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To the Graduate Council:

I am submitting herewith a problem written by James G. McCall entitled "Corn Production Practices in Cheatham County." I recommend that it be accepted for three quarter hours credit in partial fulfillment of the requirements for the degree of Master of Science, with a major in Animal Husbandry.

C. C. Chamberlain
Major Professor

We have read this problem and recommend its acceptance:

Lewis S. Dickson

Charles Hobbs

Accepted for the Council:

Dean of the Graduate School

CORN PRODUCTION PRACTICES IN CHEATHAM COUNTY

A Special Problem in Lieu of Thesis

In Partial Fulfillment

of the Requirements for the Degree

Master of Science

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by

James G. McCall

June 1965

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THE UNIVERSITY OF TENNESSEE
THE GRADUATE SCHOOL

ABSTRACT OF EDUCATIONAL RESEARCH STUDY COMPLETED

Author of Study JAMES G. McCALL Date

Title of Study CORN PRODUCTION PRACTICES IN CHEATHAM COUNTY

Course Number AG. EXT. 501A

Under direction of what department AGRICULTURAL EXTENSION Degree MASTER OF SCIENCE

Abstract approved by O. C. Chamberlain Quarter Graduating SPRING, 1965
(signature of major professor)

Note: The student should consult with his major professor and follow his advice concerning the general format of the abstract. Additional pages, if required, should be 8 1/2 x 11 inches and of quality equivalent to that required in the case of the thesis. (Master's thesis - submit **one** single-spaced typed copy; doctoral dissertation - submit **two** double-spaced typed copies.)

Corn production is quite important in Cheatham County as the farmers produce corn on 9,317 harvested acres. The average yield in 1959 was 38 bushels per acre, with a gross value of over $390,000. Variety tests at the Highland Rim Experiment Station at Springfield, Tennessee, in 1958 had an average yield of 137 bushels per acre.

The objective of this study was to find some of the major causes of low corn yield in Cheatham County.

A mail questionnaire was developed and sent to a random sample of 144 of the county's 867 corn producers. Seventy-five growers (52 percent of the sample) responded with information concerning the corn production practices they used.

From the results of this study, the main causes of low production of corn in Cheatham County appear to be: 1) failure to use soil test recommendations as a basis for fertilization; 2) lack of application of additional nitrogen; 3) lack of or too little complete fertilization; 4) too low plant population; and 5) too little use of chemicals to control weeds.

Form G-20

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CHAPTER I

INTRODUCTION

Since the beginning of Extension work in Cheatham County the Extension Service has recommended improved corn production practices; but, according to the 1959 census (6:221),* Cheatham County farmers still produced only 355,093 bushels of corn on 9,317 harvested acres. The average yield then was approximately 38 bushels per acre compared with the 137 bushels per acre averaged for certain 1958 varietal tests at the Highland Rim Experiment Station at Springfield, Tennessee (3:12).

I. IMPORTANCE OF STUDY

Figuring the 1959 county yield of 355,093 bushels of corn at $1.10 per bushel (the average price received by Cheatham County farmers for corn, 1955-1959), the crop had a gross value that year of $390,602.30 and ranked second only to tobacco in Cheatham County. If the 1959 county yield were to be doubled, the annual crop would be worth $781,204.60 (figured at the above-mentioned average price). Specific reasons for low county yields prior to this study were not known; but according to research, low yields in the area are typically caused by failure to use a recommended variety, improper fertilization, failure to control weeds, and inadequate plant population (1:4-15).

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*Numbers in parentheses refer to numbered references in the bibliography; those after the colon are page numbers.

II. OBJECTIVES

The objective of this study was to seek to find some of the major causes of low corn yield in Cheatham County. With that information the County Agent and other agricultural workers would be better prepared to plan a program to try to eliminate or overcome these causes and to help farmers raise their corn yields to an economical average level of production.

III. RELATED LITERATURE

Corn Varieties

According to Shelby (3:3), the following varieties of corn were recommended for Tennessee in 1959: A. E. S. 904W; Dixie 17, 29, 33, 55, 77; Funks G-779W; Pfister (PAG) 631W, 636W; Tennessee 501; U. S. 523W; Dixie 22; Funks G-710, G-711; Keystone 222; Pioneer 309A, and Tennessee 90.

Fertilization

According to Tennessee Agricultural Extension Service Publication No. 381, dated February 1958 (5:2), fertilizer recommendations for corn grown in the state area of Cheatham County are as follows:

Area	Grade	Pounds Per Acre
Medium Corn Soils (50-75 Bu.)	6-12-12	200-400
	Nitrogen	45
Good Corn Soils (75-100 Bu.)	6-12-12	300-500
	Nitrogen	60-70
Excellent Corn Soils (Above 100 Bu.)	6-12-12	400-600
	Nitrogen	90

Chemical Weed Control

According to Tennessee Agricultural Extension Service Publication No. 385, dated August 1958 (4:7), the recommendation for the control of broadleaf weeds and annual grasses in corn was to use 2,4-D at one and one-half pounds per acre, pre-emergence; and 2,4-D at one-half pound per acre, post-emergence.

Plant Population

According to Burns (1:10), the corn plant population listed in 1958 for medium corn land on rolling upland should be 8,000 in order to yield 50 to 80 bushels. For good corn soils, level upland or shallow bottom land, plants per acre should be about 12,000 to yield 80 to 100 bushels. For excellent corn soils, level, deep bottom land, plants per acre should be 16,000 to yield 100 plus bushels per acre.

IV. PROCEDURE

A list of all corn growers in Cheatham County was secured from the County Agricultural Stabilization Committee in 1960. This list contained 867 alphabetically-listed names. A random sample of 144 names was selected to receive the mail questionnaire (see Appendix). Seventy-five growers (52 percent of the sample) responded with information concerning the corn production practices they used.

CHAPTER II

RESULTS AND DISCUSSION

I. VARIETIES

As noted in Table I, sixty-five growers or 87 percent were using hybrid seed corn; with ten or 13 percent open-pollinated seed corn. Of this 13 percent, some is grown under control for seed, and some for roasting ears for market. Of the 87 percent using hybrid seed corn, 64.6 percent were using those recommended by the University of Tennessee. The other 35.4 percent were using commercial hybrids sold in Cheatham County. According to Long (2:13) and Shelby (3:12), any of the seed corn reported by growers in this area should be expected to yield at least 70 bushels per acre on the better corn soils. Therefore, varieties appeared not to be a major factor related to low yields in 1959.

As noted in Table II, the largest number of corn producers (53.9 percent), using hybrid seed had used them for more than ten years, with the next group falling in the five through six-year interval. The average number of years hybrids had been used was 8.6 for the group. Data in the table show that hybrid seed varieties have probably been accepted by a large share of those who have tried them.

II. FERTILIZATION

Soil Testing

As noted in Table III, only five, or 6.6 percent, were using soil test recommendations as a basis for fertilization of corn. Four

TABLE I

NUMBERS AND PERCENTS OF CORN GROWERS ACCORDING TO KINDS OF SEED CORN VARIETIES USED

Kind of Seed Corn Variety Used	Corn Growers Reporting	
	Number	Percent
Hybrid seed corn	65	87
Recommended varieties	42	56.0
Other hybrid varieties	23	31.0
Open-pollinated seed corn	10	13
Total	75	100

TABLE II

NUMBERS AND PERCENTS OF CORN GROWERS USING HYBRID SEED CORN ACCORDING TO THE LENGTH OF TIME OF USE AND AVERAGE YEARS OF USE*

Length of Time Used	Corn Growers Reporting	
	Number	Percent
Not indicated	2	3.0
1-2 years	5	7.7
3-4 years	4	6.2
5-6 years	10	15.4
7-8 years	5	7.6
9-10 years	4	6.2
11-20 years	35	53.9
Total	65	100.0
Average of those using hybrid	8.6 years	

*Ten other growers (for a study total of 75) did not use hybrid seed corn.

TABLE III

NUMBERS AND PERCENTS OF CORN GROWERS REPORTING USE OF SOIL TEST RECOMMENDATIONS AS A BASIS FOR FERTILIZATION

Basis Used for Fertilization	Corn Growers Responding	
	Number	Percent
Used soil test	5	6.6
Followed recommendation	4	5.3
Went above recommendation	1	1.3
Did not use soil test	70	93.4
Total	75	100.0

of the five reporting soil testing were following the recommendation; the other one using more fertilizer than recommended. There appeared to be no set pattern as to how often the five tested their soil for corn.

Fertilizer Used

As noted in Table IV, sixty-six, or 88 percent, reported that they fertilized their corn, with the remaining nine, or 12 percent, stating that they did not. The average amount used by the sixty-six farmers was 321 pounds per acre, although one-fourth of the growers who indicated they were using fertilizer reported they used 250 pounds or less per acre. The largest number of users was in the 300-pound group, with the 400-pound group a close second.

Nitrogen Used

As shown in Table V, only twenty-four, less than one-third, of the corn growers reporting, stated that they were using additional nitrogen on corn. Forty-eight farmers, or 64 percent, reported they used no additional nitrogen on corn. Those using additional nitrogen were using an average of 145 pounds per acre, making no difference whether the fertilizer contained 16 or 33 percent nitrogen. All who were using additional nitrogen were below county soil test recommendations, which generally call for 90 pounds actual nitrogen per acre for production in excess of 100 bushels.

TABLE IV

NUMBERS AND PERCENTS OF CORN GROWERS ACCORDING TO DIFFERENT AMOUNTS AND ANALYSES OF FERTILIZERS USED

Analysis of Fertilizer Used	Amount (Lbs.)	Corn Growers Reporting	
		Number	Percent
Used fertilizer		66	88
6-12-12	1200	1	1.3
	600	2	2.7
	500	2	2.7
	450	1	1.3
	400	10	13.3
	300	19	25.4
	250	6	8.0
	200	7	9.4
	150	1	1.3
	100	1	1.3
Other	400	2	2.7
	350	3	4.0
	300	4	5.3
	200	3	4.0
	100	1	1.3
	Not indicated	3	4.0
Did not use fertilizer		9	12
Total		75	100

TABLE V

NUMBERS AND PERCENTS OF CORN GROWERS ACCORDING TO USE OF ADDITIONAL NITROGEN

Use of Additional Nitrogen (N)		Corn Growers Responding	
Percent N	Amount (Lbs.)	Number	Percent
Used additional N		24	32
33	200	6	8.0
	150	3	4.0
	125	1	1.3
	100	5	6.7
	75	1	1.3
16	350	1	1.3
	150	2	2.7
	100	4	5.4
	Not indicated	1	1.3
Not reporting		3	4
Did not use additional N		48	64
Total		75	100

III. CHEMICAL WEED CONTROL

Table VI shows that only ten, or 13 percent of those reporting, stated they were using chemicals to control weeds. Seventy-one percent of those using chemicals were broadcasting the chemicals after the corn came up. Sixty-two, or 83 percent, reported they used no chemicals to control weeds.

IV. PLANT POPULATION

Table VII shows an average of 7,524 plants per acre, which is slightly below the recommendation by the University of Tennessee of 8,000 plants per acre on rolling upland for 50 or more bushels. Plant population recommendations for "good" bottom land are near the 16,000 plants per acre where 100 bushels or more are desired. The table shows that more than three-fourths of the corn is grown in 40 or 42-inch rows, which tends to reduce plant population per acre.

TABLE VI

NUMBERS AND PERCENTS OF CORN GROWERS REPORTING USE OF CHEMICALS FOR WEED CONTROL

Use of Chemicals for Weed Control	Corn Growers Reporting	
	Number	Percent
Chemicals used	10	13
Chemicals not used	62	83
Not reporting	3	4
Total	75	100

TABLE VII

NUMBERS AND PERCENTS OF CORN GROWERS ACCORDING TO ROW WIDTH, AVERAGE SPACING IN ROW, AVERAGE PERCENT STAND AND CALCULATED AVERAGE PLANT POPULATION

Row Width (Inches)	Average Spacing In Row (Inches)	Average Percent Stand	Calculated Average Plants Per Acre	Corn Growers Reporting	
				Number	Percent
36	19	81	7,428	9	12
38	13	93	11,807	7	9
40	18	85	7,406	26	35
42	19	85	6,684	31	41
Not reporting			0	2	3
Total			7,524	75	100

CHAPTER III

SUMMARY

This was a study of the corn production practices in Cheatham County to find the main causes of low production. Data were obtained by mail questionnaires from 75 growers (more than one-half of the randomly drawn sample responding). From the results of this study, the main causes of low production of corn in Cheatham County appear to be: (1) failure to use soil test recommendations as a basis for fertilization; (2) lack of application of additional nitrogen; (3) lack of or too little complete fertilization; (4) too low plant population, and (5) too little use of chemicals to control weeds.

Use of Soil Test

The failure to use soil test as a basis for proper fertilization is shown in that 93.4 percent reported that they did not soil test corn land. It is obvious that most of the corn producers are guessing as to the fertilizer needed for corn. From the amount of fertilizer reported used, they were guessing too low. Those testing corn land had no definite plan for testing.

Use of Nitrogen

Only about one-third of the growers were using additional nitrogen, and they only used an average of 145 pounds per acre, making no difference whether it contained 16 or 33 percent nitrogen. The above-mentioned

average was considerably less than the 300 pounds of 33 percent nitrogen generally recommended for level bottom land in which most of the corn in Cheatham County is grown.

Use of Complete Fertilization

Twelve percent were using no fertilizer and one-fourth of those using fertilizer were using less than 250 pounds per acre, which is below or is the lowest range of recommendation for upland or medium corn soils.

Concern for Plant Population

The average plant population of 7,524 plants per acre with proper seed, fertilizer, land moisture and proper weed control would yield a maximum of about 60 bushels per acre. Under average conditions, based on the results of this survey, Cheatham County growers could only hope for about 30 bushels per acre annually. Such yields would about cover the approximate cost of producing an acre of corn in the county.

Use of Chemicals to Control Weeds

The fact that only 13 percent of those reporting were using chemicals to control weeds points to the need for particular Extension attention. Some of those who are controlling weeds by plowing are pruning the roots of the corn, thereby further reducing the yield and increasing the cost of production.

Implications

Further study is needed to determine the relation between per acre production and the key practices identified through this study. Facts assembled here should be used in helping decide which Extension educational efforts should be allocated in the corn production work area and how to go about increasing corn yields in the county.

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APPENDIX

CORN PRODUCTION IN CHEATHAM COUNTY QUESTIONNAIRE

1. Do you use hybrid seed corn? a.___ Yes; b.___ No.

2. Below is a list of varieties. If the answer is "Yes," check varieties or write in the varieties used.

a.___ A. E. S. 904W
b.___ Dixie 17
c.___ Dixie 29
d.___ Dixie 33
e.___ Dixie 55
f.___ Dixie 77
g.___ Funk G-779W
h.___ Pfister (PAG) 631W
i.___ Pfister (PAG) 636W
j.___ Tenn. 501
k.___ U. S. 523W
l.___ Dixie 22
m.___ Funk G-710
n.___ Funk G-711
o.___ Keystone 222
p.___ Pioneer 309A
q.___ Tenn. 90
r._____

3. How many years have you used a hybrid variety? ____ years.

4. Do you fertilize corn? a.___ Yes; b.___ No.

5. If "Yes" how many pounds per acre? a.____ lbs. 6-12-12; b.___ lbs. other analysis.

6. How many years have you used fertilizer on your corn? ____ years.

7. Do you use additional nitrogen? a.___ Yes; b.___ No.

8. If "Yes" how many pounds per acre? a.___ Nitrate of soda; b.___ Ammonium Nitrate.

9. How many years have you used additional nitrogen on corn? ____ years.

10. Do you have corn land soil tested? a.___ Yes; b.___ No.

11. How many years have you followed this practice? ____ years.

12. If "Yes" to question 10, do you: a. follow soil test recommendation ____; b. use less than amount recommended ____; c. use more than amount recommended? ____.

13. How often do you test corn land? a.___ every year; b.___ every 2 years; c.___ every 3 years; d.___ No. years.

14. Do you use chemicals to control weeds? a.___ Yes; b.___ No.

15. If "Yes" answer the following as how used. (Check 2.)
    a.___ Band application--just row.
    b.___ Broadcast application--entire area.
    c.___ Post-emergence--after corn comes up.
    d.___ Pre-emergence--before corn comes up.

16. How many years have you followed this practice? ____ years.

17. How many acres of corn do you usually grow? ____ acres.

18. What width of rows do you plant corn? a.___ 36"; b.___ 38"; c.___ 40"; d.___ 42".

19. How far apart do you set planter to drop seed corn? ____ inches.

20. What percent stand did you have when you gathered? ____ percent.