheses.

V. REVIEW OF PERTINENT BLUEBERRY DATA

The researcher was not able to find studies that specifically describe Tennessee blueberry producers, their farms or production and marketing practices. Extension and U.S.D.A. recommendations as well as farm numbers and yield information were, however, readily available. The following discussion illustrates the diversity of these recommendations.

In addition to Tennessee's five southeastern neighbors, data regarding the production and marketing of blueberries in Michigan were included in this review. Michigan leads the nation in commercial highbush (Vaccinium australe, V. corymbosum) production and was included in this review for the purpose of comparison with rabbiteye (V. ashei) production in the southeastern states. Note also that the mountainous regions of Western North Carolina are in the highbush production region.

U.S.D.A. (4)

1. Species, cultivars--the U.S.D.A. discusses the rabbiteye cultivars of Woodard, Homebelle, Garden Blue, Tifblue, Menditoo, Southland, Briteblue and Delite. It recommends rabbiteye plantings from Eastern North Carolina South to central Florida and West to Arkansas and East Texas. Highbush varieties are recommended from

North Carolina North to southern Maine and West to southern Michigan. Recommended highbush cultivars are Bluetta, Collins, Blueray, Bluecrop, Berkeley, Jersey, Lateblue, Marrow, Wolcott, Croatan, Murphy, Earliblue, Colville, Dixie and Darrow.

2. Soil characteristics--open porus soils of sand and peat that contain an admixture of loam, and have a water table 14 to 30 inches below the surface are recommended for blueberries. The pH level should be maintained at 4.3 to 4.8.

3. Irrigation--is recommended if growers are not assured of enough rainfall to provide 1 to 2 acre-inches of water every 10 days during the picking season and as needed later in the season.

4. Spacing--highbush cultivars should be set 4 feet apart in the row and rows should be 9 to 10 feet apart. Rabbiteye varieties should be set 6 feet apart in the row and rows should be 10 to 12 feet apart depending upon cultivation practices.

5. Mulch--mulching materials recommended are sawdust, hay or straw, however, mulch is not indicated to be a necessity.

6. Fertilization, mature plants--in locations that do not have special fertilizer requirements, use 400 to 600 pounds per acre of a complete fertilizer (8-8-8) in the spring after buds start. This should be followed about 6 weeks later, if the soil pH is above 4.8 by an application of 100 pounds of ammonium sulfate per acre followed by one or two similar applications at intervals of 6 weeks. Later fertilizer applications in fertile northern states should be avoided.

Alabama (9)

1. Species, cultivars--the rabbiteye cultivars of Tifblue, Woodard, Climax and Delite are recommended.

2. Soil characteristics--light, well drained sandy loam soils with a high organic matter content which are open and porous are recommended. A pH range of 4.5 to 5.5 is desired.

3. Irrigation--irrigation at weekly intervals in the Spring and twice weekly in the Summer is recommended for commercial producers.

4. Spacing--a plant spacing of 6'x12' is recommended.

5. Mulch--for the producer with only a few plants, a 4" to 6" surface mulch of aged sawdust, pine straw or other organic materials is recommended but for the commercial grower, irrigation and chemical weed control should be used.

6. Fertilization, mature plants--beginning in the fourth year, extending to the seventh year, increase from 10 oz/plant to 16 oz/plant in a split application of 12-4-8. The first application should be made in the early Spring followed by a post harvest application. At the same time, a supplemental application of ammonium sulfate should be made to total 45 to 72 pounds of actual nitrogen.

Georgia (1)

1. Species, cultivars--the rabbiteye cultivars of Climax, Woodard, Briteblue, Bluebelle, Tifblue, Southland, and Delite are recommended.

2. Soil characteristics--nearly every soil type in Georgia is suited, but light, well drained, acid soils with a pH range of 4.5 to 5.2 are recommended.

3. Irrigation--irrigation is recommended to supplement rainfall to a level of 1 to 1-3/4 acre-inches of water per week during the growing season.

4. Spacing--a plant spacing of 5' to 8'x12' is recommended depending on means of harvest.

5. Mulch--mulch is recommended on the heavier soils in North Georgia. The materials indicated are well rotted sawdust, pine bark and pine straw, applied 3 to 4 inches deep.

6. Fertilization, mature plants--each plant should receive 2 to 3 oz. of 12-4-8 to be doubled each year beginning the second year. No outside limit is suggested. This is to be applied in two applications, the first in March and the second in late July.

Mississippi (10)

1. Species, cultivars--the rabbiteye cultivars of Tifblue, Woodard, Delite, Southland, Briteblue, Bluegem, Climax and Bluebell are recommended.

2. Soil characteristics--recommended soils are those that are light sandy loams that contain a large amount of organic matter. A pH range of 4.5 to 5.5 is recommended.

3. Irrigation--irrigation is not specifically recommended, however, an acre-inch of water is recommended per week throughout the growing season.

4. Spacing--a spacing of 5' to 6'x10' to 12' is recommended.

5. Mulch--pine straw, pine bark or similar materials are recommended.

6. Fertilization, mature plants--fertilization rates are based on soil test results. No recommendations are made in lieu of a soil test.

North Carolina (2)

1. Species, cultivars--in areas where stem canker is present the resistant Highbush cultivars of Angola, Morrow, Wolcott, Croatan, Harrison, Bluechip and Murphy are recommended. In stem canker free areas the Highbush cultivars of Waymouth, Earliblue, Blueray, Bluecrop, Berkeley and Jersey are recommended. The Rabbiteye cultivars of Premier, Woodard, Homebell, Delite, Southland, Garden Blue, Tifblue, Powderblue and Centurion are recommended. Climax is suggested for trial.

2. Soil characteristics--light sandy soils of the Lynn Haven or Leon type with an A_2 horizon of white sand above an organic hardpan are recommended. Soil pH should be in the 3.8 to 4.5 range.

3. Irrigation--between 1 and 1-3/4 acre inches of water are recommended per week during the growing season. Irrigation should be used whenever necessary to achieve this level.

4. Spacing--a plant spacing of 4' to 5'x8' to 10' is recommended for Highbush cultivars. Spacing for rabbiteye cultivars should be 5' to 6'x10' to 12'.

5. Mulch--mulch is not recommended except where it is necessary to modify soil characteristics.

6. Fertilization, mature plants--fertilization rates are based on 5,445 linear feet of row/acre, independent of plant and row spacing. Apply 300 pounds/acre of 10-20-10 or equivalent two-thirds prior to bloom and one-third 4 to 6 weeks later. Apply 30 pounds of actual nitrogen after harvest per acre if growth is poor. Use a complete fertilizer after harvest if the soil phosphorus is low or leaching has been severe.

South Carolina (8)

1. Species, cultivars--the canker resistant highbush cultivars of Morrow, Angola, Croatan, Murphy, Harrison and Bluechip are recommended for the majority of the state. In stem canker free areas Jersey, Weymouth, Berkeley, Bluecrop and Earliblue may be planted. Recommended Rabbiteye cultivars are Woodard, Homebell, Delite, Southland, Tifblue, Briteblue, Garden Blue, Bluebelle and Climax.

2. Soil characteristics--light, well drained soils which are porous and open are recommended. A pH range of 4.3 to 4.5 is recommended for Highbush cultivars. The pH range for Rabbiteye cultivars is 4.5 to 5.5.

3. Irrigation--rainfall should be supplemented by irrigation to achieve a water level of 1 to 2 acre inches per week during the growing season.

4. Spacing--Highbush cultivars should be spaced 4' to 5'x8' to 10'. Rabbiteye cultivars should be spaced 5' to 6'x10' to 12'.

5. Mulch--leaves, straw, peat, sawdust or wood chips are recommended on smaller acreages. Mulch should be spread 3 to 8 inches deep in strips 1-1/2 to 2 feet on each side or around the plant.

6. Fertilization--fertilization rates are based on 5,445 linear feet of row/acre, independent of plant and row spacing. For Highbush cultivars, apply 200 pounds/acre of 10-20-10 before bloom and an additional 100 pounds/acre after 4 to 6 weeks. If growth is poor apply 30 pounds of actual nitrogen after harvest. Rabbiteye cultivars should receive 400 to 600 pounds/acre of 8-8-8 at bloom. If needed, 200 to 300 pounds/acre of ammonium sulfate may be applied annually as late as mid-July.

Michigan (6)

1. Species, cultivars--the Highbush cultivars of Bluecrop, Rubel and Jersey are recommended.

2. Soil characteristics--loose textured soils that are a mixture of sand and peat are best. Heavier textured soils are also recommended if they are high in organic matter. A pH range of 4.0 to 5.1 is recommended.

3. Irrigation--no specific irrigation recommendations are made.

4. Spacing--a spacing of 4'x10' is recommended.

5. Mulch--mulch is not recommended for commercial growers. Home gardeners may use weathered sawdust, corncobs, leaves, wood shavings or similar materials maintained at a depth of 6 to 8 inches.

6. Fertilization, mature plants--for plants set 8 years or more apply 5 ounces/plant of 16-8-8-4. The fourth number refers to magnesium oxide. This is a special blueberry fertilizer that does not contain nitrate or chlorides as these are sometimes toxic to blueberries. This recommendation is in lieu of leaf analysis which is recommended to determine fertilization rates.

Tennessee (5)

1. Species, cultivars--the Rabbiteye cultivars of Tifblue and Woodard are recommended.

2. Soil characteristics--medium textured soils with a high water supplying capacity are recommended. A pH range of 4.5 to 5.2 is recommended.

3. Irrigation--irrigation is recommended for commercial growers. Enough water should be applied to supplement rainfall to achieve a level of 1 to 2 acre inches of water every 10 days during the growing season.

4. Spacing--spacing should be a minimum of 6'x10'.

5. Mulch--a 4" to 6" layer of decayed sawdust should be maintained under the drip line.

6. Fertilization, mature plants--fertilizer should be applied according to soil test results. In lieu of a soil test, apply 5 pounds 15-15-15 per 1,000 square feet at bud break. At 6 and 12 weeks later, apply 3 pounds of ammonium nitrate per 1,000 square feet.

CHAPTER II

TENNESSEE BLUEBERRY PRODUCTION AND MARKETING: THE FARMS, THE FARMERS, THE FUTURE

The major purpose of this chapter was to describe the characteristics of Tennessee blueberry producers, their farm operations and their production and marketing practices. Another purpose was to report findings regarding producer and farm characteristics and the producers' plans for expansion. Findings were organized and are presented in four main sections: Characteristics of Tennessee Blueberry Producers and their Farm Operations, Production Practices Utilized by Tennessee Blueberry Producers, Marketing Practices of Tennessee Blueberry Producers, and Relationships Between Tennessee Blueberry Producers' Plans for Expansion and their Personal and Farm Characteristics.

I. CHARACTERISTICS OF TENNESSEE BLUEBERRY PRODUCERS AND THEIR FARM OPERATIONS

The purpose of this section is to describe the characteristics of Tennessee blueberry farms and farmers. Findings are presented in two subsections: Personal Characteristics and Farm Characteristics. Frequencies and measures of central tendencies are used to summarize the data.

Personal Characteristics

Findings regarding four variables are summarized in this subsection: age of producers, primary source of family income, hours employed off the farm, and percent of total farm income received from blueberry sales (see Table I).

Age of producers. Data summarized in Table I indicate that the mean age of the 20 producers was 51. Five producers (25 percent) were 26 to 38 years, 7 (35 percent) were between 45 and 57, and the greatest number, 8 (40 percent) were 58 to 70 years of age.

Primary source of family income. Ten (50 percent) producers' primary source of family income came from non-farm sources. Five (25 percent) producers' income came from the farm and 5 (25 percent) producers reported that their primary source of family income was "other" sources.

Hours per week worked off farm. A majority of the producers, 13 (65 percent), did not work at all off the farm. Two (10 percent) worked under 10 hours and 5 (25 percent) worked 30-40 hours per week off the farm. On the average the 20 blueberry producers averaged working 9.3 hours per week off the farm whereas the 7 producers who worked off the farm averaged 26.4 hours per week.

Percent of total farm income from blueberries. Only 20 percent or 4 producers received 50 percent to 100 percent of their farm income from blueberries. Five (25 percent) reported 10 percent-25 percent

TABLE I

CHARACTERISTICS OF TENNESSEE BLUEBERRY PRODUCERS AND THEIR FARM OPERATIONS

Characteristics of Producers and Farm Operations	Number of Producers N=20	Percent %	Mean (N)
Personal Characteristics			
Age of Producer			51.3 (20)
26-38	5	25	
45-57	7	35	
58-70	8	40	
Primary Source of Family Income			NA*
Farm	5	25	
Non-farm	10	50	
Other	5	25	
Hours Worked Off Farm			9.3 (20)
None	13	65	
Under 10	2	10	
30-40	5	25	
Percent of Total Farm Income, Blueberries			29.3 (15)
Under 10	6	30	
10-25	5	25	
50-100	4	20	
Not yet in production	5	25	
Farm Characteristics			
Total Acres (Owned and Rented)			162.5 (20)
13-57	6	39	
65-108	8	40	
110-888	6	30	
Location of Farm			NA
Middle Tennessee	3	15	
Southeast Tennessee	5	25	
Upper East Tennessee	12	60	

TABLE I (continued)

Characteristics of Producers and Farm Operations	Number of Producers N=20	Percent %	Mean (N)
Total Acres Blueberries Set Including Non-bearing New Bushes			3.1 (20)
One-less	4	20	
1.5-3.0	10	50	
3.01-13.0	6	30	
Total Acres in Production			2.3 (15)
One-less	3	15	
1.5-3.0	6	30	
3.01-13.0	6	30	
Not yet in production	5	25	
Yield of Bushes 4 years or older/acre (lbs)			1338.4 (13)
600 lbs-less	4	20	
1,200-1,500 lbs	4	20	
2,000-2,500 lbs	5	25	
Not yet in production	5	25	
Unknown, does not apply	2	10	

*NA indicates mean is not applicable.

of their farm income from blueberries. The largest number, 6 (30 percent), showed under 10 percent of their farm income from blueberry sales. Five producers had young plants not yet in production. The 15 producers who had income from blueberries received an average of 28.6 percent of their total farm sales from the sale of blueberries.

Farm Characteristics

Five farm characteristics were included in this sub-section: total acres of land owned and rented, location of the farm, number of acres of blueberries set, acres of blueberries in production and yield per acre of plants 4 or more years old.

Total acres of land owned and rented. Findings presented in Table I indicate that 6 (30 percent) producers owned or rented between 13 and 57 acres. The largest number, 8 (40 percent), managed 65 to 108 acres. Six producers (30 percent) owned or rented between 100 and 888 acres. The 20 blueberry producers on the average managed 162.5 acres of land.

Location of farm. A majority of the farms were located in Upper East Tennessee. This area included the area between the Cumberland Plateau and the North Carolina line and layed between Knoxville north to Virginia. It included 12 (60 percent) of the producers. Five (25 percent) of the producers were located around Chattanooga in Southeast Tennessee. The smallest number 3 (15 percent), were located within 50 miles of the Nashville area in middle Tennessee.

Total acres of blueberries set, including non-bearing new plants. The 20 producers had an average of 3.1 acres of blueberries. Four (20 percent) producers had 1 acre or less, 10 (50 percent) had between 1.5 and 3.0 acres and 6 (30 percent) had between 3.01 and 13.0 acres of blueberries.

Total acres in production. Table I indicates that the 15 producers who sold blueberries had an average of 3.2 acres. Three (15 percent) producers had 1 acre or less in production, 6 (30 percent) picked berries from 1.5 to 3.0 acres and 6 (30 percent) had between 3.01 acres and 13.0 acres. Five or 25 percent of the producers in the study did not yet have plants in production.

Yield of plants 4 years or older/acre (lbs). Four (20 percent) producers had a per acre yield of less than 600 pounds, 4 (20 percent) had a yield between 1,200 pounds and 1,500 pounds, and 5 (25 percent) had a yield of from 2,000 pounds to 2,500 pounds per acre. Five (25 percent) of the producers were not yet in production and 2 (10 percent) did not know their yields in 1984. The 13 producers who sold berries had an average yield of 1,338.4 pounds per acre.

Summary

The mean age of Tennessee blueberry producers was 51 years. Most producers' primary source of family income was from non-farm sources, although they averaged (mean) only 9 hours/week of employment off the farm. The mean percent of farm income received from blueberries was 27 percent.

The majority of Tennessee's blueberry producers lived in the upper East Tennessee region. The mean size of each farm was 162 acres with an average of 3.1 acres of blueberries set. Tennessee blueberry producers had an average of 2.8 acres of blueberries in production, yielding an average of 1,338.4 pounds of berries per acre.

II. PRODUCTION PRACTICES UTILIZED BY TENNESSEE BLUEBERRY PRODUCERS

This section presents findings regarding the production practices used by Tennessee blueberry producers. It is divided into 13 sub-sections: species, Rabbiteye cultivars, Highbush cultivars, other cultivars, establishment, fertilization, weed control, pests, spacing, irrigation, pruning, disease, and production information. Data reported in this section were summarized using numbers and percentages of producers. Means were reported where applicable.

Species

Blueberries grown in Tennessee are members of one of two species (i.e., Highbush or Rabbiteye). This sub-section reports the percent of each species grown by producers in Tennessee (see Table II).

Percent Highbush. The mean percent of Highbush cultivars grown by all 20 producers was 13.1. Fourteen (70 percent) had no Highbush berries, 3 (15 percent) had between 10 percent and 40 percent Highbush and 2 (10 percent) producers had 84 percent to 100 percent Highbush. One producer did not know the percent of each species grown. The five producers who grew Highbush had an average of 49.8 percent Highbush.

TABLE II

PRODUCTION PRACTICES UTILIZED BY TENNESSEE BLUEBERRY PRODUCERS

Production Practice Used	Number of Producers N=20	Percent %	Mean (N)
Species			
Percent Highbush			13.1 (19)
None	14	70	
10-40	3	15	
84-100	2	10	
Unknown, does not apply	1	5	
Percent Rabbiteye			87.5 (20)
None	1	5	
16-60	2	10	
85-100	17	85	
Rabbiteye Cultivars			
Percent Tifblue			45.3 (20)
Under 10	2	10	
25-45	9	45	
50-75	9	45	
Percent Climax			18.6 (20)
None	4	20	
4-23	6	30	
25-34	10	50	
Percent Delite			9.3 (18)
None	9	45	
1-9	3	15	
11-33	6	30	
Unknown, does not apply	2	10	
Percent Southland			1.9 (17)
None	14	70	
1-25	3	15	
Unknown, does not apply	3	15	
Percent Woodard			9.6 (20)
None	10	50	
2-20	4	20	
21-33	6	30	

TABLE II (continued)

Production Practice Used	Number of Producers N=20	Percent %	Mean (N)
Percent Garden Blue			1.9 (17)
None	16	80	
33	1	5	
Unknown, does not apply	3	15	
Percent Homebelle			0.6 (17)
None	16	80	
11	1	5	
Unknown, does not apply	3	15	
Highbush Cultivars			
Percent Jersey			0.5 (18)
None	17	85	
10	1	5	
Unknown, does not apply	2	10	
Percent Bluecrop			1.7 (18)
None	15	75	
5	1	5	
10	1	5	
16	1	5	
Unknown, does not apply	2	10	
Percent Blueray			6.5 (18)
None	14	70	
5	1	5	
18	1	5	
20	1	5	
Unknown, does not apply	2	10	
Percent Other; Rabbiteye, Highbush			
Percent Other: Rabbiteye, Highbush			6.5 (19)
None	10	50	
1-9	5	25	
10-44	4	20	
Unknown, does not apply	1	5	

TABLE II (continued)

Production Practice Used	Number of Producers N=20	Percent %	Mean (N)
Establishment			
Age of Bush at planting			2.0 (20)
1 year or less	2	10	
2 years	15	75	
3 years	3	15	
Source of Bushes			NA*
Purchased in-state	0	0	
Purchased out-of-state	20	100	
Percent Container Grown			65.5 (20)
None	5	25	
16-40	2	10	
80-100	13	65	
Container Size			NA
1 gallon or less	12	60	
2-3 gallons	3	15	
Unknown, does not apply	5	25	
Percent Bare Root			34.5 (20)
None	10	50	
10-60	4	20	
84-100	6	30	
Root-ball Broken at Planting			NA
Containers not used	5	25	
Yes	10	50	
No	5	25	
Mulching Material Used			NA
Sawdust	13	65	
Bark	2	10	
Peat	2	10	
Combination	1	5	
Other	2	10	
Average Mulch Depth at Planting			NA
2-4 inches	5	25	
4-6 inches	5	25	
Over 6 inches	10	50	

TABLE II (continued)

Production Practice Used	Number of Producers N=20	Percent %	Mean (N)
Mulch Level Maintenance			NA
Maintain current level	7	35	
Increase	1	5	
Add no more	4	20	
Maintain at reduced level	7	35	
Unknown, does not apply	1	5	
Fertilization			
Pounds of Nitrogen/Acre on Bushes 4 Years of Older			54.1 (8)
16-38	6	30	
56-72	3	15	
84-98	3	15	
No mature bushes	5	25	
Unknown, does not apply	3	15	
Source of Nitrogen on Bushes 4 Years or Older			NA
Ammonium nitrate	1	5	
Ammonium sulfate	10	50	
In complete fertilizer	1	5	
Urea	1	5	
Unknown, does not apply	7	35	
Pounds of P_2O_5/Acre on Bushes 4 Years or Older			20.5 (13)
None	1	5	
5-20	8	40	
31-48	4	20	
Unknown, does not apply	7	35	
Pounds of K_2O/Acre on Bushes 4 Years or Older			20.9 (13)
None	1	5	
5-23	8	40	
31-48	4	20	
Unknown, does not apply	7	35	

TABLE II (continued)

Production Practice Used	Number of Producers N=20	Percent %	Mean (N)
Number of Nitrogen Applications/Yr. on Bushes 4 Years or Older			2.8 (13)
1	1	5	
2	3	15	
3	7	35	
4	1	5	
5	1	5	
Unknown, does not apply	7	35	
Number of P_2O_5 Applications/Yr. On Bushes 4 Years or Older			1.3 (14)
None	1	5	
1	11	55	
3	2	10	
Unknown, does not apply	6	30	
Number of K_2O Applications/Yr. on Bushes 4 Years or Older			1.3 (13)
None	1	5	
1	11	55	
3	2	10	
Unknown, does not apply	6	30	
Pounds of Nitrogen/Acre on Bushes 2 Years or Younger			23.0 (7)
7-12	4	20	
19-68	3	15	
Unknown, does not apply	13	65	
Pounds of P_2O_5/Acre on Bushes 2 Years or Younger			10.3 (7)
None	2	10	
7-10	3	15	
19-28	2	10	
Unknown, does not apply	13	65	
Pounds of K_2O/Acre on Bushes 2 Years or Younger			10.3 (7)
None	2	10	
7-10	3	15	
19-28	2	10	
Unknown, does not apply	13	65	

TABLE II (continued)

Production Practice Used	Number of Producers N=20	Percent %	Mean (N)
Number of Nitrogen Applications/ Year on Bushes 2 Years or Younger			2.2 (8)
1	1	5	
2	4	20	
3	3	15	
Unknown, does not apply	12	60	
Number of P_2O_5 Applications/Year on Bushes 2 Years or Younger			1.1 (8)
None	2	10	
1	5	25	
3	1	5	
Unknown, does not apply	12	60	
Number of K_2O Applications/Year on Bushes 2 Years or Younger			1.1 (8)
None	2	10	
1	5	25	
3	1	5	
Unknown, does not apply	12	60	
Secondary Nutrients Applied to Bushes 4 Years or Older			NA
None	9	45	
Iron	6	30	
Other	1	5	
Unknown, does not apply	4	20	
Method of Secondary Nutrient Application			NA
None applied	10	50	
Foliar	5	25	
Dry Material	2	10	
Unknown, does not apply	3	15	
Primary Method of N-P-K Application			NA
Granular banded in row	2	15	
Granular banded around bush	15	75	
Unknown, does not apply	2	10	

TABLE II (continued)

Production Practice Used	Number of Producers N=20	Percent %	Mean (N)
Fertilize by Soil Test on Bushes 4 Years or Older			NA
Yes	5	25	
No	10	50	
Unknown, does not apply	5	25	
Fertilize by Soil Test on Bushes 2 Years or Younger			NA
Yes	7	35	
No	8	40	
Unknown, does not apply	5	25	
Frequency of Soil Test			NA
Do not soil test	4	20	
Once each year	9	45	
Every other year	4	20	
Every four years	2	10	
Unknown, does not apply	1	5	
Soil Test Prior to Planting			NA
Yes	16	80	
No	4	20	
Material Used to Adjust pH Prior to Planting			NA
None used	6	30	
Aluminum sulfate	2	10	
Elemental sulfer	12	60	
Material Used to Adjust pH on Established Bushes			NA
None used	6	30	
Ammonium sulfate	7	35	
Aluminum sulfate	1	5	
Elemental sulfer	5	25	
Unknown, does not apply	1	5	

TABLE II (continued)

Production Practice Used	Number of Producers N=20	Percent %	Mean (N)
Weed Control			
Method of Weed Control on Bushes 4 Years or Older			NA
Herbicides	15	75	
Combination herbicide and cultivation	1	5	
Unknown, does not apply	4	20	
Primary Herbicide Used			NA
Roundup	5	25	
Premerge	1	5	
Paraquat	3	15	
Combination of herbicides	8	40	
Unknown, does not apply	3	15	
Pests			
Major Insect Problem			NA
No significant problem	12	60	
Japanese Beetle	1	5	
Other	7	35	
Primary Insecticide Used			NA
None used	15	75	
Sevin	1	5	
Other	4	20	
Primary Method of Bird Control			NA
None used	12	60	
Mesurol	4	20	
Unknown, does not apply	4	20	
Percent Crop Loss Due to Birds			1.1 (16)
None	12	60	
Less than 10 percent	4	20	
Unknown, does not apply	4	20	

TABLE II (continued)

Production Practice Used	Number of Producers N=20	Percent %	Mean (N)
Spacing			
Number of Feet Between Bushes			6.0 (20)
4	1	5	
5	2	10	
6	15	75	
8	2	10	
Number of Feet Between Rows			10.9 (20)
10	11	55	
12	9	45	
Number of Bushes/Acre			624.9 (20)
500-555	9	45	
650 or more	11	50	
Irrigation			
Type of Irrigation Used			NA
No system	4	20	
Trickle	10	50	
Overhead	6	30	
Primary Source of Water			NA
No system	4	20	
Farm pond	5	25	
Creek or river	3	15	
Lake	1	5	
Public water	3	15	
Well	4	20	
Production Information			
Primary Source of Production Information			NA
Extension publications	3	15	
Personal contacts with Extension Agents	14	70	
Other producers	1	5	
Other	2	10	

*Does not apply.

Percent Rabbiteye. Only 1 producer did not grow any Rabbiteye blueberries. The mean percent of bushes grown by all 20 producers was 87.5. Fifteen, or 75 percent, of the producers grew only the Rabbiteye species.

Rabbiteye Cultivars

A large number of Rabbiteye cultivars are available to Tennessee blueberry producers. This sub-section reports the percent of the major Rabbiteye cultivars grown on each farm. Seven cultivars are reported here. They are: Tifblue, Climax, Delite, Southland, Woodard, Garden Blue, and Homebelle.

Percent Tifblue. The mean percent of the Tifblue cultivar grown on each Tennessee blueberry farm was 45.3 percent. Only 2 (10 percent) producers had less than 10 percent Tifblue plantings. Nine (45 percent) had between 25 percent and 45 percent Tifblues and 9 (45 percent) producers had 50 percent of their plantings in Tifblues.

Percent Climax. The mean percent of the Climax cultivar grown by the 20 blueberry producers was 18.6 percent. Four (20 percent) producers reported no Climax grown. Six (30 percent) reported between 4 percent and 23 percent Climax grown and 10 (50 percent) had set between 25 percent and 34 percent of their bushes using the Climax cultivar.

Percent Delite. The mean percent of the Delite cultivar grown in Tennessee was 9.3 percent. Nine (45 percent) of the producers had

no Delite plants. Three (15 percent) had between 1 percent and 9 percent Delites. Six producers or 30 percent reported between 11 percent and 33 percent Delites. Two (10 percent) producers did not know if they had any Delites. The 9 producers who grew the Delight cultivar had set an average of 15 percent of their plants using this cultivar.

Percent Southland. The mean percent of the Southland cultivar grown on Tennessee blueberry farms was 1.9 percent. The majority of producers, 14 (70 percent), reported no Southlands. Three (15 percent) producers had between 1 percent and 25 percent Southlands and 3 (15 percent) producers did not know if they had Southlands. The 3 producers who grew the Southland cultivar had set an average of 11 percent of their plants using this cultivar.

Percent Woodard. The mean percent of the Woodard cultivar grown was 9.6 percent. Half, 10 (50 percent), of the producers reported no Woodards. Four (20 percent) had between 2 percent and 20 percent and 6 (30 percent) had 21 percent to 33 percent Woodards. The 10 producers growing the Woodard cultivar set an average of 15.3 percent of their plants using this cultivar.

Percent Garden Blue. The mean percent of the Garden Blue cultivar grown on Tennessee blueberry farms was 1.9 percent. Sixteen (80 percent) producers reported having no Garden Blues. One producer or 5 percent had one-third (33 percent) of his planting in Garden Blues. Three (15 percent) did not know if they had any Garden Blues.

Percent Homebelle. The mean percent of the Homebelle cultivar grown was 0.6 percent. Sixteen (80 percent) did not have any Homebelles. One (5 percent) producer had 11 percent Homebelles and 3 (15 percent) producers did not know if they had any Homebelles.

Highbush cultivars

Highbush cultivars are grown primarily in the mountain regions of East Tennessee. Three cultivars are reported here. They are: Jersey, Bluecrop and Blueray.

Percent Jersey. The mean percent of the Jersey cultivar grown on Tennessee blueberry farms was 0.5 percent. Of all producers, 17 (85 percent) reported no Jerseys. One (5 percent) had 10 percent Jerseys and 2 (10 percent) producers did not know if they had any Jerseys.

Percent Bluecrop. The mean percent of the Bluecrop cultivar grown was 1.7 percent. Fifteen (75 percent) producers reported having no Bluecrops. One (5 percent) producer had 10 percent Bluecrops, 1 (5 percent) producer had 16 percent Bluecrops and 2 (10 percent) did not know if they had any Bluecrops. The 3 producers who grew Bluecrop reported having 10 percent of their plants set with this cultivar.

Percent Blueray. The mean percent of the Blueray cultivar grown was 6.5 percent. Fourteen producers or 70 percent had no Bluerays. One (5 percent) had 5 percent Bluerays, 1 (5 percent) had

18 percent, 1 had 20 percent and 1 producer or 5 percent had 75 percent Bluerays. Two (10 percent) producers reported that they did not know if they had any Bluerays. The 5 producers who grew Bluerays had an average of about 24 percent of their plants of this cultivar.

Percent Other

Because it would not be practical to list all possible cultivars on the interview schedule, cultivars both Rabbiteye and Highbush not listed were grouped and called "Other Cultivars."

Percent other cultivars: Rabbiteye and Highbush. The mean percent for cultivars not included in the interview schedule was 6.5 percent. Ten (50 percent) of the producers used only the cultivars that were listed and therefore had no other cultivars. Five (25 percent) had between 1 percent and 9 percent other cultivars. Four (20 percent) had between 10 percent and 44 percent other cultivars. One producer did not know if any other cultivars were set.

Establishment

Great variation is possible in the manner in which blueberry plantings may be established. This sub-section reports establishment practices used by Tennessee producers. It is divided into nine parts. They are: age of plant at setting, source of plants, percent container grown, container size, percent bare root, root ball broken, mulching material used, mulch depth and mulch level maintenance.

Age of plants at setting. The mean age of plants at setting was 2 years. Two (10 percent) producers set plants 1 year old. Fifteen (75 percent) set plants 2 years old. Three (15 percent) set 3 year old plants.

Source of plants. All plants set in Tennessee were purchased out-of-state. All 20 (100 percent) producers bought plants somewhere outside of Tennessee.

Percent container grown. The mean percent of Tennessee blueberry plantings that were container grown plants was 65.5 percent. Only 5 (20 percent) producers did not set any container grown plants. Two (10 percent) set between 16 percent and 40 percent container plants and 13 (65 percent) reported between 80 percent and 100 percent of all plants set as container grown.

Container size. Twelve (60 percent) producers set plants from containers 1 gallon or less. Three (15 percent) set plants from containers 2-3 gallons in size. Five (25 percents) producers did not set from containers.

Percent bare-root. The mean percent of bare-root sets in Tennessee plants was 34.5 percent. Ten (50 percent) reported no bare-root sets. Four (10 percent) had between 10 percent and 60 percent bare-root sets. Six (30 percent) had between 84 percent and 100 percent bare-root sets.

Root-ball broken at planting. Ten (50 percent) producers did break up the root ball on container grown plants. Five (25 percent) did not. Five (25 percent) did not set from containers.

Mulching material used at planting. Most producers, 13 (65 percent), used sawdust at planting as a mulch. Two (10 percent) used bark, while 2 (10 percent) used peat. One (5 percent) used a combination of these materials and 2 (10 percent) used other materials.

Average mulch depth at planting. Half, 10 (50 percent), of the producers used 6" or more of mulch at planting. Five (25 percent) used 4" to 6" and 5 (25 percent) used 2" to 4".

Mulch level maintenance. Seven (35 percent) reported that they would maintain the current level of mulch. One (5 percent) had plans to increase the level. Four (20 percent) had no plans to add more mulch. Seven (35 percent) said they would maintain mulch but at a reduced level. One (5 percent) was unsure of his plans.

Fertilization

Fertilization practices can vary in the manner of application, material used and quantity and frequency applied. This subsection reports these variations. Twenty-two variables are reported in this sub-section. They are: pounds of nitrogen/acre on plants 4 years or older, source of nitrogen on plants 4 years or older, pounds of P_2O_5/acre on plants 4 years or older, pounds of K_2O/acre on plants 4 years or older, number of nitrogen applications on plants 4 years

old or older, number of P_2O_5 applications on plants 4 years or older, number of K_2O applications on plants 4 years or older, number of K_2O applications on plants 4 years or older, pounds of nitrogen on plants 2 years or younger, pounds of P_2O_5/acre on plants 2 years or younger, pounds of K_2O/acre on plants 2 years or younger, number of nitrogen applications on plants 2 years or younger, number of P_2O_5 applications on plants 2 years or younger, number of K_2O applications on plants 2 years or younger, secondary nutrients applied to plants 4 years or older, method of secondary nutrient application, method of N-P-K application, fertilize by soil test on plants 4 years or older, fertilize by soil test on plants 2 years or younger, frequency of soil test, soil test prior to planting, material used to adjust soil pH prior to planting and material used to adjust pH on established plants. Five producers did not have mature plants. Responses from these 5 producers are included in "Unknown, does not apply" category.

Pounds of nitrogen/acre on plants 4 years or older. The mean number of pounds of nitrogen applied/year in mature plants was 54.1. Six (30 percent) producers applied 16 pounds to 38 pounds. Three (15 percent) used 56 pounds to 72 pounds. Three (15 percent) used between 84 pounds and 98 pounds. Five (25 percent) did not have mature plants and 3 did not know how much nitrogen was applied. The 12 producers who applied nitrogen used an average of 54 pounds of actual nitrogen per acre.

Source of nitrogen on plants 4 years or older. One producer (5 percent) used ammonium nitrate as the primary source of nitrogen on mature plants. Ten (50 percent) used ammonium sulfate, 1 (5 percent) used the nitrogen in a complete fertilizer while 1 (5 percent) used urea. The question did not apply to, or was unknown by 7 (35 percent) of the producers.

Pounds of phosphate/acre on plants 4 years or older. The mean number of pounds of P_2O_5 applied to mature plants was 20.5. One (5 percent) producer did not apply any P_2O_5. Eight (40 percent) applied 5 pounds to 20 pounds, while 4 (20 percent) producers used between 31 pounds and 48 pounds. Seven (35 percent) producers felt the question did not apply or the answer was unknown.

Pounds of potash/acre on plants 4 years or older. The mean number of pounds/acre applied of K_2O was 20.9. One (5 percent) producer did not apply any K_2O. Eight (40 percent) applied between 5 pounds and 23 pounds, while 4 (20 percent) used 31 pounds to 48 pounds. The question was unknown by, or did not apply to 7 (35 percent) producers.

Number of nitrogen applications/year on plants 4 years or older. The mean number of nitrogen applications/year on mature plants was 2.8. One (5 percent) producer applied nitrogen once and 3 (15 percent) applied nitrogen twice. Seven (35 percent) producers applied nitrogen three times. One (5 percent) producer applied nitrogen 4 times, 1 (5 percent) applied nitrogen 5 times. The question did not apply to or was unknown by 7 (35 percent) producers.

Number of phosphate applications/year on plants 4 years or older. The mean number of P_2O_5 applications/year on mature plants was 1.3. One (5 percent) producer did not apply any P_2O_5. Eleven (55 percent) made a single application. Two (10 percent) made 3 applications. The question did not apply to or was unknown by 6 (30 percent) producers.

Number of potash applications/year on plants 4 years or older. The mean number of K_2O applications/year was 1.3. One (5 percent) producer did not apply any K_2O. Eleven (55 percent) made 1 application. Two (10 percent) made 3 applications. The question did not apply or was unknown by 6 (30 percent) producers.

Pounds of nitrogen/acre on plants 2 years or younger. The mean number of pounds of nitrogen applied per year to plants 2 years or younger was 23.0. Four (20 percent) producers applied 7 pounds to 12 pounds. Three (15 percent) producers applied between 19 pounds and 65 pounds. The question did not apply to or was unknown by 13 (65 percent) of the producers.

Pounds of phosphate/acre on plants 2 years or younger. The mean number of pounds of P_2O_5 applied to immature plants was 10.3. Two (10 percent) producers did not apply any P_2O_5. Three (15 percent) applied 7 pounds to 10 pounds of P_2O_5. Two (10 percent) producers applied between 19 pounds and 28 pounds of P_2O_5 to immature plants. The question did not apply to or was not known by 13 (65 percent) producers.

Pounds of potash/acre on plants 2 years or younger. The mean number of pounds of K_2O applied to immature plants was 10.3. Two (10 percent) producers applied no K_2O to immature plants. Three (15 percent) producers applied 7 pounds to 10 pounds. Two producers (10 percent) used 19 pounds to 28 pounds of K_2O. The question did not apply to or was unknown by 13 (65 percent) producers.

Number of nitrogen applications/year on plants 2 years or younger. The mean number of nitrogen applications on plants 2 years or younger per year was 2.2. One (5 percent) producer made only 1 such application. Four (20 percent) made 2 nitrogen applications on immature plants, while 3 (15 percent) producers made 3 such applications. The question did not apply to or was not known by 13 (65 percent) of the producers.

Number of phosphate applications/year on plants 2 years or younger. The mean number of P_2O_5 applications per year on immature plants was 1.1. Two (10 percent) producers did not apply any P_2O_5. Five (25 percent) producers made 1 such application while 1 (5 percent) made 3 applications. The question did not apply to or was not known by 12 (60 percent) of the producers.

Number of potash applications/year on plants 2 years or younger. The mean number of K_2O applications per year on immature plants was 1.1. Two (10 percent) did not apply any K_2O. Five (25 percent) producers made 1 such application while 1 (5 percent) made 3

applications. The question did not apply to or was not known by 12 (60 percent) of the producers.

Secondary nutrients applied to plants 4 years or older. Nine (45 percent) producers did not apply any secondary nutrients to mature plants. Six (30 percent) producers applied iron and 1 applied a nutrient not in the interview schedule. Four (20 percent) producers felt the question did not apply or did not know.

Method of secondary nutrient application. Half the producers, 10 (50 percent), did not apply any secondary nutrients. Five (25 percent) applied the nutrient as a foliar, 2 (10 percent) as a dry material and 3 felt the question did not apply or did not know.

Primary method of N-P-K application. Most producers, 15 (75 percent), banded N-P-K around the plant. Three (15 percent) banded the material in the row and 2 (10 percent) did not apply N-P-K or did not know their method of application.

Fertilized by soil test on plants 4 years or older. Ten (50 percent) producers did not fertilize mature plants by soil test. Five (25 percent) did so. The question did not apply to or was unknown by 5 (25 percent) producers.

Fertilize by soil test on plants 2 years or younger. Seven (35 percent) producers did fertilize immature plants by soil test. Eight (40 percent) did not. The question did not apply to or was not known by 5 (25 percent) of the producers.

Frequency of soil test. Four (20 percent) producers do not soil test. Nine (45 percent) soil tested at least once each year. Four (20 percent) producers soil tested every other year while 2 (10 percent) report soil testing every 4 years. One (5 percent) producer did not know how often soil testing was done.

Soil test prior to planting. The majority of producers, 16 (80 percent), soil tested prior to planting. Four (20 percent) did not soil test prior to planting.

Material used to adjust pH prior to planting. Six (30 percent) producers did not adjust pH prior to planting. Twelve (60 percent) used elemental sulfur and 2 (10 percent) used ammonium sulfate.

Material used to adjust pH on established plants. Six (30 percent) producers had not adjusted pH on established plants. Seven (35 percent) used ammonium sulfate, 1 (5 percent) used aluminum sulfate while 5 (25 percent) producers used elemental sulfur. One (5 percent) producer reported that the question did not apply or the answer was unknown.

Weed Control

A wide variety of chemicals are labeled for herbicide use in blueberries. Cultivation can also be used. This sub-section reports the extent to which chemicals were utilized as well as the specific chemicals used.

Method of weed control on plants 4 years or older. Fifteen (75 percent) producers used chemicals alone to control weeds. One (5 percent) used chemicals plus cultivation. The question did not apply to or was unknown by 4 (20 percent) of the producers.

Primary herbicide used. Roundup was the primary herbicide used by 5 (25 percent) of the producers. Premerge was used by 1 (5 percent), while Paraquat was used by 3 (15 percent). The majority, 8 (40 percent) used a combination of herbicides. The question was unknown by 3 (15 percent) of the producers.

Pests

Pests in blueberries are insects and birds. The purpose of this sub-section of the study is to report findings regarding: major insect problems, insecticides used, methods of bird control, and percent crop loss due to birds.

Major insect problem. Most producers, 12 (60 percent), reported no major insect problems. One producer (5 percent) reported the Japanese Beetle to be a major problem. Seven (35 percent) listed insects not on the interview schedule to be major problems.

Primary insecticide used. Fifteen (75 percent) producers did not use an insecticide. One (5 percent) used Sevin and 4 (20 percent) used insecticides not included on the interview schedule.

Primary method of bird control. Twelve (60 percent) producers reported no bird control. Four (20 percent) used Mesurol and 4 (20 percent) did not know or felt the question did not apply.

Percent crop loss due to birds. Most producers, 12 (60 percent) reported no crop loss due to birds. Four (20 percent) reported less than a 10 percent loss. The question did not apply to or was unknown by 4 (20 percent) producers.

Spacing

The spacing of plants can vary in the distance between plants in the row as well as distance between rows.

Number of feet between plants in row. The mean number of feet between plants in the row was 6. One (5 percent) producer reported 4 feet between plants, 2 (10 percent) reported 5 feet, 15 (75 percent) reported 6 feet between plants in the row. Two producers, 20 percent, set plants 8 feet apart.

Number of feet between rows. Eleven (55 percent) producers had rows on 10 foot centers. Nine (45 percent) had rows 12 feet apart. Mean distance between rows was 10.9 feet.

Number of plants/acre. Nine (45 percent) producers reported 500 to 555 plants/acre. Eleven (55 percent) reported 650 or more plants/acre. Mean number of plants/acre was 624.9.

Irrigation

Blueberries can require as much as 1.5 inches of water per week during fruiting. Irrigation can be used to supplement rainfall when needed. The purpose of this portion of the study is to report the type of irrigation used and the primary source of water used for irrigation.

Type of irrigation used. Four (20 percent) reported no irrigation system used. Ten (50 percent) utilized a trickle system and 6 (30 percent) used an over-head system.

Primary source of water. Four (20 percent) producers had no irrigation system. Five (25 percent) irrigated from a farm pond. Three (15 percent) used a lake. Three producers or 15 percent used a public water supply, while 4 (20 percent) got water from a well.

Pruning

Pruning can effect both yield and growth patterns. The only pruning practice reported here is the extent of late summer pruning.

Extent of late summer pruning. Eighteen (90 percent) producers reported that they do not prune in late summer. One (5 percent) practiced very limited pruning then and 1 (5 percent) practiced moderate late summer pruning.

Disease

The purpose of this portion is to report: major disease problems, spray programs and chemicals used in controlling blueberry diseases.

Type of disease control. Nineteen (95 percent) reported no disease control program. One (5 percent) producer utilized a regular spray program.

Chemicals used in spray program. Nineteen (95 percent) practiced no control program. One (5 percent) producer used a combination of chemicals in a regular spray program.

Major disease problem. All producers, 20 (100 percent), reported no disease problems.

Production Information

Where producers get production information can effect their production practices and educational programs designed by Extension to assist them. The purpose here is to identify their sources of production information.

Primary source of production information. Three (15 percent) reported that their primary source of production information was Extension publications. A majority of producers, 14 (70 percent) received production information from personal contacts with Extension Agents. One (5 percent) reported that the primary source of production information came from other producers and 2 (10 percent) reported that other sources provided production information.

Summary

Tennessee Blueberry producers:

1. Grew six times as many Rabbiteye as Highbush type blueberries.

2. Grew Tifblue as their primary Rabbiteye cultivar, followed by Climax, Woodard and Delite.

3. Grew Blueray as their primary Highbush cultivar, followed by Bluecrop and Jersey.

4. Set primarily 2 year old plants that were container grown and purchased out-of-state.

5. Used sawdust as their principal mulching material applied 4" to 6" deep at planting and maintained at varying levels.

6. Applied an average of 54.1 pounds of nitrogen/year on mature plants, applied over 2.8 applications in the form of ammonium sulfate. Mature plants received an average of 20 pounds each of K_2O and P_2O_5 applied over 1.3 applications, banded around the plant. Immature plants received an average of 23 pounds of nitrogen spread over 2.2 applications and 10.3 pounds each of K_2O and P_2O_5 in 1.1 applications. Approximately 1/3 of the producers applied iron to mature plants as a foliar spray. Half the producers did not fertilize mature plants by soil test, while 40 percent did not fertilize immature plants by soil test. Most producers did not soil test annually although 80 percent did test prior to planting. When pH needed adjusting prior to planting, the primary material used was elemental sulfur. Ammonium sulfate was most used to adjust pH on established plants.

7. Used herbicides as the primary means of weed control, utilizing a combination of herbicides.

8. Had no major insect problems.

9. Had no major bird problems.

10. Set plants most often on 6 foot centers in the row. Producers were evenly divided in row spacing between 10 feet and 12 feet.

11. Used trickle irrigation most often.

12. Did not prune in late Summer.

13. Had no major disease problem or spray programs.

14. Primary source of production information was personal contacts with Extension Agents and Specialists.

III. MARKETING PRACTICES OF TENNESSEE BLUEBERRY PRODUCERS

This section of the study focuses attention on the marketing practices used by Tennessee blueberry producers. It is divided into six sub-sections. They are: Method of Marketing, Price, Units, Advertising, Sale Dates and Marketing Associations. The number of producers, percent and mean (where applicable) are reported.

Method of Marketing

Blueberries can be sold in a variety of ways. It is the purpose of this sub-section to report how Tennessee blueberries are being sold. Divisions in Tennessee include U-Pick and custom picked but sold directly to consumer (see Table III).

Percent of crop sold U-Pick. The mean percent of blueberries sold U-Pick was 96.6 percent according to Table III. One (five percent) producer sold 60 percent U-Pick, 1 (5 percent) sold 90 percent U-Pick while 13 (65 percent) sold 100 percent U-Pick. The question did not apply to 5 (25 percent) producers.

TABLE III

MARKETING PRACTICES OF TENNESSEE BLUEBERRY PRODUCERS

Marketing Practice Used	Number of Producers N=20	Percent %	Mean (N)
Method of Marketing			
Percent of Crop Sold U-Pick			96.6 (15)
60	1	5	
90	1	5	
100	13	65	
Unknown, does not apply	5	25	
Percent of Crop Picked by Producer and Sold Directly to Consumer			3.1 (16)
None	14	70	
10	1	5	
40	1	5	
Unknown, does not apply	4	20	
Price			
Price Received, U-Pick/Lb.			$0.80 (15)
$0.33	1	5	
0.66	1	5	
0.70	1	5	
0.75	4	20	
0.80	2	10	
0.90	2	10	
0.95	1	5	
1.00	2	10	
1.07	1	5	
Unknown, does not apply	5	25	
Price Received/Lb., Picked by Producer, Sold Directly to Consumed			$1.00 (2)
$1.00	2	10	
Unknown, does not apply	18	90	

TABLE III (continued)

Marketing Practice Used	Number of Producers N=20	Percent %	Mean (N)
Sale Dates			
Date of First Sale			NA*
June 11-15	2	10	
July 1-10	9	45	
July 15-21	4	20	
Unknown, does not apply	5	25	
Date of Last Sale			NA
July 20	1	5	
August 10-20	9	45	
September 1-15	5	25	
Unknown, does not apply	5	25	
Units			
Units of Sale			NA
Weight	10	50	
Volume	5	25	
Unknown, does not apply	5	25	
Advertising			
Primary Method of Advertising			NA
Radio	1	5	
Newspaper	3	15	
Word-of-mouth	11	55	
Unknown, does not apply	5	25	
Marketing Associations			
Membership in Tennessee Fruit and Vegetable Growers Association			NA
Yes	12	60	
No	7	35	
Unknown, does not apply	1	5	
Membership in Marketing Association Other Than T.F.V.G.A.			NA
Yes	0	0	
No	19	95	
Unknown, does not apply	1	5	

*Does not apply.

Percent of crop picked by producer and sold directly to consumer. The mean percent of blueberries picked by the producer and sold directly to the consumer was 3.1 percent. Fourteen (70 percent) producers did not market their berries this way. One (5 percent) producer sold 10 percent of the crop this way, while 1 (5 percent) sold 40 percent of the crop after picking directly to the consumer. The question did not apply to 4 (20 percent) producers.

Price

The purpose of this sub-section is to report price per pound for blueberries sold U-pick and custom picked.

Price received, U-Pick/pound. The mean price received for berries sold U-Pick was $0.80 per pound. One (5 percent) producer sold U-Pick berries for $0.33/pound, 1 (5 percent) for $0.66/pound, 4 (20 percent) for $0.75/pound, 2 (10 percent) for $0.80/pound, 1 (5 percent) for $0.90/pound, 2 (20 percent) for $1.00/pound, and 1 (5 percent) for $1.07/pound. The question did not apply to 5 (25 percent) producers.

Price received/pound, picked by producer but sold directly to consumer. The mean price for this type of marketing was $1.00/pound. Two (10 percent) producers marketed blueberries in this manner. Eighteen (90 percent) did not pick berries for customers.

Sale Dates

Sale dates vary with geographics, species and cultivar. The purpose of this sub-section is to report beginning and ending sales dates.

Date of first sale. Two (10 percent) producers reported their first sale date between June 11 and July 15. Nine (45 percent) sold their first berries between July 1 and July 10. Four (20 percent) had first sale dates between July 15 and July 21. The question did not apply to 5 (25 percent) producers.

Date of last sale. One (5 percent) producer reported the last sale date to be July 20. Nine (45 percent) had ending sale dates between August 10 and August 20. Five (25 percent) had last sale dates between September 1 and September 15. The question did not apply to 5 (25 percent) producers.

Units

Blueberries in Tennessee are sold both by weight and by volume. The purpose of this sub-section is to report by which units blueberries are being sold in Tennessee.

Units of sale. Ten (50 percent) of the producers sold by weight while 5 (25 percent) sold by volume. The question did not apply to 5 (25 percent) producers.

Advertising

A variety of advertising methods are available to Tennessee blueberry producers. Methods used are reported here.

Primary method of advertising. One (5 percent) producer reported radio as the primary method of advertising. Three (15 percent)

used newspapers and 11 (55 percent) reported word-of-mouth to be their primary method of advertising. The question did not apply to 5 (25 percent) producers.

Marketing Associations

The purpose of this sub-section is to report how many producers are members of marketing associations and to identify those associations.

Membership in Tennessee Fruit and Vegetable Growers Association. Twelve (60 percent) producers reported membership in this association. Seven (35 percent) producers were not members of this association. One (5 percent) producer was unsure.

Membership in marketing association other than T.F.V.G.A. No producers reported other such memberships. One (5 percent) producer was unsure.

Summary

Tennessee blueberry producers sold over 96 percent of their berries U-Pick for a mean price of $0.80/pound. The harvest season state wide ranges from June 11 through September 15. Twice as many producers sell by weight as by volume with word-of-mouth being the primary means of advertising. Sixty percent of Tennessee blueberry producers are members of the Tennessee Fruit and Vegetable Growers Association.

IV. RELATIONSHIP BETWEEN TENNESSEE BLUEBERRY PRODUCERS' PLANS FOR EXPANSION AND THEIR PERSONAL AND FARM CHARACTERISTICS

This section of the study seeks to establish relationships between Tennessee blueberry producers' plans for expansion and their personal and farm characteristics. Independent variables under each sub-section are related to expansion plans. Further, if a producer indicates no expansion plans, the independent variable is related to a specific reason for not expanding. In either case, the $\underline{X^2}$ test has been applied to determine the strength of the relationship and probability level. A p level of 0.05 or lower is considered to indicate a significant relationship.

Personal Characteristics

The purpose of this sub-section is to report relationships between the personal characteristics of producer age, primary source of family income, and hours employed off the farm and expansion plans. If no expansion plans are indicated, this sub-section reports the reason to be either a slow market, limited land or a combination of factors (see Table IV).

Age of producer. All 5 (100 percent) of the producers between 26 and 38 reported plans to expand. There were 7 producers between 45 and 57. Of these, 5 (71.4 percent) planned to expand, 1 (14.3 percent) indicated no expansion plans due to a slow market and 1 (14.3 percent) had no expansion plans due to a combination of factors. Of

TABLE IV

RELATIONSHIP BETWEEN TENNESSEE BLUEBERRY PRODUCERS' PLANS FOR EXPANSION AND THEIR PERSONAL AND FARM CHARACTERISTICS

Characteristics of Producer and Farm Operation	Expansion		No Expansion Slow Market		No Expansion Limited Land		No Expansion Combination		X^2 Value	P Level
	N	%	N	%	N	%	N	%		
Personal Characteristics										
Age of Producer									7.24	0.29
26-38	5	100.0								
45-57	5	71.4	1	14.3			1	14.3		
58-70	4	50.0	2	25.0	2	25.0				
Primary Source of Income									6.28	0.39
Farm	4	80.0	1	20.0						
Non-farm	6	60.0	2	20.0	2	20.0				
Other	4	80.0					1	20.0		
Hours Worked Off Farm									10.42	0.10
None	10	76.9	2	15.4	1	7.7				
Under 10	1	50.0					1	50.0		
30-40	3	60.0	1	20.0	1	2.0				
Farm Characteristics										
Total Acres Rented/Owned									4.92	0.55
13-57	5	83.3			1	16.7				
65-108	5	62.5	1	12.5	1	12.5	1	12.5		
110-more	4	66.7	2	33.3						
Percent Farm Income/ Blueberries									4.33	0.63
Under 10	5	71.4			1	14.3	1	14.3		
10-25	4	80.0	1	20.0						
50-100	2	50.0	1	25.0	1	25.0				
Acres of Blueberries									19.40	0.003
1 or less	3	75.0					1	25.0		
1.5-3.0	10	100.0								
3.01-13.0	1	16.7	3	50.0	2	33.3				

the producers 58 to 70 years old, 4 (50 percent) planned to expand while 2 (25.0 percent) did not due to a slow market and 2 (25.0 percent) indicated no expansion plans due to limited land. A $\underline{X}^2$ value of 7.24 and a p level of 0.29 showed no significant relationship between producer age and expansion plans.

Primary source of family income. Five producers reported their primary source of family income to be from the farm. Of these, 4 (80 percent) planned to expand while 1 had no expansion plans due to a slow market. Ten producers reported their primary source of family income to be from non-farm sources. Of these, 6 (60 percent) reported plans to expand while 2 (20 percent) had no expansion plans due to a slow market and 2 (20 percent) had no expansion plans due to limited land. Five producers reported that their primary source of family income came from other sources. Of these, 4 (80 percent) had expansion plans and 1 (20 percent) had no expansion plans due to a combination of factors. A $\underline{X}^2$ value of 6.28 and p level of 0.39 showed no significant relationship.

Hours worked off farm. Thirteen producers reported that they did not work off the farm. Of these, 10 (76.9 percent) indicated plans to expand and 2 (15.4 percent) indicated no expansion plans due to a slow market while 1 (7.7 percent) had no expansion plans due to limited land. Two producers worked less than 10 hours per week off the farm. Of these, 1 (50 percent) planned to expand and 1 (50 percent) did not due to a combination of factors. Five producers

reported that they worked 30 to 40 hours per week off the farm. Of these, 3 (60 percent) reported plans to expand while 1 (20 percent) had no expansion plans due to a slow market and 1 (20 percent) had no expansion plans due to limited land. A $\underline{X}^2$ value of 10.42 and p level of 0.10 showed no significant relationship between hours employed per week off the farm and expansion plans.

Farm Characteristics

The purpose of this sub-section is to report relationships between the farm characteristics of acres owned and rented, percent farm income from blueberries and acres of blueberries and expansion plans.

Total acres owned and rented. Six producers managed between 13 and 57 acres. Of these, 5 (83.3 percent) reported plans to expand and 1 (16.7 percent) had no such plans due to limited land. Eight producers managed between 65 and 108 acres. Of these, 5 (62.5 percent) had expansion plans while 1 (12.5 percent) had no expansion plans due to a slow market, 1 (12.5 percent) no expansion plans due to limited land and 1 (12.5 percent) no expansion plans due to a combination of factors. Six producers managed 110 acres or more. Of these, 4 (66.7 percent) had expansion plans and 2 (33.3 percent) planned not to expand due to a slow market. A $\underline{X}^2$ value of 4.92 and p level of 0.55 showed no significant relationship between acres owned and rented and expansion plans.

Percent farm income from blueberries. Seven producers received less than 10 percent of their farm income from blueberries. Of these, 5 (71.4 percent) reported plans to expand while 1 (14.3 percent) had no expansion plans due to limited land and 1 (14.3 percent) had no such plans due to a combination of factors. Five producers received 10 percent to 25 percent of their farm income from blueberries. Of these, 4 (80 percent) had expansion plans and 1 (20 percent) planned not to expand due to a slow market. Four producers received 50 percent to 100 percent of their farm income from blueberries. Of these, 2 (50 percent) had expansion plans while 1 (25 percent) reported no expansion plans due to a slow market and 1 (25 percent) had no such plans due to limited land. A $\underline{X}^2$ value of 4.33 and p level of 0.63 showed no significant relationship between percent farm income from blueberries and plans for expansion.

Acres of blueberries. Three producers had 1 acre or less of blueberries. Of these, 4 (75 percent) planned to expand while 1 (25 percent) did not due to a combination of factors. Ten producers had between 1.5 and 3.0 acres of blueberries. All 10 (100 percent) reported expansion plans. Six producers had between 3.01 and 13.0 acres of blueberries. Of these, 1 (16.7 percent) reported expansion plans while 3 (50 percent) had no expansion plans due to a slow market and 2 (33.3 percent) had no expansion plans due limited land. A $\underline{X}^2$ value of 19.4 and a p level of 0.003 shows a direct significant relationship between producers with 3 acres or less of blueberries and expansion plans.

Summary

Plans for expansion among Tennessee blueberry producers is most strongly related to the number of acres already established. Most producers with 3 acres or less plan to expand and producers with more than 3 acres have no expansion plans. Other personal and farm characteristics reported are not statistically related to expansion plans.

CHAPTER III

RELATIONSHIPS BETWEEN YIELD AND TENNESSEE BLUEBERRY PRODUCERS' CHARACTERISTICS, PRODUCTION PRACTICES AND UTILIZATION FREQUENCY OF TEN TENNESSEE EXTENSION RECOMMENDED PRACTICES

Yield is, of course, a major factor in determining the overall profitability of a given farming enterprise. It is the purpose of this chapter to determine, which, if any, producer and/or farm characteristics and production practices taken individually are related to yield. Further, it is the purpose of this chapter to report the frequency of use of 10 selected Tennessee Extension recommendations by producers.

This chapter is divided into three sections. They are: Personal and Farm Characteristics of Tennessee Blueberry Producers and Their Relationships to Yield, Selected Production Practices and Their Relationships to Yield and Selected Tennessee Extension Recommended Practices Ranked According to Frequency Used.

I. PERSONAL AND FARM CHARACTERISTICS OF TENNESSEE BLUEBERRY PRODUCERS AND THEIR RELATIONSHIPS TO YIELD

It is the purpose of this section to report findings regarding relationships between Tennessee blueberry producers' personal and farm characteristics and yield. It is divided into two sub-sections.

They are: Characteristics of Producer and Farm Characteristics. The one-way analysis of variance F test was applied to determine the strength of the relationship.

Characteristics of Producer

Findings regarding the personal characteristics of age and primary source of personal income as related to yield are reported in the first part of Table V.

Age of Producer

Three producers were 26 to 38 years old and reported a mean yield of 994 pounds per acre. Six producers were between 45 and 57 years old and had a mean yield of 1,567 pounds. Four producers were 58 to 70 years old with a mean yield of 1,254. As tested by the F test there was no significant relationship between age and yield.

Primary Source of Income

Three producers reported their primary source of family income came from farm sources. Eight producers' primary source of income came from non-farm sources. Two producers reported primary family income from other source. When tested by the F test there was no significant relationship between primary source of income and yield.

Farm Characteristics

The farm characteristics of location and acres of blueberries managed are related to yield in the last part of this sub-section as illustrated in Table V.

TABLE V

PERSONAL AND FARM CHARACTERISTICS OF TENNESSEE BLUEBERRY PRODUCERS AND THEIR RELATIONSHIPS TO YIELD

Characteristics of Producers and Farm Operations	Number of Producers N=20	Mean Yield Lbs/Acre	F Value	P Value
Characteristics of Producer				
Age			0.47	0.63
26-38	3	994		
45-57	6	1567		
58-70	4	1254		
Primary Source Income			1.13	0.36
Farm	3	1833		
Non-farm	8	1074		
Other	2	1650		
Farm Characteristics				
Location			1.94	0.19
Middle Tennessee	3	963		
Southeast Tennessee	2	1280		
Upper East Tennessee	8	1493		
Acres of Blueberries			0.10	0.90
1 or less	1	1200		
1.5-3.0	7	1258		
3.01-13.0	5	1477		

Location

Three producers' farms were located in middle Tennessee and had a mean yield of 963 pounds. Two producers were located in southeast Tennessee and reported a mean yield of 1,280 pounds. Upper East Tennessee was the location of 8 producers who reported a mean yield of 1,493 pounds. When tested by the F test there was no significant relationship between farm location and yield.

Acres of Blueberries

One producer managed 1 acre or less and reported a mean yield of 1,200 pounds. Seven producers managed between 1.5 and 3.0 acres and reported a mean yield of 1,258 pounds. Five producers had between 3.01 and 13.0 acres of blueberries and reported a mean yield of 1,477 pounds. When tested by the F test there was no significant relationship between acres of blueberries and yield.

Summary

The one-way analysis of variance F test indicated no significant relationship between personal characteristics of age and primary source of income and yield. Farm characteristics of location of farm and acres of blueberries managed were not significantly related to yield. A multiple regression analysis was run on these variables as well as those of hours employed off farms, percent farm income from blueberry sales, total acres owned and rented to further determine relationships to yield. No significant relationship was indicated.

II. SELECTED PRODUCTION PRACTICES AND THEIR RELATIONSHIPS TO YIELD

The purpose of this section was to report findings regarding relationships between the use of selected production practices reported in Table VI and yield. This section is divided into three sub-sections. They are: Establishment, Fertilization and Irrigation. The analysis of variance F test was applied to determine the strength of relationships.

Establishment

A variety of production practices are needed to establish a planting of blueberries. Reported here are the practices of age of plant at setting, container size and average depth of mulch at planting.

Age of plant at setting. As indicated in Table VI, 1 producer set 1 year old plants and reported a mean yield of 1,200 pounds. Ten producers set 2 year old plants and reported a mean yield of 1,478 pounds. Two producers set 3 year old plants and reported a mean yield of 705 pounds. Seven producers reported that the question did not apply or was unknown to them. When tested by the F test, there was no significant relationship between age of plant at setting and yield.

Container size. Seven producers reported setting plants from a container 1 gallon or less in size and had a mean yield of 1,374

TABLE VI

SELECTED PRODUCTION PRACTICES AND THEIR RELATIONSHIPS TO YIELD

Production Practice	Number of Producers N=20	Mean Yield Lbs/Acre	F Value	P Level
Establishment				
Age of plant at setting			0.72	0.50
1 year or less	1	1200		
2 years	10	1478		
3 years	2	705		
Unknown, does not apply	7	--		
Container Size			0.90	0.37
1 gallon or less	7	1374		
2-3 gallons	2	705		
Unknown, does not apply	11	--		
Average Mulch Depth			0.45	0.64
2"-4"	4	1062		
4"-6"	3	1687		
More than 6"	6	1348		
Unknown, does not apply	7	--		

TABLE VI (continued)

Production Practice	Number of Producers N=20	Mean Yield Lbs/Acre	F Value	P Level
Fertilization				
Pounds of Nitrogen on 4 Year or Older Plants			0.13	0.87
16-38	6	1308		
56-72	3	994		
84-98	2	1100		
Unknown, does not apply	9	--		
Pounds P_2O_5 + K_2O/Acre on 4 Year or Older Plants			1.26	0.33
None added	1	1500		
10-20	8	1341		
62-99	2	400		
Unknown, does not apply	9	--		
Frequency of Soil Test			0.49	0.69
Never	3	1655		
Once/year	6	1405		
Once/2 years	2	700		
Once/4 years or more	2	1300		
Unknown, does not apply	7	--		

TABLE VI (continued)

Production Practice	Number of Producers N=20	Mean Yield Lbs/Acre	F Value	P Level
Soil Test Prior to Planting			2.16	0.16
Yes	10	1163		
No	3	1922		
Unknown, does not apply	7	--		
Irrigation				
Type of Irrigation System			0.65	0.54
Trickle	7	1269		
Overhead	5	1250		
No system	1	2266		
Unknown, does not apply	7	--		

pounds. Two producers set plants from containers 2 to 3 gallons in size and had a mean yield of 705 pounds. Eleven producers reported that the question either did not apply or was unknown to them. When tested by the F test, no significant relationship was found between container size and yield.

Average mulch depth. Four producers applied 2" to 4" of mulch at planting and reported a mean yield of 1,062 pounds. Three producers applied 4" to 6" of mulch and reported a mean yield of 1,687 pounds. Six producers applied more than 6" of mulch at planting and reported a mean yield of 1,348 pounds. Seven producers indicated that the question did not apply or was unknown to them. When tested by the one-way analysis of variance F test, no significant relationship was found between average mulch depth and yield.

Fertilization

The purpose of this sub-section was to report findings regarding relationships between the fertilization practices reported in Table VI of pounds of nitrogen/year/acre on 4 year old plants, pounds of P_2O_5 + K_2O/year/acre on 4 year old plants, frequency of soil testing and soil testing prior to planting and yield.

Pounds of nitrogen on 4 year or older plants/year/acre. Six producers applied 16 to 38 pounds of nitrogen to mature plants and reported a mean yield of 1,308 pounds. Three producers used between 56 and 72 pounds of nitrogen and reported a yield of 994 pounds.

Two producers used 84 to 98 pounds of nitrogen and had a mean yield of 1,100 pounds. To 9 producers the question did not apply or was unknown. Pounds of nitrogen applied to mature plants and was not significantly related to yield per acre.

Pounds of phosphate + potash on 4 year old plants or older/year/acre. One producer added no P_2O_5 or K_2O to mature plants and reported a yield of 1,500 pounds. Eight producers applied between 10 and 20 pounds of $P_2O_5+K_2O$ and reported a mean yield of 1,341 pounds. Two producers applied 62 to 99 pounds of $P_2O_5+K_2O$ and reported a mean yield of 400 pounds. The question did not apply to or was unknown by 9 producers. Pounds of $P_2O_5+K_2O$ applied to mature plants was not significantly related to yield per acre.

Frequency of soil test. Three producers indicated that they did not soil test and reported a mean yield of 1,655 pounds. Six producers reported that they soil tested at least once a year and had a mean yield of 1,405 pounds. Two said they soil tested every two years and reported a mean yield of 700 pounds. Two producers soil tested once every 4 years or more and reported a mean yield of 1,300 pounds. Seven said the question either did not apply or was unknown to them. Frequency of soil test was not significantly related to yield per acre.

Soil test prior to planting. Ten producers indicated that they did soil test prior to planting and had a mean yield of 1,163 pounds.

Three producers did not soil test prior to planting and had a mean yield of 1,922 pounds. The question was unknown by or did not apply to 7 producers. Soil testing prior to planting was not significantly related to yield per acre.

Irrigation

Each blueberry producer must decide to irrigate or not, and if so, to use a trickle or over-head system. It is the purpose of this sub-section to report findings regarding use of irrigation and yield per acre.

Type of irrigation system. Seven producers used a trickle system and reported a mean yield of 1,269 pounds. Five producers used an over-head system and reported a mean yield of 1,250 pounds. One producer had no system and reported a yield of 2,266 pounds. The question did not apply to or was unknown by 7 producers. The type of irrigation system used was not significantly related to yield per acre.

Summary

When taken individually, the production practices of age of plant at setting, container size, average mulch depth, pounds of nitrogen on mature plants, pounds of P_2O_5+K_2O on mature plants, frequency of soil test, soil test prior to planting and irrigation were not significantly related to yield.

III. SELECTED TENNESSEE EXTENSION RECOMMENDED PRACTICES RANKED ACCORDING TO FREQUENCY USED

The purpose of this section was to report in rank order the percent of blueberry producers using each of 10 selected Tennessee Extension recommended practices (Table VII). The section was divided into four sub-sections as follows: Most Frequently Used, Moderately Used, Less Frequently Used and Least Frequently Used. The number and percent of producers using each practice is reported.

Most Frequently Used Practices

The most frequently used practices were those used by at least 90 percent of the producers. Two practices met this criterion: used 30 pounds or more nitrogen/acre/year on plants 4 years or older and used recommended mulching materials.

Thirty pounds or more nitrogen/acre/year on plants 4 years or older. Nineteen (95 percent) of the 20 producers in the study used 30 pounds or more nitrogen/acre/year on mature plants.

Used recommended mulch materials. Eighteen (90 percent) of the producers used the recommended mulch material at planting.

Moderately Used Practices

Practices used by 80 to 89 percent of the producers were classified as moderately used practices. Five practices met this criterion: nitrogen applied in at least 3 increments, when plants were purchased, size of the container was 1 gallon or less, recommended

TABLE VII

SELECTED TENNESSEE EXTENSION RECOMMENDED PRACTICES RANKED ACCORDING TO FREQUENCY USED

Tennessee Extension Recommended Practices	Number of Producers	Percent
Most Frequently Used		
30 Pounds or More Nitrogen/Acre/Year on Plants 4 Years or Older	19	95
Used Recommended Mulch Materials	18	90
Moderately Used		
Nitrogen Applied in at Least Three Increments	17	85
When Plants Were Purchased in Containers, Size was One Gallon or Less	17	85
Recommended Weed Control Chemicals Used	17	85
Soil Test Prior to Planting	16	80
Irrigation Used	16	80
Less Frequently Used		
Average Mulch Depth at Planting 6" or More	15	75
Set Two Year Old Plant	15	75
Least Frequency Used		
Soil Test at Least Once/Year	9	45

weed control chemicals used, soil test prior to planting and irrigation used.

Nitrogen applied in at least 3 increments. Seventeen (85 percent) of the producers used this recommendation.

When plants purchased in containers, size was 1 gallon or less. Seventeen (85 percent) producers used this recommendation.

Recommended weed control chemicals used. Seventeen (85 percent) of the producers used this recommendation.

Soil test prior to planting. Sixteen (80 percent) producers reported soil testing prior to planting.

Irrigation used. Sixteen (80 percent) producers reported using irrigation.

Less Frequently Used

Less frequently used practices were those used by 75 percent of the producers. Two practices met this criterion: average mulch depth at planting 6" or more and setting a 2 year old plant.

Average mulch depth at planting was 6" or more. Fifteen (75 percent) producers reported using this practice.

Set 2 year old plant. Fifteen (75 percent) producers reported setting a 2 year old plant.

Least Frequently Used

Less frequently used practices were those used by less than 50 percent of the producers. Only 1 practice, soil testing at least once a year, met this criterion.

Soil test at least once/year. Nine (45 percent) of the producers reported using this practice.

Summary

The frequency of use of Tennessee Extension recommended practices ranges widely among Tennessee blueberry producers. Of the practices reported in Table VII, the most frequently used was the application of at least 30 pounds of nitrogen on mature plants and the least frequently used was soil testing at least once each year.

CHAPTER IV

RELATIONSHIPS BETWEEN PERSONAL AND FARM CHARACTERISTICS OF TENNESSEE BLUEBERRY PRODUCERS AND THE USE OF TEN TENNESSEE PRODUCTION PRACTICES

Findings reported in Chapter III indicated a wide variation in the use of Tennessee Extension recommended blueberry practices among producers. The purpose of this chapter was to report findings regarding relationships between personal and farm characteristics of Tennessee blueberry producers and producers' use of 10 Tennessee commonly used production practices. The chapter is divided into six sections. They are: Relationships Between Age of Tennessee Blueberry Producers and Use of Ten Tennessee Production Practices, Relationships Between Primary Source of Family Income and Use of Ten Tennessee Production Practices, Relationships Between Employment Status of Tennessee Blueberry Producers and Use of Ten Tennessee Production Practices, Relationships Between Percent Farm Income From Blueberry Sales and Use of Ten Tennessee Production Practices, Relationships Between Acres of Blueberries and Use of Ten Tennessee Production Practices and Relationships Between Acres Owned and Rented and Use of Ten Tennessee Production Practices.

I. RELATIONSHIPS BETWEEN AGE OF TENNESSEE BLUEBERRY PRODUCERS AND THE USE OF TEN TENNESSEE PRODUCTION PRACTICES

Age is certainly a major factor in everyone's life. The purpose of this section was to determine relationships between the age of

Tennessee's blueberry producers and their use of 10 Tennessee production practices. These practices are: age of plant at setting, container size, average mulch depth, nitrogen/acre on mature plants, frequency of soil test, chemical weed control, irrigation, cultivars, mulching materials and soil test prior to planting. In addition, age is compared with the total number of Tennessee Extension recommended practices used. The $\underline{X}^2$ test was applied to determine the strength of the relationships.

Age of Plant at Setting

Five producers were from 26 to 38 years of age. Table VIII indicates that of these, 1 (20 percent) set a plant 1 year old or less, 3 (60 percent) set a 2 year old plant and 1 (20 percent) set a plant 3 years old. Seven producers were from 45 to 57 years old. All (100 percent) set 2 year old plants. Eight producers were from 58 to 70 years old. Of these, 1 (12.5 percent) set a 1 year old plant, 5 (62.5 percent) set a 2 year old plant and 2 (25 percent) set 3 year old plants. The age of producers and the age of plant set were not significantly related.

Container Size

Five producers were from 26 to 38 years old. Of these, 4 (80 percent) set plants from a container 1 gallon or less and 1 (20 percent) bought 2 to 3 gallon containers. Four producers were from 45 to 57 years of age. All (100 percent) set plants from 1 gallon or less containers. Six producers were from 58 to 70 years old. Of these,

TABLE VIII

RELATIONSHIPS BETWEEN AGE OF TENNESSEE BLUEBERRY PRODUCERS AND THE USE OF TEN TENNESSEE PRODUCTION PRACTICES

Production Practice	Age of Producers 26-38 N	26-38 %	45-57 N	45-57 %	58-70 N	58-70 %	X^2 Value	P Value
Age of Plant at Setting							3.82	0.43
1 Year or Less	1	20.0			1	12.5		
2 Years*	3	60.0	7	100	5	62.5		
3 Years	1	20.0			2	25.0		
Container Size							1.66	9.43
1 Gallon or Less*	4	80	4	100	4	66.7		
2-3 Gallons	1	20			2	33.3		
Average Mulch Depth							2.85	0.23
Less Than 6"			3	42.9	2	25		
6" or More*	5	100	4	57.1	6	75		
Nitrogen/Acre Mature Plant							1.95	0.37
30 Pounds or Less			1	14.3				
More Than 30 Pounds*	5	100	6	85.7	8	100		
Frequency of Soil Test							9.59	0.14
None			2	28.6	2	28.6		
Once/Year*	4	80	3	42.9	2	28.6		
Once/2 Years	1	20			3	42.9		
Once/4 Years or More			2	28.6				

TABLE VIII (continued)

Production Practice	Age of Producers 26-38 N	26-38 %	45-57 N	45-57 %	58-70 N	58-70 %	X^2 Value	P Value
Chemical Weed Control								NA**
Used Recommended Chemicals*	3	100	7	100	6	100		
Irrigation							3.28	0.19
None Used	1	20			3	37.5		
Irrigated*	4	80	7	100	5	62.5		
Cultivars							2.11	0.34
Grew Recommended Cultivars			1	16.7				
Grew Non-recommended cultivars	5	100	5	83.3	7	100		
Mulching Materials							3.33	0.18
Used Recommended Material*	5	100	7	100	6	75		
Did Not Use Recommended Material					2	25		
Soil Test Prior to Planting							1.69	9.43
No			2	28.6	2	25		
Yes*	5	100	5	71.4	6	75		

TABLE VIII (continued)

Production Practice	Age of Producers 26-38 N	26-38 %	45-57 N	45-57 %	58-70 N	58-70 %	X^2 Value	P Value
Total Number of Tennessee Extension Recommended Practices Used							4.23	0.37
4 or Less					1	12.5		
5-7	2	40	2	28.6	5	62.5		
8-10	3	60	5	71.4	2	25		

*Indicates Tennessee Extension Recommended Practice.

**Does not apply.

4 (66.7 percent) set bushes from a container 1 gallon or less in size and 2 (33.3 percent) set bushes from containers 2 to 3 gallons in size. The age of the producer and the size of containers were not significantly related.

Average Mulch Depth

Five producers were between the ages of 26 and 38. All five (100 percent) mulched 6" or more. Seven producers were from 45 to 57 years old. Of these, 3 (42.9 percent) used less than 6" of mulch and 4 (57.1 percent) used 6" or more. Eight producers were from 58 to 70 years old. Of these, 2 (25 percent) used less than 6" of mulch and 6 (75 percent) used more than 6". Age of producers and the average depth of mulch used were not significantly related.

Nitrogen/Acre on Mature Plants

Five producers were between the ages of 26 and 38. All 5 (100 percent) used more than 30 pounds of nitrogen on mature plants. Seven producers were from 45 to 57 years old. Of these, 1 (14.3 percent) applied less than 30 pounds of nitrogen/acre on mature plants and 6 (85.7 percent) used more than 30 pounds of nitrogen. Eight producers were between 58 and 70 years of age. All (100 percent) used more than 30 pounds/acre of nitrogen on mature plants. Pounds of nitrogen applied per acre on mature plants was not significantly related to producers' age.

Frequency of Soil Test

Five producers were from 26 to 38 years old. Of these, 4 (80 percent) soil tested at least once a year and 1 (20 percent) tested

every 2 years. Seven producers were from 45 to 57 years of age. Of these, 2 (28.6 percent) did not soil test, 3 (42.9 percent) tested once a year and 2 (28.6 percent) tested once every 4 years or more. Seven producers were from 58 to 70 years old. Of these, 2 (28.6 percent) did not soil test, 2 (28.6 percent) soil tested once a year and 3 (42.9 percent) tested once every 2 years. Producers' age and frequency of soil testing were not significantly related.

Chemical Weed Control

Three producers were from 26 to 38 years old. All (100 percent) used recommended chemicals. Seven producers were from 45 to 57 years old. All (100 percent) used recommended chemicals for weed control. Six producers were from 58 to 70 years old and all (100 percent) used recommended chemicals. A $\underline{X}^2$ value could not be computed.

Irrigation

Five producers were from 26 to 38 years old. Of these, 1 (20 percent) did not irrigate and 4 (80 percent) used irrigation. Seven producers were 45 to 57 years old. All (100 percent) irrigated. Eight producers were from 58 to 70 years old. Of these, 3 (37.5 percent) did not irrigate and 5 (62.5 percent) irrigated. The ages of producer and use of irrigation were not significantly related.

Cultivars

Five producers were from 26 to 38 years old. Of these, all (100 percent) grew some non-recommended cultivars. Six producers

were from 45 to 57 years old. Of these, 1 (16.7 percent) grew all recommended cultivars and 5 (83.3 percent) grew some non-recommended cultivars. Seven producers were from 58 to 70 years old. All 7 (100 percent) grew some non-recommended cultivars. Producers' age and cultivars grown were not significantly related.

Mulching Materials

Five producers were from 26 to 38 years old. Of these, all (100 percent) used recommended mulching materials. Seven producers were from 45 to 57 years of age and all (100 percent) used recommended mulching materials. Eight producers were from 58 to 70 years old. Of these, 6 (75 percent) used recommended mulching materials and 2 (25 percent) did not. Producers' age and mulching materials were not significantly related.

Soil Test Prior to Planting

Five producers were from 26 to 38 years old and all 5 (100 percent) soil tested prior to planting. Seven producers were from 45 to 57 years of age. Of these, 2 (28.6 percent) did not soil test prior to planting and 5 (71.4 percent) did so. Eight producers were from 58 to 70 years of age. Of these, 2 (25 percent) did not soil test prior to planting and 6 (75 percent) did soil test prior to planting. Age of producers and use of soil testing prior to planting were not significantly related.

Total Number of Tennessee Extension Recommended Practices Used

The Tennessee Extension recommended practices considered are those asterisked in Table VIII. There were 5 producers from 26 to 38 years of age. Of these, 2 (40 percent) used 5 to 7 practices and 3 (60 percent) used 8 to 10 practices. There were 7 producers from 45 to 57 years old. Of these, 2 (28.6 percent) used between 5 and 7 recommended practices and 5 (71.4 percent) used 8 to 10 practices. Eight producers were from 58 to 70 years old. Of these, 1 (12.5 percent) used 4 practices or less, 5 (62.5 percent) used 5 to 7 recommended practices and 2 (25 percent) used 8 to 10 practices. The total number of Tennessee Extension practices used and producers' ages were not significantly related.

Summary

No significant relationships were found between producer age and the use of the production practices of age of plant at setting, container size, mulch depth, nitrogen/acre on mature plants, frequency of soil test, chemical weed control, irrigation, cultivars, mulching materials, soil testing prior to planting and the total number of Tennessee Extension recommended practices used.

II. RELATIONSHIPS BETWEEN PRIMARY SOURCE OF FAMILY INCOME AND THE USE OF TEN TENNESSEE PRACTICES

The purpose of this section was to report findings regarding relationships between the source of family income and use of 10

production practices by Tennessee blueberry producers. This section is divided into 11 sub-sections. They are: age of plant at setting, container size, mulch depth, pounds of nitrogen applied per acre on mature plants, frequency of soil test, chemical weed control, irrigation, cultivars, mulching materials, soil test prior to planting and total number of Tennessee Extension recommended practices used. The $\underline{X}^2$ test was used to determine the strength of the relationships.

Age of Plant at Setting

Table IX indicates that five producers reported their primary source of income was from farm sources. All 5 (100 percent) set 2 year old plants. Ten producers reported their primary income was from non-farm sources. Of these, 1 (10 percent) set 1 year old plants, 6 (60 percent) set 2 year old plants and 3 (30 percent) set 3 year old plants. The primary source of family income and the age of plant at setting were not significantly related.

Container Size

Three producers reported their primary family income was from farm sources. All 3 (100 percent) set plants from containers 1 gallon or less in size. Eight producers reported their primary family income was from non-farm sources. Of these, 5 (62.5 percent) set plants 1 gallon or less in size and 3 (37.5 percent) set plants from containers 2 to 3 gallons in size. Four producers reported their primary source of family income was from other sources and all (100 percent) set plants from containers 1 gallon or less in size.

TABLE IX

RELATIONSHIPS BETWEEN PRIMARY SOURCE OF FAMILY INCOME AND THE USE OF TEN TENNESSEE PRODUCTION PRACTICES

Production Practice	Primary Source of Income: Farm N	Farm %	Non-Farm N	Non-Farm %	Other N	Other %	X^2 Value	P Level
Age of Plant at Setting							4.73	0.31
1 Year or Less			1	10	1	20		
2 Years*	5	100	6	60	4	80		
3 Years			3	30				
Container Size							3.28	0.19
1 Gallon or Less*	3	100	5	62.5	4	100		
2-3 Gallons			3	37.5				
Average Mulch Depth							0.26	0.87
Less Than 6"	1	20	3	30	1	20		
6" or More*	4	80	7	70	4	80		
Nitrogen/Acre Mature Plant							3.15	0.20
30 Pounds or Less	1	20						
More Than 30 Pounds*	4	80	10	100	5	100		
Frequency of Soil Test							4.38	0.62
None	2	40	1	11.1	1	20		
Once/Year*	2	40	5	55.6	2	40		
Once/2 Years			2	22.2	2	40		
Once/4 Years or More	1	20	1	11.1				

TABLE IX (continued)

Production Practice	Primary Source of Income: Farm N	Farm %	Non-Farm N	Non-Farm %	Other N	Other %	X^2 Value	P Level
Chemical Weed Control								NA**
Used Recommended Chemicals*	4	100	8	100	4	100		
Irrigation							2.50	0.28
None Used			2	20	2	40		
Irrigated*	5	100	8	80	3	60		
Cultivars							2.75	0.25
Grew Recommended Cultivars*	1	20						
Grew Non-Recommended Cultivars	4	80	9	100	4	100		
Mulching Materials							1.11	0.57
Used Recommended Materials*	5	100	9	90	4	80		
Did Not Used Recommended Materials			1	10	1	20		
Soil Test Prior to Planting							1.87	0.39
No	2	40	1	10	1	20		
Yes*	3	60	9	90	4	80		

TABLE IX (continued)

Production Practice	Primary Source of Income						X^2 Value	P Level
	Farm		Non-Farm		Other			
	N	%	N	%	N	%		
Total Number of Tennessee Recommended Practices Used							4.62	0.32
4 or Less					1	20		
5-7	2	40	6	60	1	20		
8-10	3	60	4	40	3	60		

*Indicates Tennessee Extension Recommended Practices.

**Does not apply.

Producers' primary source of income and size of container were not significantly related.

Average Mulch Depth

Five producers reported their primary source of family income came from the farm. Of these, 1 (20 percent) used less than 6" of mulch and 4 (80 percent) used 6" or more of mulch. Ten producers reported their primary source of family income to be non-farm. Of these, 3 (30 percent) used less than 6" of mulch and 7 (70 percent) used 6" or more of mulch. Five producers reported their family income was primarily from other sources. Of these, 1 (20 percent) used less than 6" of mulch and 4 (80 percent) used 6" or more of mulch. Average mulch depth and primary source of family income were not significantly related.

Nitrogen/Acre on Mature Plants

Five producers reported their primary source of family income to be from the farm. Of these, 1 (20 percent) applied less than 30 pounds of nitrogen/acre on mature plants and 4 (80 percent) used more than 30 pounds/acre. Ten producers reported that most of their family income came from non-farm sources and all (100 percent) used more than 30 pounds/acre of nitrogen on mature plants. Five producers' primary source of family income was from other sources. All 5 (100 percent) used more than 30 pounds of nitrogen/acre. The primary source of family income and pounds of nitrogen/acre applied to mature blueberry plants were not significantly related.

Frequency of Soil Test

Five producers reported their primary source of family income was the farm. Of these, 2 (40 percent) did not soil test, 2 (40 percent) tested once a year and 1 (20 percent) tested every 4 years or more. Nine producers' family income came from non-farm sources. Of these, 1 (11.1 percent) did not soil test, 5 (55.6 percent) soil tested once a year, 2 (22.2 percent) tested every 2 years and 1 (11.1 percent) soil tested once every 4 years. Five producers' primary source of family income was from other sources. Of these, 1 (20 percent) did not soil test, 2 (40 percent) tested once each year, and 2 (40 percent) tested once every 2 years. The primary source of family income and frequency of soil testing were not significantly related.

Chemical Weed Control

Four producers' primary source of family income was from the farm. Of these, all (100 percent) used recommended chemicals for weed control. Eight producers' family income was from non-farm sources. Of these, all (100 percent) used recommended chemicals. Four producers reported their primary source of family income was from other sources. All (100 percent) used recommended chemicals for weed control. A $\underline{X}^2$ value could not be computed.

Irrigation

Five producers' primary source of family income was the farm. Of these, all (100 percent) used irrigation. Ten producers' primary source of family income was reported to be non-farm. Of these, 2

(20 percent) did not use irrigation and 8 (80 percent) did. Five producers' primary source of family income came from other sources. Of these, 2 (40 percent) did not irrigate and 3 (60 percent) did use irrigation. Producers' primary source of family income and irrigation were not significantly related.

Cultivars

Five producers' primary source of family income was the farm. Of these, 1 (20 percent) grew all recommended cultivars and 4 (80 percent) did not. Nine producers reported their primary source of family income to be non-farm. Of these, all (100 percent) grew at least some non-recommended cultivars. Four producers' primary source of family income was from other sources. All (100 percent) grew some non-recommended cultivars. The primary source of family income and use of recommended cultivars were not significantly related.

Mulching Materials

Five producers' primary source of family income was from the farm. Of these, all (100 percent) used recommended mulching materials. Ten producers' primary source of family income was non-farm. Of these, nine (90 percent) used recommended mulching materials and 1 (10 percent) did not. Five producers reported their primary source of family income as other. Of these, 4 (80 percent) used recommended mulching materials and 1 (20 percent) did not. The producers' primary source of family income and their use of recommended mulching materials were not significantly related.

Soil Test Prior to Planting

Five producers reported their primary source of family income as farm. Of these, 2 (40 percent) did not soil test prior to planting, and 3 (60 percent) did so. Ten producers' primary source of family income was non-farm. Of these, 1 (10 percent) did not soil test before planting and 9 (90 percent) did. Five producers reported their primary source of family income to be other. Of these, 1 (20 percent) did not soil test prior to planting and 4 (80 percent) did so. The producers' primary source of family income and soil testing prior to planting were not significantly related.

Total Number of Tennessee Extension Recommended Practices Used

The five producers' primary source of family income was reported as farm. Of these, 2 (40 percent) used 5 to 7 of the practices and 3 (60 percent) used between 8 and 10 practices. Ten producers reported their primary source of family income to be non-farm. Of these, 6 (60 percent) used between 5 and 7 Tennessee Extension recommended practices and 4 (40 percent) used 8 to 10 recommended practices. Five producers reported their primary source of family income as other. Of these, 1 (20 percent) used 4 or less recommended practices, 1 (20 percent) used 5 to 7 such practices and 3 (60 percent) used 8 to 10 Tennessee Extension recommended practices. The primary source of family income and the total number of Tennessee Extension recommended practices were not significantly related.

Summary

No significant relationships were found between the use of blueberry production practices of age of plant at setting, container size, mulch depth, nitrogen/acre on mature plant, frequency of soil test, chemical weed control, irrigation, cultivars, mulching materials, soil test prior to planting, the total number of Tennessee Extension recommended practices used and primary source of family income.

III. RELATIONSHIPS BETWEEN PERCENT FARM INCOME FROM BLUEBERRIES AND THE USE OF TEN TENNESSEE PRODUCTION PRACTICES

The purpose of this section was to report findings regarding relationships between the percent of farm income from blueberries and the use of 10 production practices by Tennessee blueberry producers. The section is divided into 11 sub-sections. These sub-sections are: age of plant at setting, container size, average depth of mulch, nitrogen/acre on mature plants, frequency of soil test, chemical weed control, irrigation, cultivars, mulching materials, soil test prior to planting, and total number of Tennessee Extension recommended practices used. The $\underline{X}^2$ test was used to determine the strength of the relationships between these variables.

Age of Plant at Setting

Findings presented in Table X indicate that 7 producers reported less than 10 percent of their farm income was from blueberries. Of these, 1 (14.3 percent) set plants 1 year old or less, 5 (71.4 percent)

TABLE X

RELATIONSHIPS BETWEEN FARM INCOME FROM BLUEBERRIES AND THE USE OF TEN TENNESSEE PRODUCTION PRACTICES

Production Practice	Percent Farm Income From Blueberries						χ^2 Value	P Level
	Under 10		10-25		50-100			
	N	%	N	%	N	%		
Age of Plants at Setting							0.99	0.91
1 Year or Less	1	14.3	1	20				
2 Years*	5	71.4	3	60	3	75		
3 Years	1	14.3	1	20	1	25		
Container Size							0.80	0.67
1 Gallon or Less*	4	80	4	80	1	50		
2-3 Gallons	1	20	1	20	1	50		
Average Mulch Depth							0.97	0.61
Less Than 6"	2	28.6	1	20	2	50		
6" or More*	5	71.4	4	80	2	50		
Nitrogen/Acre Mature Plants							3.20	0.20
30 Pounds or Less					1	25		
More Than 30 Pounds*	7	100	5	100	2	75		
Frequency of Soil Test							13.04	0.04
None	2	28.6						
Once/Year*	3	42.9	4	80				
Once/2 Years	2	28.6	1	20	1	33.3		
Once/4 Years or More					2	67.7		

TABLE X (continued)

Production Practice	Percent Farm Income From Blueberries: Under 10 N	Under 10 %	10-25 N	10-25 %	50-100 N	50-100 %	X^2 Value	P Level
Chemical Weed Control Use Recommended Chemicals*	5	100	5	100	4	100		NA**
Irrigation							1.69	0.42
None Used	2	28.6			1	25		
Irrigated*	5	71.4	5	100	3	75		
Cultivars							6.46	0.03
Grew Recommended Cultivars*					1	50		
Grew Non-Recommended Cultivars	7	100	5	100	1	50		
Mulching Materials							1.82	0.40
Used Recommended Materials*	7	100	4	80	3	75		
Did Not Use Recommended Materials			1	20	1	25		
Soil Test Prior to Planting							3.80	0.14
No	1	14.3			2	50		
Yes*	6	85.7	5	100	2	50		

TABLE X (continued)

Production Practice	Percent Farm Income From Blueberries						X^2 Value	P Level
	Under 10		10-25		50-100			
	N	%	N	%	N	%		
Total Number of Tennessee Recommended Practices Used							3.79	0.43
4 or Less					1	25		
5-7	4	57.1	2	40	2	50		
8-10	3	42.9	3	60	1	25		

*Indicates Tennessee Extension Recommended Practice.

**Does not apply.

set plants 2 years old and 1 (14.3 percent) set 3 year old plants. Five producers reported that between 10 percent and 25 percent of their farm income was from blueberries. Of these, 1 (20 percent) set plants 1 year old or less, 3 (60 percent) set 2 year old plants and 1 (20 percent) set 3 year old plants. Four producers reported that 50 percent to 100 percent of their farm income was from blueberries. Of these, 3 (75 percent) set a 2 year old plant and 1 (25 percent) set 3 year old plants. Percent farm income from blueberries and the age of plants at setting were not significantly related.

Container Size

Five producers reported that less than 10 percent of their farm income was from blueberries. Of these, 4 (80 percent) set plants from a container 1 gallon or less in size and 1 (20 percent) set plants from a container 2 to 3 gallons in size. Five producers had 10 percent to 25 percent of their farm income from blueberries. Of these, 4 (80 percent) set from a container 1 gallon or less and 1 (20 percent) used a 2 to 3 gallon container. Two producers had 50 percent to 100 percent of their farm income from blueberries. Of these, 1 (50 percent) set plants from a container 1 gallon or less and 1 (50 percent) set from a container 2 to 3 gallon in size. Percent farm income from blueberries and the size of containers used were not significantly related.

Average Mulch Depth

Seven producers had less than 10 percent of their farm income from blueberries. Of these, 2 (28.6 percent) used less than 6" of

mulch and 5 (71.4 percent) used 6" or more of mulch. Five producers had from 10 percent to 25 percent of their farm income from blueberries. Of these, 1 (20 percent) used less than 6" of mulch and 4 (80 percent) used more than 6". Four producers had from 50 percent to 100 percent of their family income from blueberries. Of these, 2 (50 percent) used less than 6" of mulch and 2 (50 percent) used more than 6". Percent farm income from blueberries and average mulch depth were not significantly related.

Nitrogen/Acre on Mature Plants

Seven producers had less than 10 percent of their farm income from blueberries. All (100 percent) used more than 30 pounds/acre of nitrogen on mature plants. Five producers had from 10 percent to 25 percent of their farm income from blueberries. Of these, all (100 percent) used more than 30 pounds/acre of nitrogen on mature plants. Four producers had from 50 percent to 100 percent of their farm income from blueberries. Of these, 1 (25 percent) used less than 30 pounds/acre of nitrogen on mature plants and 3 (75 percent) used more than 30 pounds/acre. Percent farm income from blueberries and pounds of nitrogen/acre on mature plants were not significantly related.

Frequency of Soil Test

Seven producers had less than 10 percent of their farm income from blueberries. Of these, 2 (28.6 percent) did not soil test, 3 (42.9 percent) tested once/year, and 2 (28.6 percent) tested every

2 years. Five producers had from 10 percent to 25 percent of their farm income from blueberries. Of these, 4 (80 percent) soil tested once a year, and 1 (20 percent) tested once every 2 years. Three producers had from 50 percent to 100 percent of their farm income from blueberries. Of these, 1 (33.3 percent) soil tested once every 2 years and 2 (67.7 percent) tested once every 4 years or more. The frequency which producers had their soil tested was significantly related to the percent of their income which came from the sale of blueberries. Frequency of soil testing tended to decrease as the percent of farm income from blueberries increased.

Chemical Weed Control

Five producers had less than 10 percent of their farm income from blueberries. Of these, all (100 percent) used recommended chemicals. Five producers had from 10 percent to 25 percent of their farm income from blueberries. Of these, all (100 percent) used recommended weed control chemicals. Four producers had from 50 percent to 100 percent of their farm income from blueberries. Of these, all (100 percent) used recommended chemicals. A $\underline{X}^2$ value could not be computed.

Irrigation

Seven producers had less than 10 percent of their farm income from blueberries. Of these, 2 (28.6 percent) did not irrigate and 5 (71.4 percent) did irrigate. Five producers had from 10 percent to 25 percent of their farm income from blueberries. Of these, all

(100 percent) irrigated. Four producers had from 50 percent to 100 percent of their farm income from blueberries. Of these, 1 (25 percent) did not irrigate and 3 (75 percent) irrigated. The percent farm income producers reported receiving from blueberries and the use of irrigation were not significantly related.

Cultivars

Seven producers had less than 10 percent of their farm income from blueberries and all (100 percent) grew non-recommended cultivars. Five producers had from 10 percent to 25 percent of their farm income from blueberries. Of these, all (100 percent) grew non-recommended cultivars. Two producers had from 50 percent to 100 percent of their farm income from blueberries. Of these, 1 (50 percent) grew recommended cultivars and 1 (50 percent) grew non-recommended cultivars. The percent of farm income producers received from blueberries and their use of recommended cultivars were significantly ($P<.03$) related. Use of recommended cultivars tended to increase as the percent of farm income received from blueberries increased.

Mulching Materials

Seven producers had less than 10 percent of their farm income from blueberries. Of these, all (100 percent) used the recommended mulching materials. Five producers had from 10 percent to 25 percent of their farm income from blueberries. Of these, 4 (80 percent) used recommended mulching materials and 1 (20 percent) did not. Four producers had from 50 percent to 100 percent of their farm income from

blueberries. Of these, 3 (75 percent) used recommended materials and 1 (25 percent) did not. Percent of farm income producers received from blueberries and their use of recommended mulching materials were not significantly related.

Soil Test Prior to Planting

Seven producers had less than 10 percent of their farm income from blueberries. Of these, 1 (14.3 percent) did not soil test prior to planting and 6 (85.7 percent) did so. Five producers had from 10 percent to 25 percent of their farm income from blueberries. Of these, all (100 percent) soil tested prior to planting. Four producers had from 50 percent to 100 percent of their farm income from blueberries. Of these, 2 (50 percent) did not soil test prior to planting and 2 (50 percent) did soil test prior to planting. The percent of farm income producers reported receiving from blueberries and soil testing prior to planting were not significantly related.

Total Number of Tennessee Extension Practices Used

Seven producers reported less than 10 percent of their farm income from blueberries. Of these, 4 (57.1 percent) used between 5 and 7 of the 10 recommended practices and 3 (42.9 percent) used from 8 to 10 of the practices. Five producers received from 10 percent to 25 percent of their farm income from blueberries. Of these, 2 (40 percent) used from 5 to 7 of the recommended practices and 3 (60 percent) used from 8 to 10 such practices. Four producers received from

50 percent to 100 percent of their farm income from blueberries. Of these, 1 (25 percent) used 4 practices or less, 2 (50 percent) used from 5 to 7 of the recommended practices and 1 (25 percent) used from 8 to 10 of the practices. The percent farm income from blueberries and the total number of Tennessee Extension recommended practices used were not significantly related.

Summary

Two production practices showed significant relationships to the percent of farm income producers received from blueberry sales. They were frequency of soil testing and varieties used. There was no significant relationships between percent of farm income and age of plant at setting, container size, average mulch depth, pounds of nitrogen/acre on mature plants, chemical weed control, irrigation, mulching materials, soil test prior to planting or the total number of Tennessee Extension recommended practices used.

IV. RELATIONSHIPS BETWEEN EMPLOYMENT STATUS OF TENNESSEE BLUEBERRY PRODUCERS AND THE USE OF TEN TENNESSEE PRODUCTION PRACTICES

The purpose of this section was to report findings regarding relationships between employment status and the use of 10 production practices by Tennessee blueberry producers. This section is divided into 11 sub-sections. The sub-sections are: age of plant at setting, container size, average mulch depth, nitrogen/acre on mature plants,

frequency of soil test, chemical weed control, irrigation, cultivars, mulching materials, soil test prior to planting and total number of Tennessee Extension recommended practices used. The X^2 test was used to determine the strength of relationships between the dependent and independent variables.

Age of Plant at Setting

Table XI indicates that 13 producers were not employed off the farm. Of these, 1 (7.7 percent) set plants 1 year old or less, 11 (84.6 percent) set 2 year old plants and 1 (7.7 percent) set 3 year old plants. Two producers were employed under 10 hours/week off the farm. Of these, 1 (50 percent) set 1 year old plants and 1 (50 percent) set 2 year old plants. Five producers were employed from 30 to 40 hours/week off the farm. Of these, 3 (60 percent) set 2 year old plants and 2 (40 percent) set 3 year old plants. Employment status of blueberry producers and age of plants at setting were not significantly related.

Container Size

Nine producers were not employed off the farm. Of these, 8 (88.9 percent) set plants from containers 1 gallon or less in size and 1 (11.1 percent) set plants from 2 to 3 gallon containers. One producer worked under 10 hours per week off the farm. This producer (100 percent) set plants from a 1 gallon or less container. Five producers were employed from 30 to 40 hours per week off the farm. Of these, 3 (60 percent) set plants from 1 gallon or less containers

TABLE XI

RELATIONSHIPS BETWEEN EMPLOYMENT STATUS OF TENNESSEE BLUEBERRY PRODUCERS AND THE USE OF TEN TENNESSEE PRODUCTION PRACTICES

Production Practice	Employment Status of Producers-Hours Off Farm						X^2 Value	P Level
	None		Under 10		30-40			
	N	%	N	%	N	%		
Age of Plant at Setting							7.09	0.13
1 Year or Less	1	7.7	1	50				
2 Years*	11	84.6	1	50	3	60		
3 Years	1	7.7			2	40		
Container Size							1.94	0.37
1 Gallon or Less*	8	88.9	1	100	3	60		
2-3 Gallons	1	11.1			2	40		
Average Mulch Depth							0.96	0.61
Less Than 6"	4	30.8			1	20		
6" or More*	9	69.2	1	100	4	80		
Nitrogen/Acre Mature Plant							0.56	0.75
30 Pounds or Less	1	7.7						
More Than 30 Pounds*	12	92.3	2	100	5	100		
Frequency of Soil Test							7.75	0.25
None	3	23.1	1	50				
Once/Year*	5	38.5			4	100		
Once/2 Years	3	23.1	1	50				
Once/4 Years or More	2	15.4						

TABLE XI (continued)

Production Practice	Employment Status of Producers-Hours Off Farm: None N	None %	Under 10 N	Under 10 %	30-40 N	30-40 %	χ^2 Value	P Level
Chemical Weed Control							NA**	
Used Recommended Chemicals*	10	100	1	100	5	100		
Irrigation							2.45	0.29
None Used	3	23.1	1	50				
Irrigated*	10	76.9	1	50	5	100		
Cultivars							0.67	0.71
Grew Recommended Cultivars	1	9.1						
Grew Non-Recommended Cultivars	10	90.9	2	100	5	100		
Mulching Materials							0.85	0.65
Used Recommended Materials*	12	92.3	2	100	4	80		
Did Not Use Recommended Materials	1	7.7			1	20		
Soil Test Prior to Planting							2.69	0.26
No	4	30.8						
Yes*	9	69.2	2	100	5	100		

TABLE XI (continued)

Production Practice	Employment Status of Producers-Hours Off Farm: None N	None %	Under 10 N	Under 10 %	30-40 N	30-40 %	Value	Level
Total Number of Tennessee Recommended Practices Used							0.72	0.94
4 or Less	1	7.7						
5-7	6	46.2	1	50	2	40		
8-10	6	46.2	1	50	3	60		

*Indicates Tennessee Extension Recommended Practice.

**Does not apply.

and 2 (40 percent) set plants from containers 2 to 3 gallons in size. Employment status of producers and size of containers in which plants were purchased were not significantly related.

Average Mulch Depth

Thirteen producers were not employed off the farm. Of these, 4 (30.8 percent) used less than 6" of mulch and 9 (69.2 percent) used 6" or more. Two producers worked less than 10 hours/week off the farm. All (100 percent) used more than 6" of mulch. Five producers were employed from 30 to 40 hours/week off the farm. Of these, 1 (20 percent) used less than 4" of mulch and 4 (80 percent) used more than 6". Employment status of producers and average mulch depth used were not significantly related.

Nitrogen/Acre on Mature Plants

Thirteen producers were not employed off the farm. Of these, 1 (7.7 percent) used less than 30 pounds of nitrogen/acre and 12 (92.3 percent) used more than 30 pounds. Two producers were employed less than 10 hours/week off the farm. Of these, both (100 percent) used more than 30 pounds/acre of nitrogen on mature plants. Five producers worked from 30 to 40 hours/week off the farm. Of these, all (100 percent) used more than 30 pounds/acre of nitrogen on mature plants. Employment status of producers and pounds of nitrogen applied per acre on mature plants were not significantly related.

Frequency of Soil Test

Thirteen producers were not employed off the farm. Of these, 3 did not soil test, 5 (38.5 percent) tested once/year, 3 (23.1 percent) tested once/2 years, and 2 (15.4 percent) tested once every 4 years or more. Two producers were employed less than 10 hours/week off the farm. Of these, 1 (50 percent) soil tested every two years. Four producers were employed from 30 to 40 hours/week off the farm. Of these, all (100 percent) soil tested every year. Employment status of producers and frequency of soil testing were not significantly related.

Chemical Weed Control

Ten producers were not employed off the farm. All these producers used recommended chemicals for weed control. One producer was employed less than 10 hours/week off the farm. The producer (100 percent) also used recommended chemicals. Five producers were employed from 30 to 40 hours/week off the farm. All (100 percent) of these producers used recommended chemicals. A X^2 value could not be computed.

Irrigation

Thirteen producers were not employed off the farm. Of these, 3 (23.1 percent) did not irrigate and 10 (76.9 percent) irrigated. Two producers were employed less than 10 hours/week off the farm. Of these, 1 (50 percent) did not irrigate and 1 (50 percent) irrigated. Five producers were employed from 30 to 40 hours/week off the farm.

Of these, all (100 percent) irrigated. Employment status of the producers and their use of irrigation were not significantly related.

Cultivars

Eleven producers were not employed off the farm. Of these, 1 (9.1 percent) grew only recommended cultivars and 10 (90.6 percent) grew some non-recommended cultivars. Two producers were employed less than 10 hours/week off the farm. Of these, both (100 percent) grew some non-recommended cultivars. Five producers were employed from 30 to 40 hours per week off the farm. All (100 percent) grew some non-recommended cultivars. Employment status and cultivars grown were not significantly related.

Mulching Materials

Thirteen producers were not employed off the farm. Of these, 12 (92.3 percent) used recommended mulching materials and 1 (7.7 percent) did not. Two producers were employed less than 10 hours/week off the farm. Of these, all (100 percent) used recommended mulching materials. Five producers were employed from 30 to 40 hours/week off the farm. Of these, 4 (80 percent) used recommended mulching materials and 1 (20 percent) did not. Employment status of producers and their use of mulching materials were not significantly related.

Soil Test Prior to Planting

Thirteen producers were not employed off the farm. Of these, 4 (30.8 percent) did not soil test prior to planting and 9 (69.2 percent) did so. Two producers were employed less than 10 hours/week off the

farm. Both (100 percent) soil tested prior to planting. Five producers were employed from 30 to 40 hours/week off the farm. All (100 percent) soil tested prior to planting. Employment status of producers and their use of soil testing prior to planting were not significantly related.

Total Number of Tennessee Extension Recommended Practices Used

Thirteen producers were not employed off the farm. Of these, 1 (7.7 percent) used 4 or less of the recommended practices, 6 (46.2 percent) used from 5 to 7 and 6 (46.2 percent) used from 8 to 10 practices. Two producers were employed less than 10 hours/week off the farm. Of these, 1 (50 percent) used from 5 to 7 recommended practices and 1 (50 percent) used from 8 to 10 practices. Five producers were employed from 30 to 40 hours/week. Of these, 2 (40 percent) used from 5 to 7 recommended practices and 3 (60 percent) used between 8 and 10 practices. The total number of recommended blueberry practices used and employment status of producers were not significantly related.

Summary

Application of the $\underline{X}^2$ test showed no significant relationships between the employment status of producers and their use of the production practices of age of plant at setting, container size, average mulch depth, nitrogen/acre on mature plants, frequency of soil test, chemical weed control, irrigation, cultivars, mulching materials, and soil test prior to planting. In addition, there was no significant

relationship between employment status and the total number of Tennessee Extension recommended blueberry production practices used.

V. RELATIONSHIPS BETWEEN ACRES OWNED AND RENTED AND THE USE OF TEN TENNESSEE PRODUCTION PRACTICES

The purpose of this section was to report findings regarding relationships between the number of acres managed (owned and rented) and the use of 10 production practices used by Tennessee blueberry producers. The section is divided into 11 sub-sections. These sub-sections are: age of plant at setting, container size, average mulch depth, nitrogen/acre on mature plants, frequency of soil test, chemical weed control, irrigation, cultivars, mulching materials, soil test prior to planting, and total number of Tennessee Extension recommended practices used. The $\underline{X}^2$ test was used to determine the strength of relationships.

Age of Plant at Setting

Table XII indicates that 6 producers managed between 13 and 57 acres. Of these, 2 (33.3 percent) set 1 year old or less plants, 3 (50 percent) set 2 year old plants and 1 (16.7 percent) set 3 year old plants. Eight producers manage from 65 to 108 acres. Of these, 7 (87.5 percent) set 2 year old plants and 1 (12.5 percent) set 3 year old plants. Six producers manage from 110 to 888 acres. Of these, 5 (83.3 percent) set 2 year old plants and 1 (16.7 percent) set 3 year old plants. Acres owned and rented by producers and the age of plant at setting were not significantly related.

TABLE XII

RELATIONSHIPS BETWEEN ACRES OWNED AND RENTED AND THE USE OF TEN TENNESSEE PRODUCTION PRACTICES

Production Practice	Acres Owned/Rented by Producer 13-57 N	%	65-108 N	%	110-888 N	%	X^2 Value	P Level
Age of Plant at Setting							5.44	0.24
1 Year or Less	2	33.3						
2 Years*	3	50	7	87.5	5	83.3		
3 Years	1	16.7	1	12.5	1	16.7		
Container Size							0.10	0.94
1 Gallon or Less*	3	75	5	83.3	4	80		
2-3 Gallons	1	25	1	16.7	1	20		
Average Mulch Depth							2.88	0.23
Less Than 6"	2	33.3	3	37.5				
6" or More*	4	66.7	5	62.5	6	100		
Nitrogen/Acre, Mature Plants							2.45	0.29
30 Pounds or Less					1	16.7		
More Than 30 Pounds*	6	100	8	100	5	83.3		
Frequency of Soil Test							14.7	0.02
None			4	50				
Once/Year*	1	20	3	37.5	5	83.3		
Once/2 Years	3	60	1	12.5				
Once/4 Years or More	1	20			1	16.7		

TABLE XII (continued)

Production Practice	Acres Owned/Rented by Producer 13-57 N	13-57 %	65-108 N	65-108 %	110-888 N	110-888 %	X^2 Value	P Level
Chemical Weed Control							NA**	
Used Recommended Chemicals*	5	100	7	100	4	100		
Irrigation							0.98	0.60
None Used	2	33.3	1	12.5	1	16.7		
Irrigated*	4	66.7	7	87.5	5	83.3		
Cultivars							2.11	0.35
Grew Recommended Cultivars*					1	16.7		
Grew Non-Recommended Cultivars	4	100	8	100	5	83.3		
Mulching Materials							1.48	0.47
Used Recommended Materials*	5	83.3	8	100	5	83.3		
Did Not Used Recommended Materials	1	16.7			1	16.7		
Soil Test Prior to Planting							0.20	0.90
No	1	16.7	2	25	1	16.7		
Yes*	5	83.3	6	75	5	83.3		

TABLE XII (continued)

Production Practice	Acres Owned/Rented by Producer 13-57 N	%	65-108 N	%	110-888 N	%	X^2 Value	P Level
Total Number of Tennessee Extension Recommended Practices Used							3.08	0.54
4 or Less	1	16.7						
5-7	3	50	3	37.5	3	50		

*Indicates Tennessee Extension Recommended Practice.

**Does not apply.

Container Size

Four producers managed between 13 and 57 acres. Of these, 3 (75 percent) set plants from containers 1 gallon or less in size and 1 (25 percent) set plants from 2 to 3 gallon containers. Six producers managed from 65 to 108 acres. Of these, 5 (83.3 percent) set plants from 1 gallon or less containers and 1 (16.7 percent) set plants from 2 to 3 gallon containers. Five producers managed from 110 to 888 acres. Of these, 4 (80 percent) set plants from 1 gallon or less containers and 1 (20 percent) set plants from 2 to 3 gallon containers. Acres owned and rented by producers and container size were not significantly related.

Average Mulch Depth

Six producers managed between 13 and 57 acres. Of these, 2 (33.3 percent) used less than 6" of mulch and 4 (66.7 percent) used more than 6" of mulch. Eight producers managed between 65 and 108 acres. Of these, 3 (37.5 percent) used less than 6" of mulch and 5 (62.5 percent) used 6" or more. Six producers managed between 110 and 888 acres. All (100 percent) used 6" or more of mulch. Acres owned and rented by producers and average mulch depth were not significantly related.

Nitrogen/Acre, Mature Plants

Six producers managed between 13 and 57 acres. All (100 percent) used more than 30 pounds of nitrogen/acre on mature plants. Eight producers managed from 65 to 108 acres. All 8 (100 percent) used

more than 30 pounds of nitrogen/acre on mature plants. Six producers managed between 110 and 888 acres. Of these, 1 (16.7 percent) used less than 30 pounds of nitrogen/acre on mature plants and 5 (83.3 percent) used more. Acres owned and rented by producers and pounds of nitrogen applied per acre to mature plants were not significantly related.

Frequency of Soil Test

Five producers managed between 13 and 57 acres. Of these, 1 (20 percent) soil tested every year, 3 (60 percent) tested every 2 years and 1 (20 percent) tested once every 4 years or more. Eight producers managed between 65 and 108 acres. Of these, 4 (50 percent) did not soil test, 3 (37.5 percent) soil tested once a year, and 1 (12.5 percent) tested every 2 years. Six producers managed between 110 and 888 acres. Of these 5 (83.3 percent) soil tested once a year and 1 (16.7 percent) tested once a year and 1 (16.7 percent) tested once every 4 years or more. Frequency of soil test was significantly related to acres of land owned and/or rented by the producers. Frequency of soil testing increased with the acres of land operated by the blueberry producers.

Chemical Weed Control

Five producers managed between 13 and 57 acres. All (100 percent) used recommended chemicals. Seven producers managed between 65 and 108 acres and all (100 percent) used recommended chemicals. Four producers managed between 110 and 888 acres. All (100 percent) used recommended weed control chemicals. A $\underline{X}^2$ value could not be computed.

Irrigation

Six producers managed between 13 and 57 acres. Of these, 2 (33.3 percent) did not irrigate and 4 (66.7 percent) irrigated. Eight producers managed between 65 and 108 acres. Of these, 1 (12.5 percent) did not irrigate and 7 (87.5 percent) did irrigate. Six producers managed between 110 and 888 acres. Of these, 1 (16.7 percent) did not irrigate and 5 (83.3 percent) irrigated. Acres owned and rented and irrigation were not significantly related.

Cultivars

Four producers managed between 13 and 57 acres. All (100 percent) grew some non-recommended cultivars. Eight producers managed 65 to 110 acres. All (100 percent) grew some non-recommended cultivars. Six producers managed between 110 and 888 acres. Of these, 1 (16.7 percent) grew all recommended cultivars and 5 (83.3 percent) grew some non-recommended cultivars. Acres owned and rented and cultivars are not significantly related.

Mulching Materials

Six producers managed between 13 and 57 acres. Of these, 5 (83.3 percent) used recommended mulching materials and 1 (16.7 percent) did not. Eight producers managed from 65 to 108 acres. All (100 percent) used recommended mulching materials. Six producers managed between 110 and 888 acres. Of these, 5 (83.3 percent) used recommended mulching materials and 1 (16.7 percent) did not. Acres owned and rented by the producers and mulching materials used were not significantly related.

Soil Test Prior to Planting

Six producers managed between 13 and 57 acres. Of these, 1 (16.7 percent) did not soil test prior to planting and 5 (83.3 percent) did so. Eight producers managed from 65 to 108 acres. Of these, 2 (25 percent) did not soil test prior to planting and 6 (75 percent) did so. Six producers managed between 110 and 888 acres. Of these, 1 (16.7 percent) did not soil test prior to planting and 5 (83.3 percent) did soil test prior to planting. Acres owned and rented by the producers and soil testing prior to planting were not significantly related.

Total Number of Tennessee Extension Recommended Practices Used

The Tennessee Extension practices considered are those asterisked in Table XII. Six producers managed from 13 to 57 acres. Of these, 1 (16.7 percent) used 4 recommended practices or less, 3 (50 percent) used between 5 and 7 practices and 2 (33.3 percent) used 8 to 10 recommended practices. Eight producers managed from 65 to 108 acres. Of these, 3 (37.5 percent) used from 5 to 7 recommended practices and 5 (62.5 percent) used between 8 and 10 recommended practices. Six producers managed 110 to 888 acres. Of these, 3 (50 percent) used from 5 to 7 recommended practices and 3 (50 percent) used from 8 to 10 Tennessee Extension recommended practices. Acres owned and rented by the producers and the number of Tennessee Extension recommended practices used were not significantly related.

Summary

Application of the $\underline{X}^2$ test showed no significant relationship between acres owned and rented by the blueberry producers and the use of the following production practices: age of plant set, container size, average mulch depth, nitrogen/acre on mature plants, chemical weed control, irrigation, cultivars, mulching materials and soil test prior to planting. The number of Tennessee Extension recommended practices used by the producers and acres owned and rented were not significantly related. The $\underline{X}^2$ test did show a direct significant relationship between acres owned and rented and the frequency of soil testing.

VI. RELATIONSHIPS BETWEEN ACRES OF BLUEBERRIES AND THE USE OF TEN TENNESSEE PRODUCTION PRACTICES

The purpose of this section was to report findings regarding relationships between acres of blueberries managed and the use of 10 production practices by Tennessee blueberry producers. The section is divided into 11 sub-sections as follows: age of plant set, container size, average mulch depth, nitrogen/acre on mature plants, frequency of soil test, chemical weed control, irrigation, cultivars, mulching materials, soil test prior to planting, and the total number of Tennessee Extension recommended practices used.

Age of Plant at Setting

Table XIII indicates that four producers managed 1 acre or less of blueberries. Of these, 1 (25 percent) set 1 year old plants

TABLE XIII

RELATIONSHIPS BETWEEN ACRES OF BLUEBERRIES AND THE USE OF TEN TENNESSEE PRODUCTION PRACTICES

Production Practice	Acres of Blueberries/Producer						X^2 Value	P Level
	One or Less		1.5-3.0		3.01-13.0			
	N	%	N	%	N	%		
Age of Plant at Setting							2.36	0.66
1 Year or Less	1	25	1	10				
2 Years*	3	75	7	70	5	83.3		
3 Years			2	20	1	16.7		
Container Size							0.93	0.62
1 Gallon or Less*	3	100	6	75	3	75		
2-3 Gallons			2	25	1	25		
Average Mulch Depth							2.75	0.25
Less Than 6"			4	40	1	16.7		
6" or More*	4	100	6	60	5	83.3		
Nitrogen/Acre, Mature Plant							2.45	0.29
30 Pounds or Less					1	16.7		
More Than 30 Pounds*	4	100	10	100	5	83.3		
Frequency of Soil Test							3.87	0.69
None	2	50	1	10	1	20		
Once/Year*	1	25	6	60	2	40		
Once/2 Years	1	25	2	20	1	20		
Once/4 Years or More			1	10	1	20		

TABLE XIII (continued)

Production Practice	Acres of Blueberries/Producer: One or Less N	One or Less %	1.5-3.0 N	1.5-3.0 %	3.01-13.0 N	3.01-13.0 %	χ^2 Value	P Level
Chemical Weed Control							NA**	
Used Recommended Chemicals*	2	100	9	100	5	100		
Irrigation							0.10	0.94
None Used	1	25	2	20	1	16.7		
Irrigated*	3	75	8	80	5	83.3		
Cultivars							2.11	0.34
Grew Recommended Cultivars*					1	16.7		
Grew Non-Recommended Cultivars	4	100	8	100	5	83.3		
Mulching Materials							0.74	0.69
Used Recommended Materials*	4	100	9	90	5	83.3		
Did Not Use Recommended Materials			1	10	1	16.7		
Soil Test Prior to Planting							1.66	0.43
No			2	20	2	33.3		
Yes*	4	100	8	80	4	66.7		

TABLE XIII (continued)

Production Practice	Acres of Blueberries/Producer						χ^2 Value	P Level
	One or Less		1.5-3.0		3.01-13.0			
	N	%	N	%	N	%		
Total Number of Tennessee Extension Recommended Practices Used							2.87	0.57
4 or Less			1	10				
5-7	1	25	4	40	4	66.7		
8-10	3	75	5	50	2	33.3		

*Indicates Tennessee Extension Recommended Practice.

**Does not apply.

or less and 3 (75 percent) set 2 year old plants. Ten producers managed from 1.5 to 3.0 acres of blueberries. Of these, 1 (10 percent) set plants 1 year old or less, 7 (70 percent) set 2 year old plants and 2 (20 percent) set 3 year old plants. Six producers managed 3.01 to 13 acres of blueberries. Of these, 5 (83.3 percent) set 2 year old plants and 1 (16.7 percent) set 3 year old plants. Acres of blueberries grown and age of plant at setting were not significantly related.

Container Size

Three producers managed 1 acre of blueberries or less. All (100 percent) of these producers set plants from containers 1 gallon or less in size. Eight producers managed between 1.5 and 3.0 acres of blueberries. Of these, 6 (75 percent) set plants from containers 1 gallon or less in size and 2 (25 percent) set plants from 2 to 3 gallon containers. Four producers managed from 3.01 to 13 acres of blueberries. Of these, 3 (75 percent) set plants from 1 gallon or less containers and 1 (25 percent) set from 2 to 3 gallon containers. Acres of blueberries grown and container size were not significantly related.

Average Mulch Depth

Four producers managed 1 acre or less of blueberries. All (100 percent) of these used 6" or more of mulch. Ten producers managed 1.5 to 3.0 acres of blueberries. Of these, 4 (40 percent) used less than 6" of mulch and 6 (60 percent) used 6 or more inches of mulch.

Six producers managed between 3.01 and 13.0 acres of blueberries. Of these, 1 (16.7 percent) used less than 6" of mulch and 5 (83.3 percent) used 6" or mulch or more. Acres of blueberries grown and average mulch depth were not significantly related.

Nitrogen/Acre, Mature Plants

Four producers managed 1 acre or less of blueberries. All (100 percent) of these used more than 30 pounds/acre of nitrogen on mature plants. Ten producers managed from 1.5 to 3.0 acres of blueberries. All (100 percent) of these used more than 30 pounds of nitrogen/acre on mature plants. Six producers managed from 3.01 to 13.0 acres of blueberries. Of these, 1 (16.7 percent) used less than 30 pounds/acre of nitrogen on mature plants and 5 (83.3 percent) used more than 30 pounds/acre of nitrogen on mature plants. Acres of blueberries grown and pounds of nitrogen applied per acre on mature plants were not significantly related.

Frequency of Soil Test

Four producers managed 1 acre or less of blueberries. Of these, 2 (50 percent) did not soil test, 1 (25 percent) tested once a year, and 1 (25 percent) tested once every 2 years. Ten producers managed 1.5 to 3.0 acres of blueberries. Of these, 1 (10 percent) did not soil test, 6 (60 percent) tested once a year, 2 (20 percent) soil tested every 2 years and 1 (10 percent) tested every 4 years or more. Five producers managed from 3.01 to 13 acres of blueberries. Of these, 1 (20 percent) did not soil test, 2 (40 percent) tested once a year,

1 (20 percent) tested every 2 years and 1 (10 percent) soil tested every 4 years or more. Acres of blueberries grown and frequency of soil testing were not significantly related.

Chemical Weed Control

Two producers managed 1 acre or less of blueberries. All (100 percent) of these used recommended herbicides. Nine producers managed from 1.5 to 3.0 acres of blueberries and all (100 percent) of these used recommended weed control chemicals. Five producers managed from 3.01 to 13 acres of blueberries and all (100 percent) of them used recommended herbicides. A X^2 value could not be computed.

Irrigation

Four producers managed 1 acre or less of blueberries. Of these, 1 (25 percent) did not irrigate and 3 (75 percent) irrigated. Ten producers managed from 1.5 to 3.0 acres of blueberries. Of these, 2 (20 percent) did not irrigate and 8 (80 percent) irrigated. Six producers managed from 3.01 to 13.0 acres. Of these, 1 (16.7 percent) did not irrigate and 5 (83.3 percent) did so. Acres of blueberries grown and use of irrigation were not significantly related.

Cultivars

Four producers managed 1 acre or less of blueberries. All (100 percent) of these grew some non-recommended cultivars. Eight producers managed from 1.5 to 3.0 acres of blueberries. All (100 percent) of these producers grew at least some non-recommended cultivars.

Six producers managed from 3.01 to 13 acres of blueberries. Of these, 1 (16.7 percent) grew all recommended cultivars and 5 (83.3 percent) grew at least some non-recommended cultivars. Acres of blueberries grown and cultivars used were not significantly related.

Mulching Materials

Four producers managed 1 acre or less of blueberries and used recommended mulching materials. Ten producers managed 1.5 to 3.0 acres of blueberries and 9 (90 percent) of them used recommended mulching materials and 1 (10 percent) used non-recommended materials. Six producers managed from 3.01 to 13 acres. Of these, 5 (83.3 percent) used recommended materials and 1 (16.7 percent) used non-recommended mulching materials. Acres of blueberries grown and mulching materials used were not significantly related.

Soil Test Prior to Planting

Four producers managed 1 acre or less of blueberries and they all soil tested prior to planting. Ten producers managed from 1.5 to 3.0 acres of blueberries. Of these, 2 (20 percent) did not soil test prior to planting and 8 (80 percent) did soil test prior to planting. Six producers managed from 3.01 to 13.0 acres of blueberries. Of these, 2 (33.3 percent) did not soil test prior to planting and 4 (66.7 percent) did soil test prior to planting. Acres of blueberries grown and soil test prior to planting were not significantly related.

Total Number of Tennessee Extension Recommended Practices Used

The Tennessee Extension practices considered are those asterisked in Table XIII. Four producers managed 1 acre or less of blueberries. Of these, 1 (25 percent) used from 5 to 7 recommended practices and 3 (75 percent) used from 8 to 10 of the recommended practices. Ten producers managed 1.5 to 3.0 acres of blueberries. Of these, 1 (10 percent) used 5 to 7 such practices and 5 (50 percent) used 8 to 10 recommended practices. Six producers managed 3.01 to 13.0 acres of blueberries. Of these, 4 (66.7 percent) used from 5 to 7 of the recommended practices and 2 (33.3 percent) used from 8 to 10. Acres of blueberries grown and the total number of Tennessee Extension recommended practices used were not significantly related.

Summary

Application of the $\underline{X}^2$ test showed no significant relationship between acres of blueberries grown and age of plant at setting, container size, average mulch depth, pounds of nitrogen applied per acre on mature plants, frequency of soil testing, chemical weed control method used, use of irrigation, cultivars planted, mulching materials used, soil test prior to planting and total number of Tennessee Extension recommended practices used.

CHAPTER V

SUMMARY OF MAJOR FINDINGS

I. PURPOSES AND SPECIFIC OBJECTIVES

Purpose

The major purpose of this study was to describe Tennessee blueberry producers, their farms, and marketing and production practices. It was believed that this information would assist Tennessee Extension Agents and Specialists in planning and implementing educational programs and information for current and potential commercial producers as well as home owners and gardners.

Specific Objectives

The specific objectives of this study were:

1. To describe Tennessee blueberry producers with regard to their personal and farm characteristics.

2. To describe Tennessee blueberry producers' production practices.

3. To describe Tennessee blueberry producers' marketing practices.

4. To determine relationships between Tennessee blueberry producers' plans for expansion and their personal and farm characteristics.

5. To determine relationships between Tennessee blueberry producers' personal and farm characteristics and yield.

6. To determine relationships between producers' use of 10 Tennessee production practices and yield per acre.

7. To rank according to frequency used, 10 selected Tennessee Extension recommended practices.

8. To determine relationships between the age of Tennessee blueberry producers and their use of 10 selected Tennessee production practices.

9. To determine relationships between the primary source of family income and use of 10 selected Tennessee production practices.

10. To determine relationships between the percent of total farm income from blueberries of Tennessee blueberry producers and their use of 10 selected Tennessee production practices.

11. To determine relationships between the employment status of Tennessee blueberry producers and their use of 10 selected Tennessee production practices.

12. To determine relationships between acres owned and rented by Tennessee blueberry producers and their use of 10 selected Tennessee production practices.

13. To determine relationships between acres of blueberries managed by Tennessee blueberry producers and their use of 10 selected Tennessee production practices.

II. METHODS AND PRACTICES

The population of this study included all blueberry producers in Tennessee who were managing at least one-half acre of berries for

commercial use. Twenty of the known 22 producers were surveyed in April of 1985. Producers were identified by the University of Tennessee Extension Plant and Soil Science Department and/or membership in the Tennessee Fruit and Vegetable Grower's Association.

The survey instrument was developed in cooperation with the University of Tennessee Extension Education and Extension Plant and Soil Science Department. This survey instrument was administered during a farm visit by the researcher with each identified producer and all data recorded.

Data were coded and punched on computer cards. Computations were made by the University of Tennessee Computing Center. The analysis of variance F test and X^2 test were used to determine the strength of relationships between variables. F values and X^2 values which achieved the .05 probability level were accepted as significant.

III. MAJOR FINDINGS

Major findings were classified and presented under headings related to the specific objectives of this study.

Characteristics of Tennessee Blueberry Producers and Their Farms

1. The mean age of Tennessee blueberry producers was 51 years.

2. Most producers' primary source of family income was from non-farm sources.

3. Tennessee blueberry producers averaged (mean) 9 hours/week of employment off the farm.

4. The mean percent of farm income received from blueberries was 27.

5. The majority of Tennessee's blueberry producers lived in upper East Tennessee.

6. The mean size of farm was 162 acres.

7. Producers had an average of 3.1 acres of blueberries established.

8. Producers had an average of 2.8 acres of blueberries in production.

9. The average yield of Tennessee blueberry was 1,338.4 pounds per acre in 1984.

Production Practices

Tennessee blueberry producers:

1. Grew six times as many rabbiteye as highbush type blueberries.

2. Grew Tifblue as their primary rabbiteye cultivar, followed by Climax, Woodard and Delite.

3. Grew Blueray as their primary highbush cultivar, followed by Bluecrop and Jersey.

4. Set primarily 2 year old plants that were container grown and purchased out-of-state.

5. Used sawdust as their principal mulching material applied 4" to 6" deep at planting and maintained at varying levels.

6. Applied an average of 54.1 pounds of nitrogen/year on mature plants, applied over 2.8 applications in the form of ammonium

sulfate. Mature plants received an average of 20 pounds each of K_2O and P_2O_5 applied over 1.3 applications banded around the plant. Immature plants received an average of 23 pounds of nitrogen spread over 2.2 applications and 10.3 pounds each of K_2O and P_2O_5 in 1.1 applications. Approximately one-third of the producers applied iron to mature plants as a foliar spray. Half the producers did not fertilize mature plants by soil test, while 40 percent did not fertilize immature plants by soil test. Most producers did not soil test annually, although 80 percent did test prior to planting. When pH needed adjusting prior to planting, the primary material used was elemental sulfur. Ammonium sulfate was most used to adjust pH on established plants.

7. Used herbicides as the primary means of weed control, utilizing a combination of herbicides.

8. Had no major insect problem.

9. Had no major bird problem.

10. Set plants most often on 6 foot centers in the row. Producers were evenly divided in row spacing between 10 feet and 12 feet.

11. Used trickle irrigation most often.

12. Did not prune in late summer.

13. Had no major disease problems or spray problems.

14. Primary source of production information was personal contacts with Extension Agents and Specialists.

Marketing Practices

1. Tennessee blueberry producers sold over 96 percent of their berries U-Pick.

2. The mean price received for blueberries was $0.80 per pound.

3. The harvest season in Tennessee ranged from June 11 to September 15.

4. Twice as many producers sold by weight as by volume.

5. Word-of-mouth was the primary means of advertising.

6. Sixty percent of Tennessee blueberry producers were members of the Tennessee Fruit and Vegetable Growers Association.

Plans for Expansion

1. Most producers with 3 acres or less of berries planned to expand.

2. Producers with more than 3 acres of berries had no expansion plan.

3. Personal and farm characteristics of age of producer, primary source of family income, hours worked off farm, total acres owned and rented and percent farm income from blueberries were not significantly related to plans for expansion.

Personal Characteristics and Yield

1. No significant relationships were found between the personal producer characteristics of age and primary source of income and yields.

2. No significant relationships were found between the farm characteristics of location and acres of blueberries and yields.

Production Practices and Yield

When taken individually the production practices of age of plant at setting, container size, average mulch depth, pounds of nitrogen applied on mature plants, pounds of potash and phosphate applied on mature plants, frequency of soil test, soil test prior to planting and use of irrigation were not significantly related to yields.

Frequency of Use of Ten Tennessee Extension Recommendations

Of the 10 selected Tennessee Extension recommended blueberry production practices, the most frequently used was the application of 30 pounds or more of nitrogen per acre per year on mature plants followed by use of recommended mulch, nitrogen applied in at least 3 increments per year, container size of 1 gallon or less, recommended herbicides used, soil test prior to planting, irrigation used, average mulch depth at planting was 6" or more, set 2 year old plant and soil test at least once each year.

Producer Age and Production Practices

No significant relationships were found between producer age and the use of the production practices of age of plant at setting, container size, mulch depth, nitrogen/acre on mature plants, frequency of soil test, chemical weed control, irrigation, cultivars, mulching

materials, soil testing prior to planting and the total number of Tennessee Extension recommended practices used.

Source of Income and Production Practices

No significant relationships were found between the use of the producer production practices of age of plant at setting, container size, mulch depth, nitrogen/acre on mature plants, frequency of soil test, chemical weed control, irrigation, cultivars, mulching materials, soil test prior to planting, the total number of Tennessee Extension recommended practices used and primary source of family income.

Percent Farm Income From Blueberries and Production Practices

Two production practices showed significant relationships to the percent farm income from blueberry plants. They were frequency of soil testing and use of recommended cultivars. There were no significant relationships between percent farm income and age of plant at setting, container size, average mulch depth, pounds of nitrogen/acre on mature plants, chemical weed control, irrigation, mulching materials, soil test prior to planting or the total number of Tennessee Extension recommended practices used.

Acres Owned and Rented and Production Practices

Applications of the $\underline{X}^2$ test showed no significant relationship between acres owned and rented and the use of the production practices of age of plant set, container size, average mulch depth, nitrogen/acre

on mature plants, chemical weed control, irrigation, cultivars, mulching materials and soil test prior to planting. The $\underline{X}^2$ value showed no significant relationship between the number of Tennessee Extension recommended practices used and acres owned and rented. The $\underline{X}^2$ test did show a direct significant relationship between acres owned and rented and the frequency of soil testing.

Acres of Blueberries and Production Practices Used

Application of the $\underline{X}^2$ test showed no significant relationship between acres of blueberries grown and age of plant at setting, container size, average mulch depth, nitrogen/acre on mature plants, frequency of soil testing, chemical weed control, irrigation, cultivars, mulching materials, soil test prior to planting, and total number of Tennessee Extension recommended practices used.

IV. IMPLICATIONS AND RECOMMENDATIONS

The following implications and recommendations are based upon the findings of the study and the experiences and views of the researcher.

1. The majority of Tennessee's blueberry producers were clustered around Nashville and Chattanooga and throughout East Tennessee. A great potential for new blueberry establishments exists then, throughout the rest of middle and west Tennessee, especially those of the U-Pick type. Extension should be aware of this potential when assisting certain clientele in these areas with enterprise decisions.

2. Producers with less than 3 acres of blueberries nearly all expressed plans for expansion. Producers with more than 3 acres indicated no expansion plans but at the same time did not indicate that they were dissatisfied with the extra acreage. Extension clientele should be aware of the tendency to expand to at least 3 acres. This implies special considerations in site selection, irrigation layout and water supply, marketing plans, and a variety of other production and establishment decisions.

3. The average yield per acre of blueberries grown in Tennessee in 1984 was 1,338.4 pounds. While results in other states and on Tennessee Experiment stations show vastly greater potential, the researcher feels that this figure may be more realistic for use as a base line for forcasting yield for producers planning on entering the market.

4. Because Tennessee producers grew six times as many rabbiteye type plants as highbush types, Extension needs to keep abreast of developments in rabbiteye culture. At the same time this also implies great potential for further highbush expansion. The extreme cold of January 1985 following a relatively warm December 1984 did serious damage to rabbiteye plants throughout Tennessee but did not affect the highbush cultivars. This winter hardiness and earlier ripening characteristic should earn highbush cultivars a place in the climaticly suitable regions of East Tennessee.

5. The majority of Tennessee producers set container grown plants that were purchased out of state. No significant yield differences

were recorded between container grown and bare-root sets. Bare-root sets are generally less expensive and should therefore be considered in new establishments. In the course of gathering data the researcher observed two producers propagating plants. These should be available to Tennessee producers in the spring of 1985.

6. Maintaining a proper pH level seemed to be a problem with many producers as indicated by the use of iron chelate. This is not surprising as most producers did not soil test annually and were therefore unaware of forthcoming nutritional problems. Producers whose primary source of income was farm were the exception. Increased educational efforts need to be made to stress the importance of soil testing on a regular annual basis.

7. Because Tennessee producers sold almost their entire crop as U-Pick berries the wholesale fresh marketing of Tennessee blueberries have yet to be explored. If the supply of blueberries surpasses the U-Pick demand, producers will need Extension's assistance in implementing new marketing procedures.

8. According to statistical analysis, none of the production practices were significantly related to yield. Certainly the relatively small population of the study made reliable statistical analysis difficult. Secondly, while a production practice may have, in fact, been carried out, the study did not attempt to evaluate the manner or <u>quality</u> in which the practice was used. Finally, it is the view of the researcher that blueberry bushes are extremely sensitive to <u>all</u> production practices and that yield responses can be significantly

depressed by the neglect or poor implementation of even a single practice so as to make evaluation of these variables extremely difficult, if not impossible. The important implication is that blueberries may respond negatively to a single neglected practice and cannot be forced into a positive response no matter what else is done to them. Extension's educational emphasis should be one of stressing the use of the entire package of recommended practices as well as the manner in which these practices are carried out.

9. As 60 percent of Tennessee's blueberry producers are members of the Tennessee Fruit and Vegetable Growers Association, this organization is a valuable potential tool for the distrubiton of Extension production and marketing data. It deserves Extension's continued support.

10. Producers whose percentage of total farm income from blueberries was low and producers who managed relatively large tracts of land soil tested more frequently than other producers. Special effort needs to be given producers with small acreages and limited farming experience and/or involvement to encourage this group to soil test annually.

11. Producers with a low percentage of total farm income from blueberries were the only group to set recommended cultivars. The limited number of such cultivars, promotion of non-recommended cultivars by nurserymen, grower desire for experimentation and poor performance of the Woodard recommended cultivar all may have contributed to this situation. In addition, limited Tennessee emphasis on highbush cultivars

may have forced many highbush producers to depend on other sources for varietal information. Tennessee Extension needs to direct itself to the task of providing Tennessee producers with updated information on the performance of a wider range of both rabbiteye and highbush cultivars under Tennessee growing conditions.

12. It was the observation of the researcher while on the farms of producers that almost without exception the plantings lacked uniformity. Nearly all plantings contained what appeared to be outstanding plants in terms of health and vigor as well as a significant number of plants that lacked production capacity. The implication is that some plants have benefited from the production practices used and others have failed to respond. Production practices need to be systematically carried out with a high degree of quality associated with the implementation. Secondly, individual plants that do not respond need special attention. It is Extension's role to establish procedures that will put these bushes into production or recommend their replacement.

V. RECOMMENDATIONS FOR FURTHER STUDY

1. Benchmark data such as that cited in Table I and II, pages 16 and 21 should be systematically collected to follow the growth and development of Tennessee's blueberry industry. If the growth of this industry so warrants, Extension will then be able to justify expanded educational programs.

2. As varietal trials with both rabbiteye and highbush species are conducted, Extension should make appropriate recommendations.

3. Due to the expense and labor involved and certain problems associated with mulch, as research is conducted relative to its benefits, Extension should make appropriate recommendations.

4. As research is conducted to establish procedures on what to do with individual plants that are not at the production level of the rest of the planting, Extension should make appropriate recommendations.

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BIBLIOGRAPHY

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APPENDIX

COMMERCIAL BLUEBERRY

PRODUCTION AND MARKETING SURVEY

1984 DATA

Name of Producer _____ Date Surveyed _____

Address of Producer _____

1 Card Number
1

___ ___ ___ County Number
2 3 4

___ ___ Producer Number
5 6

A. PRODUCER

___ ___ 1. Age of Producer.

___ ___ 2. Primary source of family income (1=farm; 2=non-farm; 3=other-retired, etc.).

___ ___ ___ 3. Total acres, including rented or leased on farm.

___ ___ 4. How many hours are you employed off the farm each week?

___ ___ ___ 5. What percent of your farm income did you receive from blueberry sales in 1984?

B. ACREAGE

Where acres are requested, please report to the nearest tenth of an acre. Example: 1.5, 2.0, .7, etc.

___ ___ ___ ___ 6. How many total acres of blueberries are set, including non-bearing new sets in 1984?

___ ___ ___ ___ 7. From how many total acres did you sell berries in 1984?

___ ___ ___ ___ 8. Of the acres reported in #7 above, how many acres were 2 years old or less?

___ ___ ___ ___ 9. Of the acres reported in #7 above, how many acres were 3 years old?

___ ___ ___ ___ 10. Of the acres reported in #7 above, how many acres were 4 years old or more?

C. CULTIVARS

What percentage of all plantings are:

___ ___ ___ 11. Highbush
___ ___ ___ 12. Rabbiteye
___ __- 13. Tifblue
___ ___ 14. Climax
___ ___ 15. Delite
___ ___ 16. Southland
___ ___ 17. Woodard
___ ___ 18. Garden Blue
___ ___ 19. Homebelle
___ ___ 20. Jersey
___ ___ 21. Bluecrop
___ ___ 22. Blueray
___ ___ 23. Other, specify _____

D. ESTABLISHMENT

___ 24. At what age were the majority of your bushes set (1 = 1 year or less; 2=2 years; 3=3 years; 4=4 years or more)?

___ 25. What was the source of the majority of your bushes (1=home produced; 2=purchased in state; 3=purchased out of state)?

___ ___ ___ 26. Of all plantings, what percent were container grown?

___ 27. If containers were used, what was the size of the container (1=1 gallon or less; 2=1-2 gallons; 3-2-3 gallons; 4=3-4 gallons; 5=4 or more gallons)?

___ ___ ___ 28. Of all plantings, what percentage were bare-root sets?

___ 29. If container grown plants were set, was any attempt made to break up the root ball prior to setting (1=containers not used; 2=yes; 3=no)?

___30. Card Number ___ ___ Producer Number

E. MULCH

___ 31. With what material were your settings mulched at setting (1=no mulch; 2=sawdust; 3=shavings; 4=bark; 5=peat; 6= combination, specify _____ 7=other, specify_____.

___ 32. If mulch was used at or following planting, what was the average depth of mulch at the base of the plant (1=no mulch; 2=less than 1 inch; 3=1-2 inches; 4=2-4 inches; 5=4-6 inches; 6=more than 6 inches)?

___ 33. At what level did you or will you maintain the mulch level (1=no mulch; 2=maintain level as at setting; 3=increase level; 4=add no additional mulch; 5=maintain at a reduced level)?

F. FERTILIZATION

___ ___ 34. For plants 4 years or older, how many lbs. of actual N. was applied per acre in 1984?

___ 35. For plants 4 years or older, what was your primary source of nitrogen in 1984 (1=ammonium nitrate; 2=ammonium sulfate; 3=nitrogen in a complete fertilizer such as 10-10-10; 4= other, specify _____)?

___ ___ 36. For plants 4 years or older, how many lbs. of actual P205 were applied in 1984?

___ ___ 37. For plants 4 years or older how many lbs. of actual K20 were applied in 1984?

___ 38. On how many occasions were nitrogen applied to plants 4 years or older in 1984?

___ 39. On how many occasions was P_2O_5 applied to plants 4 years or older in 1984?

___ 40. On how many occasions was K_2O applied to plants 4 years or older in 1984?

___ ___ 41. For plants 2 years or younger how many lbs. of actual nitrogen were applied in 1984?

___ ___ 42. For plants 2 years or younger how many lbs. of actual P_2O_5 were applied in 1984?

___ ___ 43. For plants 2 years or younger, how many lbs. of actual K_2O were applied in 1984?

___ ___ 44. On how many occasions was nitrogen applied to plants 2 years or younger in 1984?

___ 45. On how many occasions was P_2O_5 applied to plants 2 years or younger in 1984?

___ 46. On how many occasions was K_2O applied to plants 2 years or younger in 1984?

___ 47. On plants 4 years or older, what secondary or micro-nutrients did you apply in 1984 (1=none applied; 2=iron; 3=other, specify _____)?

___ 48. How did you apply secondary or micro-nutrients in 1984 (1= none applied; 2=foliar; 3=applied as a dry material; 4= applied in solution to soil)?

___ 49. What was your primary method of N-P-K applications to plants in 1984 (1=granular, broadcast; 2=granular, banded in row; 3=granular, banded around plants; 4=soluable into soil; 5=soluable onto folage)?

___ 50. Was fertilizer applied according to soil test on any plants 4 years or older in 1984 (1=yes; 2=no)?

___ 51. Was fertilizer applied according to soil test on any plants younger than 4 years in 1984? (1=yes; 2=no).

___ 52. How often do you soil test (1=do not soil test; 2=at least once a year; 3=at least once every other year; 4=at least once every 3 years; 5=every 4 years or more)?

___ 53. Do you routinely test soil to determine pH levels prior to planting (1=yes; 2=no)?

___ 54. What material was used to adjust pH prior to planting (1= none used; 2=elemental sulfur; 3=aluminum sulfate; 4= other, specify _____)?

___ 55. If pH adjustments were made on established plants what material did you use (1=no adjustments made; 2=ammonium sulfate; 3=ammonium nitrate; 4=aluminum sulfate; 5= elemental sulfur)?

G. WEED CONTROL

___ 56. For plants 4 years or older, what was your primary means of weed control in 1984 (1=no control; 2=herbicides; 3= herbicides plus cultivation; 4=mulch; 5=cultivation only; 6=combination, specify _____)?

___ 57. What was the primary herbicide used (1=none used; 2=Roundup; 3=Premerge; 4=Princep; 5=Sinbar; 6=Paraquat; 7=Fusilade; 8= combination, specify _____; 9=other, specify _____)?

___ 58. What was your time of application (1=no herbicide used; 2=pre-harvest, before weeds emerged; 3=pre-harvest, weeds less than 6" tall; 4=pre-harvest, weeds more than 6" tall; 5=post harvest; 6=combination, specify _____)?

H. INSECTS

___ 59. What was your major insect problem in 1984 (1=no significant problem; 2=aphids, fleabettles; 3=Japanese Beetle; 4= grasshoppers; 5=soil insects; 6=other, specify _____)?

___ 60. What insecticides were used in 1984 (1=none used; 2=sevin; 3=malathion; 4=thiodan; 5=methyl parathion; 6=other, specify _____)?

I. BIRDS

___ 61. What was your primary means of controlling birds in 1984 (1=no control; 2=bait; 3=noise; 4=netting; 5=visuals such as flags etc.: 6=mesurol; 7=other, specify _____)?

___ ___ 62. What percentage crop loss do you estimate was due to birds in 1984?

J. PLANT SPACING

___ ___ 63. How many feet are there between most of your rows?

___ 64. How many feet are there between most of your plants in the row?

___ ___ ___ 65. Approximately how many plants are set per acre?

K. IRRIGATION

___ 66. What type of irrigation system do you have (1=no system; 2=trickle; 3=overhead; 4=other, specify _____)?

___ 67. What is the primary source of water for your system (1=no system; 2=farm pond; 3=creek or river; 4=lake; 5=public water system; 6=other, specify _____)?

___ ___ 68. In inches, how much water (including rain) did your plants received in 1984? (April--September)

___ 69. Does your system have frost protection capabilities (1=yes; 2=no)?

I. DISEASE

___ 70. What type of chemical disease control program did you follow in 1984 (1=no chemical control; 2=regular spray program; 3=treatment for specific disease at outbreak)?

___ 71. What chemicals did you use (1=none used; 2=Captan; 3=Benlate; 4=copper based materials; 5=combination, specify _____; 6=other, specify _____)?

___ 72. What was your major disease problem in 1984 (1=no problem; 2=specify _____)?

M. MARKETING

3/I Card Number ___ ___ Producer Number

What percentage of the berries you marked in 1984 were:

___ ___ ___ 73. Pick-your own

___ ___ ___ 74. Custom picked by you but sold on the farm directly to the consumer?

___ ___ ___ 75. Custom picked by you and sold off farm directly to the consumer (roadside etc.)?

___ ___ ___ 76. Custom picked by you and sold off farm but not to consumer (wholesaled)?

___ 77. By what units were your berries sold in 1984 (1=weight; 2=volume)?

___ ___ ___ ___ 78. What price did you receive from the majority of your pick-your-own sales (9999=did not sell U-Pick; 2= $_____ per lb/gal.)?

___ ___ ___ ___ 79. What price did you receive from the majority of you direct to consumer custom picked sales (9999=no such sales; 2=$_____ per lb/gal.)?

___ ___ 80. What percentage of your crop was left unpicked?

___ 81. What was your primary means of advertising (1=none; 2=radio; 3=newspaper; 4=roadside signs; 5=word of mouth; 6= combination, specify _____; 7=other, specify _____)?

___ ___ ___ 82. What was the approximate date of your first sale (record the month in column 31 and the day in column 32, 33)?

___ ___ ___ 83. What was the approximate date of your last sale (use the same reporting system as question #82)?

___ 84. Are you a member of a producer or marketing association (1= yes; 2=no; If yes specify _____)?

___ 85. What was your primary source of production information (1= trade publications; 2=Extension publications; 3=personal contacts with Extension Agents and Specialists; 4=other producers; 5=other, specify _____)?

___ 86. What is the major reason you would not expand in the future (1=I plan to expand; 2=slow market; 3=limited capital; 4= limited land; 5=limited labor; 6=combination, specify _____; 7=other, specify _____)?

___ ___ ___ ___ 87. For plants 4 years and older, what would you estimate your yield (report on a per acre basis, indicate units _____lbs/gal./acre.)?

___ 88. To what extent do you practice late summer or early fall pruning (1=do not prune then; 2=very limited; 3=limited; 4=moderate; 5=extensive)?

VITA

Rodney L. Davis was born in Laramie, Wyoming on October 14, 1948. He is the son of Marvin and Gladys Davis. He attended public school in Federal Way, Washington and graduated from Federal Way High School in June 1966.

He attended Western Washington State College for two years before moving to Sevier County, Tennessee in 1970. After graduating from The University of Tennessee, Knoxville with a B.S. degree in Agriculture in August 1975, he began work with the University of Tennessee Agriculture Extension Service as an Assistant Extension Agent in 4-H agriculture in Johnson City. He attended Extension Winter Short-course for four years before leaving Extension in July 1982. In September 1985 he continued his studies.