May 15, 1962

To the Graduate Council:

I am submitting herewith a thesis written by Nathan J. Lowe entitled "A Study of the Production Practices of Burley Tobacco Growers in Williamson County." I recommend that it be accepted for nine quarter hours credit in partial fulfillment of the requirements for the degree of Master of Science, with a major in Agricultural Extension.

Lewis H. Dickson
Major Professor

We have read this thesis and recommend its acceptance:

Robert L. Johnson

Charles M. Hobbs

Frank T. Bell

Accepted for the Council:

Hilton A. Smith
Dean of the Graduate School

A STUDY OF THE PRODUCTION PRACTICES OF BURLEY TOBACCO GROWERS IN WILLIAMSON COUNTY

A Thesis

Presented to

the Graduate Council of

The University of Tennessee

In Partial Fulfillment

of the Requirements for the Degree

Master of Science

---

by

Nathan J. Lowe

June 1962

ACKNOWLEDGEMENTS

The author acknowledges the assistance given by his graduate committee, Dr. Lewis H. Dickson, Chairman, Drs. Robert S. Dotson, Frank F. Bell and Charles S. Hobbs. Their suggestions and directions in conducting this study were most helpful.

He expresses his appreciation to Drs. Webster Pendergrass, Dean, College of Agriculture, and Vernon W. Darter, Director, Agricultural Extension Service, The University of Tennessee, and also Agricultural Extension District Supervisors Milburn E. Jones and Owen E. Hodges for granting in-service training leave for the purpose of doing graduate study.

Likewise, he is indebted to George Sprouse, Jr., Soil Scientist, Soil Conservation Service, for his assistance in identifying soils of tobacco fields used in the study.

He expresses his appreciation to Mrs. Sara Bruce, Williamson County Agricultural Stabilization and Conservation Office Manager, for her assistance with farmers' tobacco yield records.

The writer further wishes to express his appreciation to Mrs. Beverly Watkins, Williamson County Agricultural Extension secretary, and to all farmers who so willingly cooperated in the study.

516952

TABLE OF CONTENTS

CHAPTER		PAGE
I.	INTRODUCTION	1
	Importance of Tobacco	1
	Yield Situation	2
	Importance of the Study	3
	Objectives	4
II.	REVIEW OF THE LITERATURE	5
III.	METHODS AND PROCEDURE	9
IV.	RESULTS AND DISCUSSION	13
	Personal and Family Data	14
	Race and Sex	14
	Size of Farm	16
	Tenure Status and Managerial Responsibility	16
	Age	19
	Educational Level	19
	Major Source of Income	19
	Individual Production Practices	23
	Plant Bed Sterilization	23
	Plant Bed Fertilization	23
	Varieties	23
	Plant Bed Seeding Rate	27
	Plant Bed Weed Infestation	27
	Plant Bed Insect Control	27

CHAPTER PAGE

IV. (Continued)

Plant Bed Disease Damage. 31

Quality of Tobacco Plants 31

Type of Soil. 36

Soil Testing. 36

Soil Analysis 39

Fertilizer Usage. 39

Manure Usage. 39

Fertilizer Nutrients. 44

Fertilizer Placement. 46

Time and Method of Transplanting. 46

Rotation Practices. 46

Cover Crops Grown Preceding Tobacco 50

Plant Population. 50

Depth of Cultivation. 54

Topping 54

Sucker Control. 57

Time Between Tobacco Topping and Harvest. 57

Disease and Insect Damage 60

Priming 60

Farmers' Stated Reasons for Yield Level Status. 60

V. APPLICATION OF FINDINGS TO DEVELOPMENT OF A SUGGESTED EXTENSION TEACHING APPROACH FOR USE IN WILLIAMSON COUNTY 63

Situational Data. 63

CHAPTER PAGE

V. (Continued)

Teaching Objectives 65

Teaching Schedule 67

VI. SUMMARY AND CONCLUSIONS 70

Summary of Findings 71

Conclusions 74

Recommendations 75

BIBLIOGRAPHY. 76

APPENDIXES

A. Williamson County Tobacco Schedule Form 80

B. Classification of Soils for Tobacco in Williamson County, Tennessee 82

C. Tables Showing Relationship of Tobacco Yields Produced to Comparison of Spacings of Tobacco Plants Within 3, 3¼, and 3½ Foot Rows. 83

D. Farmers' Stated Reasons for Yield Level Status. 86

LIST OF TABLES

TABLE PAGE

I. Distribution of Tobacco Producers by Five-Year Average Tobacco Yields Per Acre in Each 100 Pound Interval, Number of Growers and Number Sampled in Each Interval, Williamson County, Tennessee, 1956 Through 1960. . 10

II. Relationship of Tobacco Yields Produced to Race and Sex of Farm Owners of 144 Selected Farms in Williamson County, Tennessee, 1956 Through 1960. 15

III. Relationship of Tobacco Yields Produced to Size of Farm and Cropland, in Acres, of 144 Selected Farmers in Williamson County, Tennessee, 1956 Through 1960 17

IV. Relationship of Tobacco Yields Produced to Tenure and Decision Making Statuses of 144 Selected Farmers in Williamson County, Tennessee, 1956 Through 1960 18

V. Relationship of Tobacco Yields Produced to Ages of 144 Selected Farmers in Williamson County, Tennessee, 1956 Through 1960 20

VI. Relationship of Tobacco Yields Produced to Educational Levels Attained by 144 Selected Farm Owners in Williamson County, Tennessee, 1956 Through 1960 21

VII. Relationship of Tobacco Yields Produced to Major Source of Income of 144 Selected Farmers in Williamson County, Tennessee, 1956 Through 1960. 22

TABLE PAGE

VIII. Relationship of Tobacco Yields Produced to Methods and Times of Plant Bed Sterilization Reported by 144 Selected Farmers in Williamson County, Tennessee, 1956 Through 1960 24

IX. Relationship of Tobacco Yields Produced to Fertilizer Treatments of Tobacco Plant Beds as Reported by 144 Selected Farmers in Williamson County, Tennessee, 1956 Through 1960 25

X. Relationship of Tobacco Yields Produced to Tobacco Varieties Used by 144 Selected Farmers in Williamson County, Tennessee, 1956 Through 1960. 26

XI. Relationship of Tobacco Yields Produced to Plant Bed Seeding Rate Used by 144 Selected Farmers in Williamson County, Tennessee, 1956 Through 1960. 28

XII. Relationship of Tobacco Yields Produced to Degree of Plant Bed Weed Infestation of 144 Selected Farmers in Williamson County, Tennessee, 1956 Through 1960 29

XIII. Relationship of Tobacco Yields Produced to Effectiveness of Insect Control in Tobacco Plant Beds of 144 Selected Farmers in Williamson County, Tennessee, 1956 Through 1960. 30

XIV. Relationship of Tobacco Yields Produced to Use of Soil Insecticides on Plant Beds as Reported by 144 Selected Farmers in Williamson County, Tennessee, 1956 Through 1960. 32

TABLE PAGE

XV. Relationship of Tobacco Yields Produced to Extent of Disease Damage in Tobacco Plant Beds of 144 Selected Farmers in Williamson County, Tennessee, 1956 Through 1960. 33

XVI. Relationship of Tobacco Yields Produced to Numbers of Farmers Experiencing Blackshank Disease as Reported by 144 Selected Farmers in Williamson County, Tennessee, 1956 Through 1960. 34

XVII. Relationship of Tobacco Yields Produced to Quality of Tobacco Plants Reported by 144 Selected Farmers in Williamson County, Tennessee, 1956 Through 1960 35

XVIII. Relationship of Tobacco Yields Produced to Soil Type Classification of Land of 144 Selected Farmers in Williamson County, Tennessee, 1956 Through 1960 37

XIX. Relationship of Tobacco Yields Produced to Numbers of Growers Who Fertilized Tobacco According to Soil Test Recommendations as Reported by 144 Selected Farmers in Williamson County, Tennessee, 1956 Through 1960. . . 38

XX. Relationship of Tobacco Yields Produced to pH Ranges of Soils of 144 Selected Farmers in Williamson County, Tennessee, 1956 Through 1960. 40

XXI. Relationship of Tobacco Yields Produced to Soil Analyses Showing Available Phosphate and Potash in Soils of 144 Selected Farmers in Williamson County, Tennessee, 1956 Through 1960. 41

TABLE PAGE

XXII. Relationship of Tobacco Yields Produced to Average Pounds of Commercial Fertilizer Used by 144 Selected Farmers in Williamson County, Tennessee, 1956 Through 1960. 42

XXIII. Relationship of Tobacco Yields Produced to Tons of Manure Applied to Tobacco and Average Total Tons Applied Per Acre by 144 Selected Farmers in Williamson County, Tennessee, 1956 Through 1960. 43

XXIV. Relationship of Tobacco Yields Produced to Average Pounds of Fertilizer Nutrients Applied to Tobacco by 144 Selected Farmers in Williamson County, Tennessee, 1956 Through 1960. 45

XXV. Relationship of Tobacco Yields Produced to Methods of Fertilizer Placement Used by 144 Selected Farmers in Williamson County, Tennessee, 1956 Through 1960 47

XXVI. Relationship of Tobacco Yields Produced to Time and Method of Tobacco Transplanting Reported by 144 Selected Farmers in Williamson County, Tennessee, 1956 Through 1960. 48

XXVII. Relationship of Tobacco Yields Produced to Tobacco Crop Rotation Practice Followed by 144 Selected Farmers in Williamson County, Tennessee, 1956 Through 1960 49

XXVIII. Relationship of Tobacco Yields Produced to Kind of Cover Crop Used by 144 Selected Farmers in Williamson County, Tennessee, 1956 Through 1960. 51

TABLE PAGE

XXIX. Relationship of Tobacco Yields Produced to Tobacco Plant Population of 144 Selected Farmers in Williamson County, Tennessee, 1956 Through 1960. 52

XXX. Relationship of Tobacco Yields Produced to Uniformity of Tobacco Plant Stands Reported by 144 Selected Farmers in Williamson County, Tennessee, 1956 Through 1960. . . 53

XXXI. Relationship of Tobacco Yields Produced to Depth of Cultivation Reported by 144 Selected Farmers in Williamson County, Tennessee, 1956 Through 1960 55

XXXII. Relationship of Tobacco Yields Produced to Stage of Maturity and Height of Tobacco When Topped as Reported by 144 Selected Farmers in Williamson County, Tennessee, 1956 Through 1960 56

XXXIII. Relationship of Tobacco Yields Produced to Levels of Tobacco Sucker Control as Reported by 144 Selected Farmers in Williamson County, Tennessee, 1956 Through 1960. 59

XXXIV. Relationship of Tobacco Yields Produced to Weeks of Growth of Tobacco Between Topping and Harvest as Reported by 144 Selected Farmers in Williamson County, Tennessee, 1956 Through 1960 59

XXXV. Relationship of Tobacco Yields Produced to Extent of Disease and Insect Damage to Tobacco as Reported by 144 Selected Farmers in Williamson County, Tennessee, 1956 Through 1960 61

TABLE PAGE

XXXVI. Relationship of Tobacco Yields Produced to Comparison of Spacings of Tobacco Plants Within 3 Foot Rows as Reported by 34 Farmers in Williamson County, Tennessee, 1956 Through 1960. 83

XXXVII. Relationship of Tobacco Yields Produced to Comparison of Spacings of Tobacco Plants Within 3¼ Foot Rows as Reported by 34 Farmers in Williamson County, Tennessee, 1956 Through 1960. 84

XXXVIII. Relationship of Tobacco Yields Produced to Comparison of Spacings of Tobacco Plants Within 3½ Foot Rows as Reported by 76 Farmers in Williamson County, Tennessee, 1956 Through 1960. 85

CHAPTER I

INTRODUCTION

The Williamson County Agricultural Extension Program Planning Committee, together with the Extension staff, developed a program statement in 1960 to serve as a blueprint for Extension work in the county for the following five years (1961-1966). They made a careful study of county facts and trends, identified major problem areas, reviewed opportunities available to improve local situations, and made decisions concerning which Extension program areas should receive major emphasis during the succeeding five year period.

"Low yields of burley tobacco," was designated by the committee as a problem of major importance to Williamson County burley tobacco growers. Because of the importance of tobacco in the county, the Extension staff saw fit to include work toward solution of this problem in the 1960 county Extension plan of work.

I. IMPORTANCE OF TOBACCO

In 1959, there was a total of 1,986 farms in Williamson County.[1] Of this number 1,757 grew a total of 1,843 acres of tobacco.[2]

---

[1]United States Bureau of the Census, United States Census of Agriculture: 1959. Vol. I, Counties, Part 31, Tenn. (Washington: Government Printing Office, 1961), p. 167.

[2]Tennessee Agricultural Stabilization and Conservation Committee, Annual Statistical Report: 1959 (Nashville, Tenn.: Tennessee Agricultural Stabilization and Conservation Office, United States Department of Agriculture, 1960), pp. 40-41.

Dairying, livestock and tobacco comprise the three principal farm enterprises in the county. Up to the time of the study, approximately 20 percent of the total gross farm income came from tobacco annually. The total gross sales from tobacco in 1959 was approximately $1,673,000.[3] Other recent years have been similar.

Franklin, the county seat of Williamson County, has one of only twenty burley tobacco markets in the State of Tennessee. In 1960, the Franklin market handled 3,937,254 pounds of tobacco for an average price of $62.97 per hundred pounds.[4] The Franklin market ranked twelfth in pounds of tobacco handled and average price paid, compared with the other nineteen markets in Tennessee.

II. YIELD SITUATION

The average annual yield of tobacco for Williamson County for the five year period, 1956-60 was 1,421 pounds per acre. The state average for the same period was 1,698 pounds per acre.[5] Therefore, it is seen that Williamson County tobacco growers averaged 277 pounds less than the state average.

---

[3] Ibid.

[4] Agricultural Marketing Service, Tobacco Division, Tobacco Market News: 1959 Crop (Lexington, Ky.: Agricultural Marketing Service, Tobacco Division, 1960), p. 2.

[5] Tennessee Agricultural Stabilization and Conservation Committee, Annual Statistical Reports: 1956-1960 (Nashville, Tenn.: Tennessee Agricultural Stabilization and Conservation Office, United States Department of Agriculture, 1957-1961), pp. 36-44.

The county average annual yield during the above period ranged by years from 1,320 pounds per acre in 1959 to 1,543 pounds per acre in 1956, while the state average annual yield ranged by years from 1,629 pounds in 1960 to 1,737 in 1959.[6]

The 1960 records of the Federal-State Crop Reporting Service show that among 71 counties in Tennessee that produce burley tobacco, Williamson County ranked 8th in acreage harvested, yet it ranked 60th in average yields per acre.

There has been wide variations in per acre yields of tobacco in Williamson County during recent years. Some growers have been found to consistently produce high yields of tobacco per acre while others consistently produce low yields. To illustrate this point, during the five year period, 1956 through 1960, annual farm yields ranged from a low per acre average of 317 pounds to a high per acre average of 2,503 pounds, a difference of 2,186 pounds per acre.[7]

III. IMPORTANCE OF THE STUDY

If farmers of Williamson County were to increase their yields of burley tobacco merely to the state average, they would receive

---

[6] Ibid.

[7] Williamson County Agricultural Stabilization and Conservation Office, confidential unpublished records of tobacco acreages, allotments and yields of farmers in Williamson County (Franklin, Tenn.: 1956-1960).

approximately $400,000 additional gross income per year at present market prices.[8]

A study of yield data, soil types and production practices of a representative group of tobacco growers with high, medium and low production levels was needed to furnish background information to assist growers in increasing yields and returns from the tobacco crop. It also was needed to identify cultural practices that need more educational emphasis, and from which more specific teaching objectives can be formulated by County Extension staff members responsible for such work in the county.

IV. OBJECTIVES

The present study, then, was made: 1) to determine present production levels of the tobacco producers in Williamson County; 2) to identify the production practices used by tobacco producers in Williamson County that contribute to high, medium and low yields; and 3) to develop a suggested outline of an educational approach to teaching research-verified tobacco production practices to growers in Williamson County.

---

[8]Gilbert N. Rhodes, Written communication (Knoxville, Tenn.: University of Tennessee Agricultural Extension Service, 1961).

CHAPTER II

REVIEW OF THE LITERATURE

The major purpose of the Cooperative Extension Service, as stated in the Smith-Lever Act, is ". . . to aid in diffusing among the people of the United States useful and practical information on subjects relating to agriculture and home economics, and to encourage the application of the same. . ."[1]

According to the so-called "Scope Report" made by the 1957 Extension Subcommittee on Scope and Responsibility, efficiency in agricultural production is stated first among nine areas of Extension program emphasis.[2] Use of high-yielding crops and adoption of improved cultural methods are recognized as important tools of an increasingly more efficient agricultural production.[3]

Raudabaugh, in explaining the five recognized stages of Extension educational program development, stated that improvements can be accomplished after needs and interests are identified through a systematic collection of facts, an analysis of them and their careful interpretation.[4]

---

[1]Darcie Byrn (ed.), Evaluation in Extension (Washington: Federal Extension Service, Division of Extension Research and Training, 1956), p. 6.

[2]The Cooperative Extension Service Today; A Statement of Scope and Responsibility, Federal Extension Service (Washington: Extension Committee on Organization and Policy, 1958), p. 8.

[3]A Guide to Extension Programs for the Future (Raleigh, N. C.: Agricultural Extension Service, North Carolina State College, 1959), pp. 4-7.

[4]Byrn, op. cit., pp. 7-8.

Even though research workers have written much on individual cultural practices of burley tobacco, very little has been written on why yields vary among farmers within a given area.

Williams, in studying costs and returns from tobacco, said producers can remove some of the risk and uncertainties in producing tobacco by availing themselves of the production principles and practices identified and verified by professional research workers.[5]

With regard to some of the research-verified principles and practices, a brief review might be in order at this point.

1. Harmon ran tobacco tests on Armour and Maury Silt Loam soils of Middle Tennessee and found yields to be nearly the same under similar management levels.[6]

2. Rhodes, in a two year study, found no significant differences in tobacco stands in plant beds comparing plots treated with cyanamid and methyl bromide for weed control.[7]

3. The West Virginia, Kentucky and Tennessee Experiment Stations have consistently gotten significant increases in yields of burley

---

[5]Lewis Blanton Williams, Jr., "Costs and Returns from Burley Tobacco Enterprise in the Central Basin of Tennessee" (unpublished Master's thesis, The University of Tennessee, Knoxville, 1951), p. 69.

[6]Alonzo Byron Harmon, Jr., "An Evaluation of Some Important Soil Types in the Central Basin of Tennessee" (unpublished Master's thesis, The University of Tennessee, Knoxville, 1953), pp. 24-25.

[7]Gilbert N. Rhodes, "The Evaluation of Certain Treatments for Weed Control in Tobacco Plant Beds" (unpublished Master's thesis, The University of Tennessee, Knoxville, 1955), pp. 1-18.

tobacco by making additions of nitrogen, manure, phosphate, and potash.[8]

4. The Kentucky Experiment Station found very slight differences in tobacco yields by comparing different depths of tillage.[9] The Tennessee Station found very little differences in yields comparing methods of tillage and number of plants per acre.[10]

5. The Tennessee Experiment Station found that tobacco, topped medium in height, produced slightly higher yields when compared to that topped low, high and when blooms were removed the day the tobacco was cut.[11]

6. Heggestad and Bowman found that the time of harvest after topping influenced yields. They found that highest yields were obtained when tobacco was harvested about 25 days after topping. Lower yields were obtained if harvest was either hastened or delayed.[12]

7. Hale studied the relation of soil type, soil fertility levels and the relation of certain management practices to yields of tobacco.

---

[8]T. C. McIlvaine and others, Fertilizer Experiments with Tobacco (Morgantown: West Virginia University Agricultural Experiment Station, Bulletin 402, 1957), pp. 11-12; P. E. Karraker and C. E. Boriner, Cropping and Soil Management for Burley Tobacco (Lexington: University of Kentucky Agricultural Experiment Station, Bulletin 453, 1943), pp. 31-32; B. C. Nichols and others, Fertilizer Tests with Burley Tobacco (Knoxville: University of Tennessee Agricultural Experiment Station, Bulletin 252, 1956), p. 14.

[9]Karraker, op. cit., pp. 23-24.

[10]University of Tennessee Agricultural Experiment Station, Unpublished data of tobacco experiments (Greeneville, Tennessee: 1935-1939).

[11]Ibid.

[12]H. E. Haggestad and D. R. Bowman, Burley Tobacco Quality, Yield and Chemical Composition as Affected by Time of Harvest (Knoxville: University of Tennessee Agricultural Experiment Station, Bulletin 230, 1953), p. 8.

His results indicated a high correlation between soil types and yields.[13] He found that farmers with high yields more nearly approximated recommended practices with respect to fertilization, time of transplanting and the use of cover crops. He indicated that advanced age of the grower and lack of interest of the grower in producing the highest possible yield contributed to low production.[14]

---

[13]William M. Hale, "Relation of Soil Type and Certain Chemical Soil Tests to Yields of Tobacco in Bradley County" (unpublished problem in lieu of thesis, The University of Tennessee, Knoxville, 1959), pp. 6-24.

[14]William M. Hale, "Relation of Certain Management Practices to Yields of Tobacco in Bradley County" (unpublished problem in lieu of thesis, The University of Tennessee, Knoxville, 1959), pp. 3-28.

CHAPTER III

METHODS AND PROCEDURE

Records of the Williamson County Agricultural Stabilization and Conservation Office were used to determine the five-year average per acre yield of tobacco on all farms producing tobacco in Williamson County for the five year period, 1956 through 1960.[1]

A frequency distribution of growers by yields was made from which samples of growers for inclusion in the study were to be taken. Table I shows the distribution. Only names of producers with an acreage allotment of 0.5 or more were selected for consideration. Also, eliminated from the study were farmers on tobacco producing farms that changed ownership during the study period.

Consideration of factors affecting tobacco yields was made with the assistance of the University of Tennessee staff agronomists. Generally-accepted factors agreed upon were included in the interview schedule prepared for use in the study, and different kinds of tobacco production data were secured by personal interviews with the selected growers. Summaries of the findings from the interviews were made on copies of the mimeographed schedule form (see Appendix A, page 80).

---

[1]Williamson County Agricultural Stabilization and Conservation Office. Confidential unpublished records of tobacco acreages, allotments and yields of farmers in Williamson County (Franklin, Tennessee: 1956-1960).

TABLE I

DISTRIBUTION OF TOBACCO PRODUCERS BY FIVE-YEAR AVERAGE TOBACCO YIELDS PER ACRE IN EACH 100 POUND INTERVAL, NUMBER OF GROWERS AND NUMBER SAMPLED IN EACH INTERVAL, WILLIAMSON COUNTY, TENNESSEE, 1956 THROUGH 1960

5-Year Average Yield Per Acre, Lbs.	Number of Growers	Number Sampled
CONSIDERABLY BELOW AVERAGE GROUP		
Below 700	19	9
700-799	28	9
800-899	57	9
900-999	56	9
BELOW AVERAGE GROUP		
1000-1099	84	9
1100-1199	124	9
1200-1299	142	9
1300-1399	116	9
ABOVE AVERAGE GROUP		
1400-1499	173	9
1500-1599	160	9
1600-1699	136	9
1700-1799	102	9
CONSIDERABLY ABOVE AVERAGE GROUP		
1800-1899	55	9
1900-1999	24	9
2000-2099	18	9
2100 and above	16	9
TOTAL	1374	144

Reference to Table I, page 10, will show how nine names of growers were drawn randomly from each of the sixteen 100 pound yield intervals in the frequency distribution chart, making a total of 144 samples.

All farms selected in the sample were visited and interviewed between April 1, 1961 and July 1, 1961. Data were obtained in each case from the farm owner or operator. All farmers were asked the same questions by the same interviewer.

Soil samples of the tobacco fields of each farmer selected for the study were taken from the first six inches of top-soil, using a soil sampling tube. Soil tests to determine the pH level and available phosphorus and potassium were made by the State Soil Testing Laboratory at Nashville.

Soil types of the various tobacco fields were identified by George Sprouse, Jr., Soil Scientist, Soil Conservation Service. The classification groups of soils for tobacco in Williamson County were brought together and reviewed by F. F. Bell, University of Tennessee Agronomist, M. E. Springer, University of Tennessee Agricultural Experiment Station Agronomist, and Oliver Rice, Soil Conservation Service Agronomist.

The sixteen levels or classes of tobacco yields in the yield distribution chart, as presented in Table I, page 10, were grouped into four yield groups: considerably below average (below 1000 pounds per acre), below average (1000-1399 pounds per acre), above average (1400-1799 pounds per acre), and considerably above average (1800 or more pounds per acre). Throughout the tables presented in Chapter IV of

this study, the term "considerably below average group" shall be interpreted as meaning farmers with an average per acre tobacco yield of below 1000 pounds, "below average group" as average per acre tobacco yields between 1000 and 1399 pounds, "above average group" as average per acre yields between 1400 and 1799 pounds, and "considerably above average group" as average per acre yields above 1800 pounds.

CHAPTER IV

RESULTS AND DISCUSSION

Of the 1,374 tobacco growers in Williamson County, twelve percent fell into the considerably below average (under 1000 pounds per acre) yield group; thirty-nine percent were in the below average (1000-1399 pounds per acre) yield group; forty-one percent were in the above average (1400-1799 pounds per acre) yield group, and eight percent were in the considerably above average (1800 or more pounds per acre) yield group.

The 36 growers in each of the four yield groups were selected by means of stratified random sampling with consideration being given to geographical distribution, soil types and type-of-farming areas.

All growers selected for this study willingly gave all information asked for by the interviewer. Many asked that the results of this study be made known to them.

Six kinds of personal and family data were obtained, including: race and sex of farm owners, size of farm, managerial responsibility, age, educational level, and major source of income.

Data were obtained in regard to 25 individual production practices or factors that were thought to possibly influence yield differentials. These included: plant bed sterilization, plant bed fertilization, tobacco varieties, plant bed seeding rate, plant bed weed infestation, plant bed insect control, plant bed disease and insect

damage, quality of tobacco plants, type of soil, soil tests, soil analysis, fertilizer usage, manure usage, fertilizer nutrients, fertilizer placement, time and method of transplanting, rotation practices, cover crops preceding tobacco, plant population, depth of cultivation, topping, sucker control, time between tobacco topping and harvest, maturity at harvest and priming.

I. PERSONAL AND FAMILY DATA

Race and sex. A count of tobacco producers in Williamson County from the Agricultural Stabilization and Conservation Office indicated that 141 (10 percent) of the 1,374 farms in the population from which samples were taken were owned by white women. Also, Negroes owned 78 (6 percent) of the farms. Sixteen of the latter farms were owned by Negro women.

Reference to Table II shows that all Negro tobacco producers had relatively low per acre yields, in fact, 11 of 13 had yields that were considerably below average. None of the Negro growers had above average or considerably above average yields.

Also, a high proportion, six out of 10, of the white women farm owners had considerably below average yields. Only two of 10 white women had average per acre yields of more than 1,400 pounds. None of them had considerably above average yields.

Of the 36 growers having average per acre yields below 1,000 pounds, six, or approximately sixty percent, of the white women and 11, or about eighty-five percent, of the Negroes were included.

TABLE II

RELATIONSHIP OF TOBACCO YIELDS PRODUCED TO RACE AND SEX OF FARM OWNERS OF 144 SELECTED FARMS IN WILLIAMSON COUNTY, TENNESSEE, 1956 THROUGH 1960

	All Farm Owners						White Farm Owners						Negro Farm Owners					
	Total		Male		Female		Total		Male		Female		Total		Male		Female	
Yield Group	No.	Per-cent	No.	Per-cent	No.	Per-cent	No.	Per-cent	No.	Per-cent	No.	Per-cent	No.	Per-cent	No.	Per-cent	No.	Per-cent
Considerably below average (below 1000 lbs. per acre)	36	25.0	26	18.1	10	6.9	25	17.4	19	13.2	6	4.2	11	7.6	7	4.8	4	2.8
Below average (1000-1399 lbs. per acre)	36	25.0	34	23.6	2	1.4	34	23.6	32	22.2	2	1.4	2	1.4	2	1.4	0	0
Above average (1400-1799 lbs. per acre)	36	25.0	34	23.6	2	1.4	36	25.0	34	23.6	2	1.4	0	0	0	0	0	0
Considerably above average (1800 or more lbs. per acre)	36	25.0	36	25.0	0	0.0	36	25.0	36	25.0	0	0	0	0	0	0	0	0
Total Study	144	100.0	130	90.3	14	9.7	131	91.0	121	84.0	10	7.0	13	9.0	9	6.2	4	2.8

Size of farm. Small farms included in the study, those of less than 100 total acres in size, or having less than 50 acres of cropland, tended to have tobacco yields considerably below average per acre. As may be computed from Table III, one-half of all farms of less than 100 total acres in size had per acre average tobacco yields of under 1,000 pounds. Also, three-fourths of all farms with considerably below average yields were smaller than 100 acres in size. As the yields became higher, increasingly smaller proportions were produced on farms of less than 100 acres in size. However, the trend was less clear in farms above 100 acres. Table III also shows that increase in size of cropland acreage was directly proportional to increase in tobacco yields.

Tenure status and managerial responsibility. Approximately one-half of the tobacco was grown by the land owners and the other one-half by tenants or sharecroppers, as shown in Table IV. There were no consequential differences in yield levels of tobacco grown by land owners compared to tobacco grown by sharecroppers or tenants. However, where tobacco decisions were made entirely by sharecroppers or tenants, the trend was toward considerably below average yields. Of the 16 tenants or sharecroppers making all tobacco decisions, 9 (56 percent) had per acre average yields of less than 1,000 pounds, and only one of the 16 had considerably above average yields. No significant trends were indicated where decisions were made either by owners alone or jointly by farm owners and tenants or sharecroppers comparing relatively high and low yields.

TABLE III

RELATIONSHIP OF TOBACCO YIELDS PRODUCED TO SIZE OF FARM AND CROPLAND, IN ACRES, OF 144 SELECTED FARMERS IN WILLIAMSON COUNTY, TENNESSEE, 1956 THROUGH 1960

	Size of Farm, Acres								Cropland, Acres							
	Total		Below 100		100-200		Over 200		Total		Below 50		50-100		Over 100	
Yield Group	No.	Per-cent	No.	Per-cent	No.	Per-cent	No.	Per-cent	No.	Per-cent	No.	Per-cent	No.	Per-cent	No.	Per-cent
Considerably below average (below 1000 lbs. per acre)	36	25	27	19	7	5	2	1	36	25	28	19	5	4	3	2
Below average (1000-1399 lbs. per acre)	36	25	11	8	14	9	11	8	36	25	12	8	10	7	14	10
Above average (1400-1799 lbs. per acre)	36	25	10	7	11	8	15	10	36	25	8	5	14	10	14	10
Considerably above average (1800 or more lbs. per acre)	36	25	6	4	17	12	13	9	36	25	5	4	15	10	16	11
Total Study	144	100	54	38	49	34	41	28	144	100	53	36	44	31	47	33

TABLE IV

RELATIONSHIP OF TOBACCO YIELDS PRODUCED TO TENURE AND DECISION MAKING STATUSES OF 144 SELECTED FARMERS IN WILLIAMSON COUNTY, TENNESSEE, 1956 THROUGH 1960

	All Farmers Included		Tobacco Grown By						Tobacco Decisions Made By					
			Owner		Tenant		Share Cropper		Owner		Tenant or Share Cropper		Jointly	
Yield Group	No.	Per-cent	No.	Per-cent	No.	Per-cent	No.	Per-cent	No.	Per-cent	No.	Per-cent	No.	Per-cent
Considerably below average (below 1000 lbs. per acre)	36	25	19	13	1	1	16	11	21	15	9	6	6	4
Below average (1000-1399 lbs. per acre)	36	25	13	9	3	2	20	14	19	13	3	2	14	10
Above average (1400-1799 lbs. per acre)	36	25	20	14	4	3	12	8	24	17	3	2	9	6
Considerably above average (1800 or more lbs. per acre)	36	25	19	13	2	1	15	11	22	15	1	1	13	9
Total Study	144	100	71	49	10	7	63	44	86	60	16	11	42	29

Age. The data relating ages of tobacco producers to yield levels are presented in Table V. It is of interest to note that only 26 (18 percent) of the 144 tobacco producers were below 40 years of age; while 74 (about 51 percent) were between ages 40 to 60, and 44 (about 31 percent) were above 60 years of age. Approximately two-thirds of the older farmers had tobacco yields below the county average, while fully 45 percent of them had per acre yields of less than 1,000 pounds. It appears that difference of age was not a factor in yield levels above 1,400 pounds.

Educational level. Data with regard to the educational levels of tobacco growers in Williamson County associated with different yield levels of tobacco production are presented in Table VI. The largest proportion (54 percent) of the land owners had not gone beyond the 8th grade. Of 144 farm owners interviewed, 25 had not gone beyond the 4th grade, three of this latter group not having had any formal schooling. All three of those with no schooling and 13 of the remaining 22 not having gone beyond the 4th grade had average per acre tobacco yields below 1,000 pounds. There was some indication that farmers who had completed high school had somewhat higher per acre average tobacco yields.

Major source of income. There was some indication that farmers with tobacco as a major source of income showed a slight trend toward very low tobacco yield levels, compared to farmers with dairying, livestock or other major sources of income, as may be seen in Table VII. Among 36 farmers with per acre average tobacco yields of less than

TABLE V

RELATIONSHIP OF TOBACCO YIELDS PRODUCED TO AGES OF 144 SELECTED FARMERS IN WILLIAMSON COUNTY, TENNESSEE, 1956 THROUGH 1960

Yield Group	All Farmers Included		Farmers by Age Group					
			Young Below 40		Medium 40 to 60		Old Over 60	
	No.	Per-cent	No.	Per-cent	No.	Per-cent	No.	Per-cent
Considerably below average (below 1000 lbs. per acre)	36	25.0	4	2.8	12	8.3	20	13.9
Below average (1000-1399 lbs. per acre)	36	25.0	11	7.6	17	11.8	8	5.6
Above average (1400-1799 lbs. per acre)	36	25.0	4	2.8	23	16.0	9	6.2
Considerably above average (1800 or more lbs. per acre)	36	25.0	7	4.8	22	15.3	7	4.9
Total Study	144	100.0	26	18.0	74	51.4	44	30.6

TABLE VI

RELATIONSHIP OF TOBACCO YIELDS PRODUCED TO EDUCATIONAL LEVELS ATTAINED BY 144 SELECTED FARM OWNERS IN WILLIAMSON COUNTY, TENNESSEE, 1956 THROUGH 1960

	All Farmers Included		Number of Years of School Completed							
			0 - 4		5 - 8		9 - 12		13 or more	
Yield Group	No.	Per-cent	No.	Per-cent	No.	Per-cent	No.	Per-cent	No.	Per-cent
Considerably below average (below 1000 lbs. per acre)	36	25	16	11	12	8	5	4	3	2
Below average (1000-1399 lbs. per acre)	36	25	4	3	12	8	9	6	11	8
Above average (1400-1799 lbs. per acre)	36	25	0	0	18	12	14	10	4	3
Considerably above average (1800 or more lbs. per acre)	36	25	5	4	12	8	15	10	4	3
Total Study	144	100	25	18	54	36	43	30	22	16

TABLE VII

RELATIONSHIP OF TOBACCO YIELDS PRODUCED TO MAJOR SOURCE OF INCOME OF 144 SELECTED FARMERS IN WILLIAMSON COUNTY, TENNESSEE, 1956 THROUGH 1960

	All Farmers Included		Major Sources of Income							
			Tobacco		Dairying		Livestock		Other	
Yield Group	No.	Per-cent	No.	Per-cent	No.	Per-cent	No.	Per-cent	No.	Per-cent
Considerably below average (below 1000 lbs. per acre)	36	25	17	12	5	3	5	3	9	7
Below average (1000-1300 lbs. per acre)	36	25	10	7	14	10	10	7	1	1
Above average (1400-1799 lbs. per acre)	36	25	10	7	14	10	9	6	4	2
Considerably above average (1800 or more lbs. per acre)	36	25	12	8	8	6	13	9	3	2
Total Study	144	100	49	34	41	29	37	25	17	12

1,000 pounds, 17 said tobacco was their major source of income. Among the farmers with per acre average tobacco yields above 1,000 pounds, there were no consequential differences in major sources of income. An interesting side note at this point was that dairy and livestock farmers generally had applied more manure to tobacco land than had other farmers.

II. INDIVIDUAL PRODUCTION PRACTICES

Plant bed sterilization. Numbers of Williamson County tobacco producers were about equally divided among three methods of plant bed sterilization for weed control. The three methods were: burning, use of cyanamid and use of methyl bromide. As shown in Table VIII, no tobacco yield variation appeared when the three methods were compared. The same applied to the comparison of fall sterilization and spring sterilization. From this it would appear that neither the method nor the time of plant bed sterilization had a critical influence on tobacco yield.

Plant bed fertilization. Among the 144 tobacco farmers included in the study, 115 (80 percent) approximated Extension recommendations as to rates of fertilizers applied to tobacco plant beds. Reference should be made to Table IX. No consequential differences were observed when rates of fertilizer applied per 100 square yard plant bed were compared with tobacco yield levels.

Varieties. As presented in Table X, tobacco varieties did not appear to constitute a large, if any, factor influencing per acre yield levels in Williamson County. Ky. 16 was found to be the most popular

TABLE VIII

RELATIONSHIP OF TOBACCO YIELDS PRODUCED TO METHODS AND TIMES OF PLANT BED STERILIZATION REPORTED BY 144 SELECTED FARMERS IN WILLIAMSON COUNTY, TENNESSEE, 1956 THROUGH 1960

	All Farmers Included		Method of Sterilization								Time of Sterilization					
			Burning		Cyanamid		Methyl Bromide		2 or More Methods		Fall		Spring		Both	
Yield Group	No.	Per-cent	No.	Per-cent	No.	Per-cent	No.	Per-cent	No.	Per-cent	No.	Per-cent	No.	Per-cent	No.	Per-cent
Considerably below average (below 1000 lbs. per acre)	36	25.0	17	11.8	12	8.3	6	4.2	1	0.7	14	9.7	21	14.6	1	0.7
Below average (1000-1399 lbs. per acre)	36	25.0	12	8.3	12	8.3	10	7.0	2	1.4	14	9.7	19	13.2	3	2.1
Above average (1400-1799 lbs. per acre)	36	25.0	8	5.6	11	7.6	15	10.4	2	1.4	12	8.3	22	15.3	2	1.4
Considerably above average (1800 or more lbs. per acre)	36	25.0	14	9.7	10	7.0	8	5.5	4	2.8	10	7.0	22	15.2	4	2.8
Total Study	144	100.0	51	35.4	45	31.2	39	27.1	9	6.3	50	34.7	84	58.3	10	7.0

TABLE IX

RELATIONSHIP OF TOBACCO YIELDS PRODUCED TO FERTILIZER TREATMENTS OF TOBACCO PLANT BEDS AS REPORTED BY 144 SELECTED FARMERS IN WILLIAMSON COUNTY, TENNESSEE, 1956 THROUGH 1960

Yield Group	All Farmers Included		Pounds of Commercial Fertilizer Applied Per 100 Square Yards of Plant Bed									
			None		25		50		75		100	
	No.	Per-cent	No.	Per-cent	No.	Per-cent	No.	Per-cent	No.	Per-cent	No.	Per-cent
Considerably below average (below 1000 lbs. per acre)	36	25	1	1	1	1	22	15	1	1	11	7
Below average (1000-1399 lbs. per acre)	36	25	2	1	5	4	26	18	0	0	3	2
Above average (1400-1799 lbs. per acre)	36	25	0	0	3	2	28	19	0	0	5	4
Considerably above average (1800 or more lbs. per acre)	36	25	0	0	4	3	26	18	0	0	6	4
Total Study	144	100	3	2	13	10	102	70	1	1	25	17

TABLE X

RELATIONSHIP OF TOBACCO YIELDS PRODUCED TO TOBACCO VARIETIES USED BY 144 SELECTED FARMERS IN WILLIAMSON COUNTY, TENNESSEE, 1956 THROUGH 1960

Yield Group	All Farmers Included		Farmers Using Tobacco Varieties											
			Ky. 16		11A or 11B		Burley 21		Ky. 41A		Other[a]		2 or More[b]	
	No.	Percent	No.	Percent	No.	Percent	No.	Percent	No.	Percent	No.	Percent	No.	Percent
Considerably below average (below 1000 lbs. per acre)	36	25	25	17	1	1	3	2	3	2	1	1	3	2
Below average (1000-1399 lbs. per acre)	36	25	16	11	2	1	8	6	1	1	2	1	7	5
Above average (1400-1799 lbs. per acre)	36	25	16	11	3	2	11	8	1	1	2	1	3	2
Considerably above average (1800 or more lbs. per acre)	36	25	14	10	2	1	12	8	1	1	3	2	4	3
Total Study	144	100	71	49	8	5	34	24	6	5	8	5	17	12

[a]Other varieties included Burley 37, Burley 2, and Ky. 9.

[b]Most of these grew Ky. 16 and one or more other varieties.

variety grown, there being some indication that a somewhat larger percentage of producers with yields in the considerably above average category grew the Burley 21 variety.

Plant bed seeding rate. Tobacco research workers have recommended that tobacco seed be planted at the rate of 2 to 3 level teaspoonfuls per 9 x 100 foot plant bed. Reference to Table XI shows that 134 (93 percent) of the 144 farmers in the study followed recommendations. Variations in seeding rates were not reflected in differences in yield levels.

Plant bed weed infestation. Data presented in Table XII show that 32 (about 22 percent) of the 144 Williamson County farmers interviewed, reported no weeds in their tobacco plant beds, 99 (nearly 69 percent) reported some weed infestation, and 13 (about 9 percent) reported heavy weed infestation. There is some indication that the higher producers did a better job of weed control. Even though the numbers reporting some weeds in each of the four tobacco yield groups were about the same, approximately twice as many producers with per acre average tobacco yields above the county average reported no weeds as compared to producers with per acre yields below the average. A slightly larger number of producers with per acre average yields below average reported heavy weed infestations than was true with above average yield producers.

Plant bed insect control. Reference to data presented in Table XIII shows that tobacco producers with higher per acre yields tended to do a better job of plant bed insect control when compared to farmers

TABLE XI

RELATIONSHIP OF TOBACCO YIELDS PRODUCED TO PLANT BED SEEDING RATE USED BY 144 SELECTED FARMERS IN WILLIAMSON COUNTY, TENNESSEE, 1956 THROUGH 1960

	All Farmers Included		Level Teaspoons Seed Used Per 9 x 100 Ft. Bed							
			2		3		4		5	
Yield Group	No.	Per-cent	No.	Per-cent	No.	Per-cent	No.	Per-cent	No.	Per-cent
Considerably below average (below 1000 lbs. per acre)	36	25	17	12	18	12	0	0	1	1
Below average (1000-1399 lbs. per acre)	36	25	14	10	18	13	2	1	2	1
Above average (1400-1799 lbs. per acre)	36	25	24	16	10	7	1	1	1	1
Considerably above average (1800 or more lbs. per acre)	36	25	22	15	11	8	3	2	0	0
Total Study	144	100	77	53	57	40	6	4	4	3

TABLE XII

RELATIONSHIP OF TOBACCO YIELDS PRODUCED TO DEGREE OF PLANT BED WEED INFESTATION OF 144 SELECTED FARMERS IN WILLIAMSON COUNTY, TENNESSEE, 1956 THROUGH 1960

	All Farmers Included		Degree of Weed Infestation in Plant Beds					
			None		Some		Much	
Yield Group	No.	Per-cent	No.	Per-cent	No.	Per-cent	No.	Per-cent
Considerably below average (below 1000 lbs. per acre)	36	25.0	5	3.5	26	18.0	5	3.5
Below average (1000-1399 lbs. per acre)	36	25.0	6	4.1	25	17.4	5	3.5
Above average (1400-1799 lbs. per acre)	36	25.0	11	7.6	24	16.7	1	0.7
Considerably above average (1800 or more lbs. per acre)	36	25.0	10	7.0	24	16.6	2	1.4
Total Study	144	100.0	32	22.2	99	68.7	13	9.1

TABLE XIII

RELATIONSHIP OF TOBACCO YIELDS PRODUCED TO EFFECTIVENESS OF INSECT CONTROL IN TOBACCO PLANT BEDS OF 144 SELECTED FARMERS IN WILLIAMSON COUNTY, TENNESSEE, 1956 THROUGH 1960

Yield Group	All Farmers Included		Effectiveness of Insect Control in Plant Beds					
			Good		Fair		Poor	
	No.	Per-cent	No.	Per-cent	No.	Per-cent	No.	Per-cent
Considerably below average (below 1000 lbs. per acre)	36	25.0	13	9.0	23	16.0	0	0
Below average (1000-1399 lbs. per acre)	36	25.0	17	11.8	18	12.5	1	0.7
Above average (1400-1799 lbs. per acre)	36	25.0	21	14.6	15	10.4	0	0
Considerably above average (1800 or more lbs. per acre)	36	25.0	27	18.75	8	5.55	1	0.7
Total Study	144	100.0	78	54.15	64	45.45	2	1.4

with lower per acre average yields. Approximately twice as many with yields considerably above average did a relatively good job of controlling insects as did farmers with yields considerably below average. As the yields increased, the numbers of farmers with relatively good insect control likewise increased. The reverse was true of farmers who did a relatively fair job of insect control. As may be seen in Table XIV, the number of farmers using soil insecticides in tobacco plant beds tended to increase as tobacco yields increased.

Plant bed disease damage. As seen in Table XV, about as many farmers in one yield group reported disease damage as in another. However, a large majority of all yield groups reported no damage and a relatively small proportion of each group reported much damage. Table XVI shows that no farmers with considerably below average yields had experienced blackshank disease, while the other three groups admitted they had. It is possible that some of the farmers in the lower yield groups might not have recognized the blackshank disease even though having had it.

Quality of tobacco plants. Table XVII discloses that 105 (about 73 percent) of the farmers interviewed reported they had good quality tobacco plants at setting time, 10 (7 percent) reported they had excellent quality plants, 28 (about 20 percent) reported their plants to be fair, and only one farmer reported poor quality plants. All but one of the 10 reporting excellent quality plants were producers with per acre average tobacco yields above average. One-half of those reporting fair quality plants were producers with per acre average tobacco yields

TABLE XIV

RELATIONSHIP OF TOBACCO YIELDS PRODUCED TO USE OF SOIL INSECTICIDES ON PLANT BEDS AS REPORTED BY 144 SELECTED FARMERS IN WILLIAMSON COUNTY, TENNESSEE, 1956 THROUGH 1960

Yield Group	All Farmers Included		Soil Insecticides Applied to Plant Beds			
			Yes		No	
	No.	Per-cent	No.	Per-cent	No.	Per-cent
Considerably below average (below 1000 lbs. per acre)	36	25.0	17	11.8	19	13.2
Below average (1000-1399 lbs. per acre)	36	25.0	14	9.7	22	15.3
Above average (1400-1799 lbs. per acre)	36	25.0	20	13.9	16	11.1
Considerably above average (1800 or more lbs. per acre)	36	25.0	23	16.0	13	9.0
Total Study	144	100.0	74	51.4	70	48.6

TABLE XV

RELATIONSHIP OF TOBACCO YIELDS PRODUCED TO EXTENT OF DISEASE DAMAGE IN TOBACCO PLANT BEDS OF 144 SELECTED FARMERS IN WILLIAMSON COUNTY, TENNESSEE, 1956 THROUGH 1960

Yield Group	All Farmers Included		Extent of Disease Damage in Plant Beds					
			Much		Some		None	
	No.	Per-cent	No.	Per-cent	No.	Per-cent	No.	Per-cent
Considerably below average (below 1000 lbs. per acre)	36	25	1	1	4	3	31	21
Below average (1000-1399 lbs. per acre)	36	25	3	2	15	10	18	13
Above average (1400-1799 lbs. per acre)	36	25	0	0	16	11	20	14
Considerably above average (1800 or more lbs. per acre)	36	25	0	0	6	4	30	21
Total Study	144	100	4	3	41	28	99	69

TABLE XVI

RELATIONSHIP OF TOBACCO YIELDS PRODUCED TO NUMBERS OF FARMERS EXPERIENCING BLACKSHANK DISEASE AS REPORTED BY 144 SELECTED FARMERS IN WILLIAMSON COUNTY, TENNESSEE, 1956 THROUGH 1960

Yield Group	All Farmers Included		Number of Farmers Experiencing Blackshank Disease			
			Yes		No	
	No.	Per-cent	No.	Per-cent	No.	Per-cent
Considerably below average (below 1000 lbs. per acre)	36	25.0	0	0	36	25.0
Below average (1000-1399 lbs. per acre)	36	25.0	9	6.25	27	18.75
Above average (1400-1799 lbs. per acre)	36	25.0	9	6.25	27	18.75
Considerably above average (1800 or more lbs. per acre)	36	25.0	6	4.2	30	20.8
Total Study	144	100.0	24	16.7	120	83.3

TABLE XVII

RELATIONSHIP OF TOBACCO YIELDS PRODUCED TO QUALITY OF TOBACCO PLANTS REPORTED BY 144 SELECTED FARMERS IN WILLIAMSON COUNTY, TENNESSEE, 1956 THROUGH 1960

Yield Group	All Farmers Included		Farmers By Plant Quality Group							
			Excellent		Good		Fair		Poor	
	No.	Per-cent	No.	Per-cent	No.	Per-cent	No.	Per-cent	No.	Per-cent
Considerably below average (below 1000 lbs. per acre)	36	25.0	0	0	21	14.6	14	9.7	1	0.7
Below average (1000-1399 lbs. per acre)	36	25.0	1	0.7	28	19.4	7	4.9	0	0
Above average (1400-1799 lbs. per acre)	36	25.0	4	2.8	27	18.7	5	3.5	0	0
Considerably above average (1800 or more lbs. per acre)	36	25.0	5	3.5	29	20.1	2	1.4	0	0
Total Study	144	100.0	10	7.0	105	72.8	28	19.5	1	0.7

considerably below average. These data might be interpreted as indicating the possibility that tobacco producers with higher yields have been growing plants of a higher quality.

Type of soil. The 55 soil types identified on the 144 farms growing tobacco in Williamson County were brought together into five soil groups. (See Appendix, page 82.) Table XVIII shows that 36 (25 percent) grew tobacco on superior soils, 45 (about 31 percent) on excellent soils, 36 (25 percent) on good soils, 18 (about 12 percent) on fair soils, and 9 (about 6 percent) on poor soils. A slight increasing trend in numbers of farmers producing tobacco on better soils as the yield groups increased was noted. Almost as many farmers produced below average tobacco yields on superior, excellent and good soils as produced above average yields. This can be interpreted to mean that most tobacco producers grow tobacco on soils capable of producing much higher yields under proper management and cultural practices. Thus, it would appear that factors other than soil type must be responsible, singly and/or in combination, for relatively low tobacco yields on land of high potential productive capacity.

Soil testing. Too few tobacco producers have followed soil test recommendations, as shown in Table XIX. During the five year period, 1956-60, only 24 (approximately 17 percent) of the farmers interviewed followed soil test recommendations. None in the considerably below average yield group had made soil tests, while 25 percent of the below and above average groups and about 17 percent of the considerably above average group had made tests.

TABLE XVIII

RELATIONSHIP OF TOBACCO YIELDS PRODUCED TO SOIL TYPE CLASSIFICATION OF LAND OF 144 SELECTED FARMERS IN WILLIAMSON COUNTY, TENNESSEE, 1956 THROUGH 1960

	All Farmers Included		Farmers Producing Tobacco By Soil Type Group									
			Superior		Excellent		Good		Fair		Poor	
Yield Group	No.	Per-cent	No.	Per-cent	No.	Per-cent	No.	Per-cent	No.	Per-cent	No.	Per-cent
Considerably below average (below 1000 lbs. per acre)	36	25.0	8	5.5	9	6.2	10	7.0	6	4.2	3	2.1
Below average (1000-1399 lbs. per acre)	36	25.0	11	7.6	7	4.9	10	7.0	5	3.4	3	2.1
Above average (1400-1799 lbs. per acre)	36	25.0	10	7.0	12	8.3	8	5.5	4	2.8	2	1.4
Considerably above average (1800 or more lbs. per acre)	36	25.0	7	4.9	17	11.8	8	5.5	3	2.1	1	0.7
Total Study	144	100.0	36	25.0	45	31.2	36	25	18	12.5	9	6.3

TABLE XIX

RELATIONSHIP OF TOBACCO YIELDS PRODUCED TO NUMBERS OF GROWERS WHO FERTILIZED TOBACCO ACCORDING TO SOIL TEST RECOMMENDATIONS AS REPORTED BY 144 SELECTED FARMERS IN WILLIAMSON COUNTY, TENNESSEE, 1956 THROUGH 1960

	All Farmers Included		Farmers Following Soil Test Recommendations			
			Yes		No	
Yield Group	No.	Per-cent	No.	Per-cent	No.	Per-cent
Considerably below average (below 1000 lbs. per acre)	36	25.0	0	0	36	25.0
Below average (1000-1399 lbs. per acre)	36	25.0	9	6.2	27	18.8
Above average (1400-1799 lbs. per acre)	36	25.0	9	6.3	27	18.7
Considerably above average (1800 or more lbs. per acre)	36	25.0	6	4.2	30	20.8
Total Study	144	100.0	24	16.7	120	83.3

Soil analysis. Soil tests show that tobacco was grown on soils with a wide range in pH values, as presented in Table XX. Lime applications were recommended on all fields showing a pH value of less than 6.2. Therefore, approximately two-thirds of the fields were seen to need lime. Also, of soils having a pH value of less than 5.5, nearly two-thirds produced below average yields.

Data presented in Table XXI show that most tobacco producing soils in Williamson County tested high in available phosphate and potash. Approximately 60 percent of the producers grew tobacco on soils that tested extra high in available phosphate. Comparing the four yield groups, a smaller proportion of the soils that produced yields considerably below average tested extra high in phosphate than either of the higher yield groups. No noticeable differences in potash levels are seen when soil test results are visually compared according to yield grouping.

Fertilizer usage. Data in Table XXII disclose that the variation in amounts of commercial fertilizer was a major factor contributing to relatively low and wide variations in tobacco yields. An increasingly greater proportion of the higher producers used larger amounts of commercial fertilizer as the yield levels increased.

Manure usage. There appeared to be a definite relation between the amounts of manure used and tobacco yields, as presented in Table XXIII. Of the 144 producers interviewed, approximately 15 percent reportedly used no manure, about 17 percent used from one to 5 tons per acre, 28 percent used from 6 to 10 tons, 13 percent used from 11 to 15

TABLE XX

RELATIONSHIP OF TOBACCO YIELDS PRODUCED TO pH RANGES OF SOILS OF 144 SELECTED FARMERS IN WILLIAMSON COUNTY, TENNESSEE, 1956 THROUGH 1960

Yield Group	All Farmers Included		Farmers by Soil pH Range[a]							
			Under 5.5		5.5 - 6.1		6.2 - 6.6		Over 6.6	
	No.	Per-cent	No.	Per-cent	No.	Per-cent	No.	Per-cent	No.	Per-cent
Considerably below average (below 1000 lbs. per acre)	36	25	17	12	6	4	9	6	4	3
Below average (1000-1399 lbs. per acre)	36	25	6	4	19	13	9	7	2	1
Above average (1400-1799 lbs. per acre)	36	25	6	4	13	9	16	11	1	1
Considerably above average (1800 or more lbs. per acre)	36	25	6	4	21	15	9	6	0	0
Total Study	144	100	35	24	59	41	43	30	7	5

[a]Lime applications recommended for soils testing below pH 6.2.

TABLE XXI

RELATIONSHIP OF TOBACCO YIELDS PRODUCED TO SOIL ANALYSES SHOWING AVAILABLE PHOSPHATE AND POTASH IN SOILS OF 144 SELECTED FARMERS IN WILLIAMSON COUNTY, TENNESSEE, 1956 THROUGH 1960

Yield Group	All Farmers Included		Farmers by Degree of Phosphate Availability[a]						Farmers by Degree of Potash Availability[b]					
			Extra High		High		Medium		High		Medium		Low	
	No.	Percent	No.	Percent	No.	Percent	No.	Percent	No.	Percent	No.	Percent	No.	Percent
Considerably below average (below 1000 lbs. per acre)	36	25.0	15	10.4	20	13.8	1	0.7	29	20	6	4	1	1
Below average (1000-1399 lbs. per acre)	36	25.0	22	15.3	14	9.7	0	0	34	24	2	1	0	0
Above average (1400-1799 lbs. per acre)	36	25.0	23	16.0	12	8.3	1	0.7	36	25	0	0	0	0
Considerably above average (1800 or more lbs. per acre)	36	25.0	26	18.1	9	6.2	1	0.7	35	24	1	1	0	0
Total Study	144	100.0	86	59.8	55	38.1	3	2.1	134	93	9	6	1	1

[a]Phosphate availability: (1) extra high = above 150 lbs. P per acre; (2) high = 36-150 lbs. P per acre; (3) medium = 16-25 lbs. P per acre.

[b]Potash availability: (1) high = 190 and above lbs. per acre; (2) medium = 140-180 lbs. per acre; (3) low = 90-130 lbs. per acre.

TABLE XXII

RELATIONSHIP OF TOBACCO YIELDS PRODUCED TO AVERAGE POUNDS OF COMMERCIAL FERTILIZER USED BY 144 SELECTED FARMERS IN WILLIAMSON COUNTY, TENNESSEE, 1956 THROUGH 1960

	All Farmers Included		Farmers by Commercial Fertilizer Applied Group Average Pounds Per Acre Per Year[a]											
			None		100-399		400-699		700-1000		1100-1500		1600 or more	
Yield Group	No.	Per-cent	No.	Per-cent	No.	Per-cent	No.	Per-cent	No.	Per-cent	No.	Per-cent	No.	Per-cent
Considerably below average (below 1000 lbs. per acre)	36	25	11	8	11	8	8	5	6	4	0	0	0	0
Below average (1000-1399 lbs. per acre)	36	25	5	3	13	9	8	6	9	6	1	1	0	0
Above average (1400-1799 lbs. per acre)	36	25	7	5	10	7	5	3	10	7	4	3	0	0
Considerably above average (1800 or more lbs. per acre)	36	25	1	1	2	1	4	3	17	12	4	3	8	5
Total Study	144	100	24	17	36	25	25	17	42	29	9	7	8	5

[a]All analyses included.

TABLE XXIII

RELATIONSHIP OF TOBACCO YIELDS PRODUCED TO TONS OF MANURE APPLIED TO TOBACCO AND AVERAGE TOTAL TONS APPLIED PER ACRE BY 144 SELECTED FARMERS IN WILLIAMSON COUNTY, TENNESSEE, 1956 THROUGH 1960

Yield Group	All Farmers Included		Farmers by Tons Applied Group Per Acre Per Year										Average Total Tons Manure Applied Per Acre
			None		1-5		6-10		11-15		16 or more		
	No.	Per-cent	No.	Per-cent	No.	Per-cent	No.	Per-cent	No.	Per-cent	No.	Per-cent	
Considerably below average (below 1000 lbs. per acre)	36	25.0	13	9.0	16	11.1	4	2.8	1	0.7	2	1.4	4
Below average (1000-1399 lbs. per acre)	36	25.0	7	4.9	5	3.5	14	9.7	2	1.4	8	5.5	11
Above average (1400-1799 lbs. per acre)	36	25.0	0	0	2	1.4	12	8.3	9	6.3	13	9.0	15
Considerably above average (1800 or more lbs. per acre)	36	25.0	2	1.4	2	1.4	10	6.9	6	4.2	16	11.1	16
Total Study	144	100.0	22	15.3	25	17.4	40	27.7	18	12.6	39	27.0	

tons and more than 27 percent used more than was recommended. Ninety-one percent of the producers that used no manure and 84 percent of those that used 5 tons or less per acre produced tobacco yields considerably below average. At the same time, 92 percent of the growers with above average yields had applied 6 or more tons of manure per acre. It also is seen that producers with considerably above average per acre tobacco yields applied an average of approximately four times as many tons of manure per acre as did producers with average per acre yields of less than 1,000 pounds. This will indicate that the use of manure, along with commercial fertilizer applications, is an important consideration to tobacco growers if relatively high yields are desired.

Fertilizer nutrients. Data with regard to averages of fertilizer nutrients applied to tobacco in relation to yield levels are presented in Table XXIV. The averages include pounds of available nitrogen, phosphate and potash applied from commercial fertilizer, manure and legume crops turned. The data show a very noticeable relation in amounts of N, P_2O_5 and K_2O applied to tobacco yield levels. The higher the amounts of all three nutrients, especially N and K_2O, applied the higher the yield level. Growers with less than average per acre yields applied less nitrogen and potash than is recommended under average conditions. Some growers with very high yields applied more of all nutrients than recommended.

However, it is evident that far too many producers (about 75 percent) were at the time of the study using less than recommended amounts of nitrogen and potash.

TABLE XXIV

RELATIONSHIP OF TOBACCO YIELDS PRODUCED TO AVERAGE POUNDS OF FERTILIZER NUTRIENTS APPLIED TO TOBACCO BY 144 SELECTED FARMERS IN WILLIAMSON COUNTY, TENNESSEE, 1956 THROUGH 1960

Yield Group	All Farmers Included	Average Pounds of Fertilizer Nutrients From All Sources Applied Per Acre Per Year[a]		
	No.	N	P_2O_5	K_2O
Considerably below average (below 1000 lbs. per acre)	36	52	30	79
Below average (1000-1399 lbs. per acre)	36	94	38	153
Above average (1400-1799 lbs. per acre)	36	133	48	203
Considerably above average (1800 or more lbs. per acre)	36	165	100	288

[a]The N and K_2O in manure applied were included, using an assumed average analysis of 5-2-8, used by Tennessee Soil Testing Laboratory and because of way Williamson County farmers handle their manure. An assumed value of 25 pounds of N per acre legume cover crops and 15 pounds of N per acre in legume-small grain mixtures were included.

Fertilizer placement. Reference to Table XXV shows that the vast majority of the producers that used commercial fertilizer used the broadcast method. A comparison of the broadcast method with placement of fertilizer in tobacco rows suggests there was some advantage to the former way. However, a single comparison of Tables XXII and XXV discloses that the majority of the producers that applied fertilizer in tobacco rows used relatively small amounts, since recommended rates for this method are usually for 300 pounds or less.

Time and method of transplanting. The data presented in Table XXVI show that most low yield producers transplanted tobacco at medium to late times in the season, while most high producers were found to have been transplanting at medium to early times. Nearly three-fourths of the growers reportedly set tobacco between May 20 and May 31. Most of the early transplanters had above average per acre yields, and most late transplanters had below average per acre yields.

Even though 76 percent of the producers transplanted tobacco by machine rather than by hand, data do not show any clear evidence of possible differentials in yield levels. However, visual inspection does show the existence of a slight tendency for the data to favor machine setting.

Rotation practices. Nearly three-fourths of the tobacco producers, 107 of the 144 interviewed, stated that they grew tobacco continuously on the same land year after year, as may be seen in Table XXVII. Rotations with tobacco grown one in two years and one in three years apparently did not result in any greater yields than did continuous

TABLE XXV

RELATIONSHIP OF TOBACCO YIELDS PRODUCED TO METHODS OF FERTILIZER PLACEMENT USED BY 144 SELECTED FARMERS IN WILLIAMSON COUNTY, TENNESSEE, 1956 THROUGH 1960

Yield Group	All Farmers Included		Farmers by Method of Fertilizer Placement							
			None		Broadcast		In Row		Both	
	No.	Per-cent	No.	Per-cent	No.	Per-cent	No.	Per-cent	No.	Per-cent
Considerably below average (below 1000 lbs. per acre)	36	25.0	11	7.6	15	10.4	9	6.3	1	0.7
Below average (1000-1399 lbs. per acre)	36	25.0	5	3.4	24	16.7	5	3.5	2	1.4
Above average (1400-1799 lbs. per acre)	36	25.0	7	4.9	24	16.6	4	2.8	1	0.7
Considerably above average (1800 or more lbs. per acre)	36	25.0	1	0.7	34	23.6	1	0.7	0	0
Total Study	144	100.0	24	16.6	97	67.3	19	13.3	4	2.8

TABLE XXVI

RELATIONSHIP OF TOBACCO YIELDS PRODUCED TO TIME AND METHOD OF TOBACCO TRANSPLANTING REPORTED BY 144 SELECTED FARMERS IN WILLIAMSON COUNTY, TENNESSEE, 1956 THROUGH 1960

Yield Group	All Farmers Included		Farmers by Transplanting Time Group[a]						Farmers by Method Group			
			Early		Medium		Late		Hand		Machine	
	No.	Percent	No.	Percent	No.	Percent	No.	Percent	No.	Percent	No.	Percent
Considerably below average (below 1000 lbs. per acre)	36	25	0	0	24	17	12	8	13	9	23	16
Below average (1000-1399 lbs. per acre)	36	25	7	5	26	18	3	2	8	6	28	19
Above average (1400-1799 lbs. per acre)	36	25	8	6	28	19	0	0	6	4	30	21
Considerably above average (1800 or more lbs. per acre)	36	25	12	8	21	15	3	2	8	6	28	19
Total Study	144	100	27	19	99	69	18	12	35	25	109	75

[a]Early: Before May 20; Medium: May 20-31; Late: June 1 or later.

TABLE XXVII

RELATIONSHIP OF TOBACCO YIELDS PRODUCED TO TOBACCO CROP ROTATION PRACTICE FOLLOWED BY 144 SELECTED FARMERS IN WILLIAMSON COUNTY, TENNESSEE, 1956 THROUGH 1960

Yield Group	All Farmers Included		Farmers by Rotation Practice Followed					
			Continuous Tobacco		Tobacco One Year in Two		Tobacco One Year in Three	
	No.	Percent	No.	Percent	No.	Percent	No.	Percent
Considerably below average (below 1000 lbs. per acre)	36	25	28	19	5	4	3	2
Below average (1000-1399 lbs. per acre)	36	25	26	18	4	3	6	4
Above average (1400-1799 lbs. per acre)	36	25	27	19	5	3	4	3
Considerably above average (1800 or more lbs. per acre)	36	25	26	18	4	3	6	4
Total Study	144	100	107	74	18	13	19	13

tobacco cropping. However, numbers reporting such rotations were relatively small.

Cover crops grown preceding tobacco. The data comparing kinds of cover crops grown preceding tobacco with yield levels attained are presented in Table XVIII. Approximately one-half of all growers reportedly used mixtures of small grain and crimson clover. Of the remainder, 19 used none, 14 used rye alone, 11 used oats alone and 15 used crimson clover alone. Eleven of the 19 producers who used no cover crops had average per acre tobacco yields considerably below average. Mixtures of small grain and crimson clover were found to be predominantly used by producers with above average yields. This indicates the possible value of such cover crops in efficient tobacco culture.

Plant population. There was some degree of relation between tobacco plant population and per acre average yield levels, as shown in Table XXIX. The per acre average number of plants for growers with yields considerably below average was 9,056 compared to 9,758 for growers with per acre average yields in the considerably above average category; while median numbers of plants for the same groups were 9,500 and 9,600, respectively. Data in Table XXX indicate that difference in plant population at the various yield levels was related to uniformity of tobacco stands. An increasingly larger percentage of the farmers reported "good" stands as yield levels of the four groups increased. The reverse held for those reporting "medium" uniformity of stands. Data comparing spacings of tobacco plants within, 3, $3\frac{1}{4}$, and $3\frac{1}{2}$ foot rows at the various yield levels may be seen in Tables XXXVI, XXXVII and XXXVIII, in Appendix

TABLE XXVIII

RELATIONSHIP OF TOBACCO YIELDS PRODUCED TO KIND OF COVER CROP USED BY 144 SELECTED FARMERS IN WILLIAMSON COUNTY, TENNESSEE, 1956 THROUGH 1960

Yield Group	All Farmers Included		Farmers by Kind of Cover Crop Used											
			None		Rye		Oats		Rye and Clover		Oats and Clover		Clover	
	No.	Per-cent	No.	Per-cent	No.	Per-cent	No.	Per-cent	No.	Per-cent	No.	Per-cent	No.	Per-cent
Considerably below average (below 1000 lbs. per acre)[a]	36	25	11	7	5	3	3	2	7	5	5	4	4	3
Below average (1000-1399 lbs. per acre)	36	25	4	3	4	3	5	3	7	5	13	9	3	2
Above average (1400-1799 lbs. per acre)	36	25	3	2	4	3	1	1	12	8	12	8	4	3
Considerably above average (1800 or more lbs. per acre)[b]	36	25	1	1	1	1	2	1	16	11	11	7	4	3
Total Study[c]	144	100	19	13	14	10	11	7	42	29	41	28	15	11

[a]One (1%) used barley.

[b]One (1%) used grass and clover.

[c]Two additional farmers cited in footnotes above make up the remaining 2 percent.

TABLE XXIX

RELATIONSHIP OF TOBACCO YIELDS PRODUCED TO TOBACCO PLANT POPULATION OF 144 SELECTED FARMERS IN WILLIAMSON COUNTY, TENNESSEE, 1956 THROUGH 1960

Yield Group	Number of Farmers Included	Average Number of Tobacco Plants Per Acre	Median Number of Plants Per Acre	Range in Numbers of Plants Per Acre
Considerably below average (below 1000 lbs. per acre)	36	9056	9500	6300 - 11,000
Below average (1000-1399 lbs. per acre)	36	9407	9500	7000 - 15,000
Above average (1400-1799 lbs. per acre)	36	9572	9600	7000 - 12,500
Considerably above average (1800 or more lbs. per acre)	36	9758	9600	7000 - 12,500
Total Study	144	9448	9550	6300 - 15,000

NOTE: U. T. Agronomy Department plant count chart used.

TABLE XXX

RELATIONSHIP OF TOBACCO YIELDS PRODUCED TO UNIFORMITY OF TOBACCO PLANT STANDS REPORTED BY 144 SELECTED FARMERS IN WILLIAMSON COUNTY, TENNESSEE, 1956 THROUGH 1960

Yield Group	All Farmers Included		Farmers by Degree of Uniformity of Tobacco Stand Group[a]					
			Good		Medium		Poor	
	No.	Per-cent	No.	Per-cent	No.	Per-cent	No.	Per-cent
Considerably below average (below 1000 lbs. per acre)	36	25	22	15	14	10	0	0
Below average (1000-1399 lbs. per acre)	36	25	26	18	9	6	1	1
Above average (1400-1799 lbs. per acre)	36	25	32	22	4	3	0	0
Considerably above average (1800 or more lbs. per acre)	36	25	34	24	2	1	0	0
Total Study	144	100	114	79	29	20	1	1

[a]Good stand: 90 percent or more plant livability; Medium stand: 80 to 90 percent plant livability; Poor stand: below 80 percent plant livability.

C, page 83, where a slight tendency for data to favor the $3\frac{1}{4}$ foot row may be seen.

Depth of cultivation. Comparing deep and shallow cultivation of tobacco at different per acre average yield levels, as presented in Table XXXI, indicates that depth of cultivation was apparently not an important factor causing yield variations of tobacco in Williamson County.

Topping. The stage of maturity at which tobacco was topped, as presented in Table XXXII, was a major factor affecting per acre yields. None of the growers with per acre yields below 1,000 pounds topped before 40 percent of their tobacco had bloomed. Only one grower topped before the time when 75 percent of his plants had bloomed, while 35 producers in the considerably below average category topped at a late time. Comparing per acre tobacco yield levels with times of topping, it is seen that the proportion of producers who topped earlier increased as the yield levels increased. Only eight of 36 producers with considerably above average yields practiced late topping. Producers with below average yields tended to top at medium to late times, while producers with above average yields topped at medium to early times.

Only 16 (11 percent) practiced early topping as recommended by research. Thus, it is indicated that the practice of early tobacco topping should be included as a focal point in future Extension teaching related to tobacco culture.

Tobacco topped at different heights did not show any clearly evident affects, but a slight advantage to high topping may have been present.

TABLE XXXI

RELATIONSHIP OF TOBACCO YIELDS PRODUCED TO DEPTH OF CULTIVATION REPORTED BY 144 SELECTED FARMERS IN WILLIAMSON COUNTY, TENNESSEE, 1956 THROUGH 1960

Yield Group	All Farmers Included		Farmers by Depth of Cultivation Group			
			Deep		Shallow	
	No.	Per-cent	No.	Per-cent	No.	Per-cent
Considerably below average (below 1000 lbs. per acre)	36	25	11	8	25	17
Below average (1000-1399 lbs. per acre)	36	25	12	8	24	17
Above average (1400-1799 lbs. per acre)	36	25	11	8	25	17
Considerably above average (1800 or more lbs. per acre)	36	25	5	3	31	22
Total Study	144	100	39	27	105	73

TABLE XXXII

RELATIONSHIP OF TOBACCO YIELDS PRODUCED TO STAGE OF MATURITY AND HEIGHT OF TOBACCO WHEN TOPPED AS REPORTED BY 144 SELECTED FARMERS IN WILLIAMSON COUNTY, TENNESSEE, 1956 THROUGH 1960

Yield Group	All Farmers Included		Farmers by Stage of Tobacco Maturity Group[a]						Farmers by Group According to Height of Tobacco When Topped[b]					
			Early		Medium		Late		High		Medium		Low	
	No.	Per-cent	No.	Per-cent	No.	Per-cent	No.	Per-cent	No.	Per-cent	No.	Per-cent	No.	Per-cent
Considerably below average (below 1000 lbs. per acre)	36	25	0	0	1	1	35	24	12	8	21	15	3	2
Below average (1000-1399 lbs. per acre)	36	25	1	1	9	6	26	18	7	5	27	19	2	1
Above average (1400-1799 lbs. per acre)	36	25	2	1	21	15	13	9	13	9	23	16	0	0
Considerably above average (1800 or more lbs. per acre)	36	25	13	9	15	10	8	6	20	14	15	10	1	1
Total Study	144	100	16	11	46	32	82	57	52	36	86	60	6	4

[a]Early topping: prior to the time when 40 percent of plants are in bloom; Medium topping: during the time when 40 to 75 percent of plants are in bloom; Late topping: after 75 percent or more of plants are in bloom.

[b]High topping: over 26 leaves left on stalk; Medium topping: 22 to 26 leaves left; Low topping: less than 22 leaves left.

Sucker control. The degree to which tobacco growers controlled suckers was found to greatly influence yield differentials. As shown in Table XXXIII, it was apparent that more complete sucker control resulted in higher per acre average tobacco yields. No growers in the considerably below average yield group reported using complete sucker control, while nearly two-thirds of them indicated that their sucker control was poor. At the same time, two-thirds of the growers in the considerably above average yield group reported using complete sucker control; while only 2 percent indicated poor control. A total of less than 30 percent of the 144 growers interviewed had practiced complete sucker control as is recommended by research workers. This means that teaching tobacco growers to use proper sucker control should be considered as an important objective for Extension workers in the county.

Time between tobacco topping and harvest. Very closely associated with the stage of maturity when tobacco was topped was the length of time tobacco was allowed to grow between topping and harvest. This information is presented in Table XXXIV. Of the 144 growers interviewed, 21 (about 15 percent) harvested less than one week after topping, 30 (about 21 percent) waited one week, 52 (about 36 percent) waited two weeks, and 41 (about 28 percent) waited 3 weeks or more before harvesting as recommended if tobacco has been properly topped. It should be noted that, of the group producing yields in the considerably above average category, more than two-thirds followed the recommendation; while only four in the lowest group so indicated. The data show a direct relation between a longer time of growth between topping and

TABLE XXXIII

RELATIONSHIP OF TOBACCO YIELDS PRODUCED TO LEVELS OF TOBACCO SUCKER CONTROL AS REPORTED BY 144 SELECTED FARMERS IN WILLIAMSON COUNTY, TENNESSEE, 1956 THROUGH 1960

Yield Group	All Farmers Included		Farmers by Level of Sucker Control Group[a]					
			Complete		Some		Poor	
	No.	Percent	No.	Percent	No.	Percent	No.	Percent
Considerably below average (below 1000 lbs. per acre)	36	25	0	0	16	11	20	14
Below average (1000-1399 lbs. per acre)	36	25	5	3	18	13	13	9
Above average (1400-1799 lbs. per acre)	36	25	15	11	19	13	2	1
Considerably above average (1800 or more lbs. per acre)	36	25	22	15	11	8	3	2
Total Study	144	100	42	29	64	45	38	26

[a]Complete: no suckers allowed to grow; Some: tobacco suckered one time, or late, or two top suckers left; Poor: no suckers removed or suckered very late.

TABLE XXXIV

RELATIONSHIP OF TOBACCO YIELDS PRODUCED TO WEEKS OF GROWTH OF TOBACCO BETWEEN TOPPING AND HARVEST AS REPORTED BY 144 SELECTED FARMERS IN WILLIAMSON COUNTY, TENNESSEE, 1956 THROUGH 1960

Yield Group	All Farmers Included		Farmers by Group According to Weeks of Tobacco Growth Between Topping and Harvest									
			Less than One Week		One Week		Two Weeks		Three Weeks		Over Three Weeks	
	No.	Per-cent	No.	Per-cent	No.	Per-cent	No.	Per-cent	No.	Per-cent	No.	Per-cent
Considerably below average (below 1000 lbs. per acre)	36	25.0	8	5.5	17	11.8	7	4.9	4	2.8	0	0
Below average (1000-1399 lbs. per acre)	36	25.0	10	6.9	7	4.9	17	11.8	2	1.4	0	0
Above average (1400-1799 lbs. per acre)	36	25.0	1	0.7	3	2.1	20	13.9	10	6.9	2	1.4
Considerably above average (1800 or more lbs. per acre)	36	25.0	2	1.4	3	2.1	8	5.6	14	9.7	9	6.2
Total Study	144	100.0	21	14.5	30	20.9	52	36.2	30	20.8	11	7.6

harvest and increased yields. Results tend to bear out research findings on this point.

Disease and insect damage. Most tobacco growers in all per acre yield level groups reported experiencing little or no disease and insect damage to their growing crops. There were no noticeable differences in extent of damage when yield level groups were compared, as seen in Table XXXV. However, it should be noted that a larger percentage of growers producing yields considerably above average reported no insect damage than was true with any other group.

Priming. None of the 144 growers interviewed had ever primed any tobacco, so no comparisons were possible.

III. FARMERS' STATED REASONS FOR YIELD LEVEL STATUS

After completing each interview schedule, each grower, according to his production level, was asked by the interviewer why his yields were relatively low, no higher or relatively high, respectively. A summary of the actual answers given is presented in Appendix D, page 86.

Reasons given by tobacco growers who had considerably below average per acre yields (under 1000 pounds) as to why their yields were low were as follows: inefficient production practices, didn't know, inadequate resources and unfavorable weather.

A higher proportion of the reasons given by tobacco growers who had average yields per acre ranging from 1000 to 1799 pounds as to why their yields were no higher, as compared to the lower yield group,

TABLE XXXV

RELATIONSHIP OF TOBACCO YIELDS PRODUCED TO EXTENT OF DISEASE AND INSECT DAMAGE TO TOBACCO AS REPORTED BY 144 SELECTED FARMERS IN WILLIAMSON COUNTY, TENNESSEE, 1956 THROUGH 1960

	All Farmers Included		Farmers by Tobacco Disease Damage Group						Farmers by Tobacco Insect Damage Group					
			Much		Some		None		Much		Some		None	
Yield Group	No.	Per-cent	No.	Per-cent	No.	Per-cent	No.	Per-cent	No.	Per-cent	No.	Per-cent	No.	Per-cent
Considerably below average (below 1000 lbs. per acre)	36	25	1	1	4	3	31	21	2	1	11	8	23	16
Below average (1000-1399 lbs. per acre)	36	25	3	2	15	10	18	13	1	1	23	16	12	8
Above average (1400-1799 lbs. per acre)	36	25	0	0	16	11	20	14	0	0	23	16	13	9
Considerably above average (1800 or more lbs. per acre)	36	25	0	0	6	4	30	21	1	1	9	6	26	18
Total Study	144	100	4	3	41	28	99	69	4	3	66	46	74	51

placed the blame for not having produced higher yields on inadequate labor. Also, a smaller proportion answered that they did not know.

Fertilization was the factor given by a high proportion of tobacco growers who had above average and considerably above average per acre yields. Also, a large proportion stated that proper topping and sucker control were factors that attributed to their high yields.

A comparison of findings from this study with farmers' stated reasons for relatively high or low yields revealed that most tobacco growers did not know the most important factors, or practices, limiting tobacco production in Williamson County. This points to the need for more efficient Extension teaching in the tobacco production practice areas identified.

CHAPTER V

APPLICATION OF FINDINGS TO DEVELOPMENT OF A SUGGESTED EXTENSION TEACHING APPROACH FOR USE IN WILLIAMSON COUNTY

Philosophically, Extension programs are based on the needs of people in the local county. Local volunteer lay people meet together with Extension staff members periodically to determine the needs of people in each county. Such groups of lay people are referred to in Tennessee as Program Development Committees.

The Williamson County Agricultural Extension Program Development Committee met with the Extension staff in December 1960 to plan the Extension work to be conducted in the next five-year period. The written end-product of that planning effort consisted in the Williamson County Agricultural Extension Program Statement. Included in that statement were a number of long-range (five-year) program objectives. One of the program objectives selected for top priority in 1961 and 1962 by the Program Development Committee and staff was "Tobacco growers to produce higher yields of tobacco per acre for greater net returns."[1]

I. SITUATIONAL DATA

Situational data provided in the program statement cited above to explain the importance of the program objective selected included the following:

---

[1]Williamson County Agricultural Extension Program Development Committee, Williamson County Agricultural Extension Program Statement (Franklin, Tennessee: Cooperative Extension Service, 1961), p. 7.

1. Approximately 1,700 farmers in Williamson County were found to be growing a total of 1,800 acres of tobacco annually;

2. The county average per acre yield for the preceding five-year period was found to be approximately 277 pounds below the state average;

3. In 1959, tobacco ranked third, being exceeded only by dairying and livestock, as a source of total annual county gross agricultural income;

4. Tobacco returned a total gross income of approximately $1,673,000 annually to farmers of Williamson County in 1959;

5. It was estimated that if Williamson County tobacco producers should increase their yields merely to the state average, they would receive approximately $400,000 additional gross income per year.

The present study provided the following additional information concerning the tobacco situation in Williamson County:

1. A wide variation in per acre average yields was found, ranging from a low of 317 pounds reported by one producer to a high of 2,503 pounds reported by another;

2. The county five-year (1956 through 1960) per acre average yield was found to have been approximately 1,421 pounds;

3. It was found that 1,374 farmers produced 0.5 acres or more of tobacco annually;

4. Approximately 82 percent of the tobacco was found to have been grown on good, excellent, and superior soil types;

5. Only 17 percent of the producers reportedly had made soil tests at least once on their tobacco land during the five-year period and reported having applied fertilizer based on soil test recommendations;

6. Soil test data show that 60 percent of the tobacco fields were rated "extra high" and 38 percent were rated "high" in available phosphate;

7. Seventeen percent of the growers reportedly used no commercial fertilizer during recent years;

8. It was found that the following factors were limiting tobacco production in the county:-

a) Lack of knowledge of most farmers in regard to the low yield situations on individual farms and generally on farms in the county;

b) Inadequate fertilization based on soil test recommendations;

c) Untimely topping and inadequate sucker control;

d) The fact that Negro farm owners and women farm owners were found not to use most recommended tobacco production practices.

II. TEACHING OBJECTIVES

Based on the situational data mentioned above, the following Extension teaching objectives are proposed as being appropriate:

1. To help tobacco growers recognize the low-yield situation and the potentially high-yield opportunities through use of recommended practices;

2. To help tobacco growers understand the importance of fertilizing tobacco based on soil test recommendations and related practices, and to help them develop the necessary ability to so fertilize;

3. To help tobacco growers understand the importance of proper tobacco plant topping and sucker control and related practices, and to help them develop the necessary ability to so top and sucker their plants.

A suggested schedule for the inclusion of teaching and other activities designed for working toward accomplishment of each of the above-stated teaching objectives is presented on pages 67 through 69 in the outlined form currently used by the Tennessee Agricultural Extension Service for county annual plans of work.

The following proposal is suggested for consideration as a part of the 1963 Williamson County Agricultural Extension Plan of Work.

III. TEACHING SCHEDULE

Teaching Objective No. 1. To help tobacco growers recognize the low-yield situation and the potentially high-yield opportunities through use of recommended practices.

METHOD AND TOPIC	AGENT RESPONSIBLE	ASSISTED BY	WHEN	WHERE	EVALUATIVE TECHNIQUES
News Articles -- Feature tobacco production success stories	County Agent	Selected Growers	Throughout year when appropriate	Local Paper	1. Check ASC records annually to determine changes in tobacco yields
Group Meeting -- Present tobacco research data at county-wide meeting of growers	County Agent	Agronomy Specialist	February	Courthouse	2. Ask community leaders to report number of farmers with increased yields
Community Meetings -- Discuss value of high yields	County Agent	Assistant Agent	March	All Community Clubs	
Radio -- Interview farmer with tobacco success story	County Agent	Selected Growers	Feb. April July	At farm (taped)	3. Planned observations by agents as they visit tobacco farmers. Keep record of observations.
Field Day -- Tobacco research	All Agents	Local Leaders	July	Spring Hill Exp. Station	
Circular letter -- Feature dollar value of high tobacco yields	County Agent	Assistant Agent	March	County-wide	

Teaching Objective No. 2. To help tobacco growers understand the importance of fertilizing tobacco based on soil test recommendations and related practices, and to help them develop the necessary ability to so fertilize.

METHOD AND TOPIC	AGENT RESPONSIBLE	ASSISTED BY	WHEN	WHERE	EVALUATIVE TECHNIQUES
Fertilizer and Supply Dealers' Meeting -- Create an interest in soil testing and proper fertilization	Men Agents	Extension Agronomist	January	County-wide	1. Compare number of farmers making soil tests from State Soil Laboratory reports from previous year.
Community Club Meetings -- Create an interest in taking soil samples	County Agent	Community Leaders	February	All organized Community Clubs	2. Ask fertilizer dealers to report on volume of tobacco fertilizer sold and interest among growers.
4-H Club Meetings -- Demonstrate method of taking soil samples	Asst. Agent	Local 4-H Leaders	March	All 4-H Clubs	
Radio -- Interview tobacco grower with success story	County Agent	Selected Grower	March	Local Radio	3. Planned observations by agents as they travel over county.
News Article -- Feature tobacco fertilization success story	County Agent	Selected Grower	March	Local Paper	
Office and Farm Visits -- Create interest in soil testing and proper fertilization	All Agents		Feb.-May	County-wide and Office	4. Use checklist of tobacco production approved practices annually to determine practices used and/or adopted.

Teaching Objective No. 3. To help tobacco growers understand the importance of proper tobacco plant topping and sucker control and related practices, and to help them develop the necessary ability to so top and sucker their plants.

METHOD AND TOPIC	AGENT RESPONSIBLE	ASSISTED BY	WHEN	WHERE	EVALUATIVE TECHNIQUES
Community Meetings -- Create interest in proper topping and sucker control, using colored slides	County Agent	Community Leaders	July	All Community Clubs	1. Ask community leaders to report on number of farmers who follow recommended practices with respect to topping and suckering of tobacco.
Circular Letter -- Feature value of proper topping and sucker control, also, proper methods	County Agent		July	County-wide	
News Article -- Feature success story	County Agent	Selected Grower	July	Local Paper	2. Determine the percent increase in the number of farmers topping tobacco early and keeping suckers controlled by use of a prepared mail questionnaire.
Radio -- Interview farmer with success story	County Agent	Selected Grower	July	Local Radio	
Field Day -- Publicize and create interest in attending	All Agents	Local Leaders	July	Middle Tenn. Experiment Sta.	3. Planned observation by agents as they visit farms over the county.
Office and Farm Visits -- Create interest in proper topping and sucker control	Men Agents		June August	County-wide and Office	4. Use checklist of tobacco production approved practices annually to determine practices used and/or adopted.

CHAPTER VI

SUMMARY AND CONCLUSIONS

Relatively low burley tobacco production per acre was identified by the Williamson County Extension Program Development Committee as a problem of major concern in the county. Of nearly 2,000 farmers in the county, approximately 1,700 were found to have grown a total of approximately 1,800 acres of tobacco yearly during recent years. A further study of county tobacco data revealed that the average per acre yield for the five-year period, 1956 through 1960, was 1,421 pounds, this figure being 277 pounds less than the state average of 1,698 pounds for the same period. Also, it was found that there was a wide variation in per acre tobacco yields, ranging from a low of 317 pounds produced by one Williamson County tobacco producer to a high of 2,503 pounds produced by another.

It was estimated that an additional annual county gross income of approximately $400,000 could be received by tobacco growers if they would increase their yields of tobacco merely up to the state average level. However, since data were not available concerning practices growers were presently using, Extension workers had no definite way of knowing what they should emphasize in order to help tobacco growers increase yields. Therefore, the present study was made with the following stated objectives: 1) to determine present production levels of the tobacco producers in Williamson County; 2) to identify the production

practices used by tobacco producers in Williamson County that contribute to high, medium and low yields, and 3) to develop a suggested outline of an educational approach to teaching research-verified tobacco production practices to growers in Williamson County.

I. SUMMARY OF FINDINGS

Five-year, 1956 through 1960, average per acre yield data were computed for all 1,757 tobacco growers in the county. A frequency distribution was made of the 1,374 growers who had averaged growing 0.5 or more acres per year during the period studied. Twelve percent of the 1,374 growers had averaged producing considerably below average (below 1,000 pounds) per acre yields, 34 percent had produced below average (1,000-1,399 pound) yields, 46 percent had produced above average (1,400-1,799 pound) yields and only eight percent had produced considerably above average (1,800 or more pounds) yields. One hundred pound intervals were used, and nine names of growers were drawn randomly from each of the 16 intervals for a total sample of 144 tobacco growers.

An interview schedule form including family, personal and production factors was prepared and used to secure data from the 144 farmers selected. In addition, soil types were identified and soil tests were made on all tobacco fields.

Growers with considerably above average per acre tobacco yields were found to more nearly approximate research-verified recommended cultural practices than were growers with below average yields. The fact that so many relatively low yields were produced on good, excellent

and superior type tobacco soils points out that many farmers still have need for learning about and making use of approved management and cultural practices.

The lack of use of proper fertilization practices and, also, of correct topping and suckering practices by high proportions of the tobacco growers included in the study were found to constitute two of the greatest factors related to or causing low yields.

Only 17 percent of the producers reportedly had made soil tests on their tobacco land and had applied fertilizer based on the soil test recommendations. Seventeen percent, or approximately one out of every six growers, reported using no commercial fertilizer. A comparison of fertilizer recommendations and the amounts of N, P_2O_5 and K_2O actually applied to tobacco by producers shows that 75 percent of all growers did not apply enough nitrogen and that approximately one-half of them did not apply adequate amounts of potash. Only producers with considerably above average per acre yields had applied adequate amounts of nitrogen, and only producers with above average yields were found to have applied adequate amounts of potash as recommended.

Soil test data show that 60 percent of the tobacco fields were "extra high" and 38 percent were "high" in available phosphate. This means that most growers in the county should consider applying straight nitrogen and potash fertilizer materials instead of continuing to apply mixed fertilizers or those containing high proportions of phosphate.

Tobacco topping data show that only one percent of the growers with below average yields had topped their tobacco at the maturity stage

recommended by research workers. Even though a high percentage of the growers with above average yields had topped tobacco earlier, only 10 percent of the growers with yields above 1,400 pounds reportedly had topped at the recommended stage.

It also was found that too few farmers (29 percent) had controlled suckers in the recommended way. Only 3 percent of the growers with average per acre yields below 1,400 pounds reported that they had controlled suckers properly. Likewise, only 29 percent of the growers had waited three weeks or more between topping and harvest as recommended when tobacco is topped at the proper stage.

Among producers with considerably below average yields, large proportions were Negro owners, women owners, owners of farms less than 100 acres in size, tenants and sharecroppers making all decisions and/or producers above 60 years of age. The above yield group when compared with higher yield groups, was found to have applied smaller amounts of fertilizer and manure. Also, a higher proportion had failed to properly follow other recommended tobacco cultural practices.

Eighty-two percent of the tobacco was found to have been grown on good, excellent, and superior soil types, and almost as many below average yields were produced on the better soil types as was found to be true with the above average yield groups. This means that the Williamson County soils on which tobacco was being grown at the time of the study were capable of producing higher yields under improved levels of management.

Farmers with consistently high yields, compared to farmers with consistently low yields, based on the findings of this study, were found to be slightly more efficient in using improved varieties, growing quality plants, transplanting early and controlling insects.

One of the program objectives selected for top priority in 1961 and 1962 by the Williamson County Extension Program Development Committee and Extension staff was for tobacco growers to produce higher yields of tobacco per acre for greater net returns.

Based on situational data provided in the County Program Statement and on the findings of this study, three Extension teaching objectives were selected, and a suggested schedule developed for their attainment. Teaching objectives selected include: 1) to help tobacco growers recognize the low-yield situation and the potentially high-yield opportunities through use of recommended practices; 2) to help tobacco growers understand the importance of fertilizing tobacco based on soil test recommendations and related practices, and to help them develop the necessary ability to so fertilize; and 3) to help tobacco growers understand the importance of proper tobacco plant topping and sucker control and related practices, and to help them develop the necessary ability to so top and sucker their plants.

II. CONCLUSIONS

Based on the findings of the present study the following conclusions are drawn: 1) most farmers in the county do not recognize the low tobacco yield situation and the potentially high-yield opportunities

through use of recommended practices; 2) most farmers in the county are not properly fertilizing their tobacco based on soil test recommendations; 3) most farmers in the county are not properly topping tobacco and controlling suckers; 4) most Negroes and most women who are farm owners need special assistance if they are to effectively produce tobacco in Williamson County; and 5) more Extension program emphasis needs to be placed on the adoption of recommended tobacco production practices.

III. RECOMMENDATIONS

It is recommended that further research be conducted in the following areas: 1) tobacco plant population and spacing; 2) tobacco rotation practices; and 3) the effectiveness of chemicals used for tobacco sucker control.

Furthermore, the proposed Extension teaching objectives and teaching schedule are recommended for adoption as a part of the 1963 Williamson County Agricultural Extension Plan of Work.

BIBLIOGRAPHY

BIBLIOGRAPHY

A Guide to Extension Programs for the Future. Raleight, N. C.: Agricultural Extension Service, North Carolina State College, 1951.

Byrn, Darcie (ed.). Evaluation in Extension. Topeka, Kansas: H. M. Ives and Sons, Inc., 1959.

Haggestad, H. E. and D. R. Bowman. Burley Tobacco Quality, Yield and Chemical Composition as Affected by Time of Harvest. Agricultural Experiment Station, Bulletin 230. Knoxville: The University of Tennessee, 1953.

Hale, William M. "Relation of Certain Management Practices to Yields of Tobacco in Bradley County." Unpublished problem in lieu of thesis, The University of Tennessee, Knoxville, 1959.

_____. "Relation of Soil Type and Certain Chemical Soil Tests to Yields of Tobacco in Bradley County." Unpublished problem in lieu of thesis, The University of Tennessee, Knoxville, 1959.

Harmon, Alonzo Byron, Jr. "An Evaluation of Some Important Soil Types in the Central Basin of Tennessee." Unpublished Master's thesis, The University of Tennessee, Knoxville, 1953.

Karraker, P. E. and C. E. Boriner. Cropping and Soil Management for Burley Tobacco. Agricultural Experiment Station, Bulletin 453. Lexington: University of Kentucky, 1943.

McIlvaine, T. C. and others. Fertilizer Experiments with Tobacco. Agricultural Experiment Station, Bulletin 402. Morgantown: West Virginia University, 1957.

Nichols, B. C. and others. Fertilizer Tests with Burley Tobacco. Agricultural Experiment Station, Bulletin 252. Knoxville: The University of Tennessee, 1956.

Rhodes, Gilbert N. Written communication. Knoxville: Department of Agronomy, Agricultural Extension Service, The University of Tennessee, 1961.

_____. "The Evaluation of Certain Treatments for Weed Control in Tobacco Plant Beds." Unpublished Master's thesis, The University of Tennessee, Knoxville, 1955.

Tennessee Agricultural Stabilization and Conservation Committee, Annual Statistical Report: 1956. Nashville: United States Department of Agriculture, 1957.

_____. Annual Statistical Report: 1957. Nashville: United States Department of Agriculture, 1958.

_____. Annual Statistical Report: 1958. Nashville: United States Department of Agriculture, 1959.

_____. Annual Statistical Report: 1959. Nashville: United States Department of Agriculture, 1960.

_____. Annual Statistical Report: 1960. Nashville: United States Department of Agriculture, 1961.

The Cooperative Extension Service Today; A Statement of Scope and Responsibility. Committee on Organization and Policy. Washington: Federal Extension Service, 1958.

Tobacco Market News: 1959 Crop. Lexington, Ky.: Agricultural Marketing Service, Tobacco Division, 1960.

United States Bureau of the Census. United States Census of Agriculture: 1959. Vol. I, Counties, Part 31, Tennessee. Washington: Government Printing Office, 1961.

University of Tennessee Agricultural Experiment Station, The. Unpublished data of tobacco experiments, Greeneville, Tennessee, 1935-39.

Williams, Lewis Blanton, Jr. "Costs and Returns from Burley Tobacco Enterprise in the Central Basin of Tennessee." Unpublished Master's thesis, The University of Tennessee, 1951.

Williamson County Agricultural Extension Program Development Committee. Williamson County Agricultural Extension Program Statement. Franklin, Tennessee: Cooperative Extension Service, 1961.

Williamson County Agricultural Stabilization and Conservation Office. Confidential unpublished records of tobacco acreages, allotments and yields of farmers in Williamson County, Franklin, Tennessee, 1956-60.

APPENDIXES

APPENDIX A

WILLIAMSON COUNTY TOBACCO SCHEDULE FORM

NAME_____ ADDRESS_____ DATE_____

AVERAGE YIELD PER ACRE_____

1. Acres in farm_____ Cropland Acres_____ Tobacco Allotment_____
2. Age: Young_____ Medium_____ Old_____
3. Tobacco Grown by: Owner_____ Tenant_____ Share Cropper_____ Part-time Farmer_____
4. Tobacco decisions made by: Owner_____ Cropper or tenant_____ Jointly_____
5. Schooling: Owner: Grammer 0 1 2 3 4 5 6 7 8
   High School 1 2 3 4
   Higher_____
   Cropper or Tenant:
   Grammer 0 1 2 3 4 5 6 7 8
   High School 1 2 3 4
6. Major source of income: Tobacco___ Dairying___ Livestock___ Other___
7. Have you had blackshank? Yes___ No___
8. Type of soil_____

   Superior_____ Excellent_____ Good_____ Fair_____ Poor_____
9. Tons of manure applied per acre: None_____ Below 10_____

   10-15_____ Heavy_____
10. Followed soil test: Yes_____ No_____
11. Commercial fertilizer - lbs. None_____, 100-300_____, 400-600_____,

    700-1000_____, Above 1000_____.

    Analysis_____
12. Plant nutrients applied: N_____, P_2O_5_____, K_2O_____
13. Soil test results: pH_____, Available phosphorus_____

    Available potash_____

    Recommendations: N_____ P_2O_5_____ K_2O_____

    Shortage: N_____ P_2O_5_____ K_2O_____

    Surplus: N_____ P_2O_5_____ K_2O_____
14. Fertilizer placement: Broadcast_____, In row_____, Both_____
15. Fertilizer in plant bed: None___, 25 lbs.___, 50 lbs.___, 100 lbs.___

    Analysis_____

16. Plant bed sterilization: Burnt____, Cyanamid____, Gas____.

17. Time of sterilization: Fall____, Spring____.

18. Variety: Ky. 16____, Burley 2___, 11A or 11B___, Burley 21___ Other___

19. Rate of seeding (teaspoonful) 2___, 3___, 4___, 5____

20. Plant bed weed infestation: None____, Some____, Much____

21. Quality of plants: Excellent___, Good___, Fair___, Poor___

22. Were plantbed insecticides used: Yes____, No____

23. Insect control: Good____, Fair____, Poor____

24. Transplanting: Early____, Medium____, Late____

25. How transplanted: Hand____, Machine____

26. Rotation: Tobacco after tobacco____, 1 in 2____ 3 yr.____

27. Cover crop turned: Yes____ No____

28. Kind of cover crop: Small grain___, Grain and clover___, Clover___, Grass____

    Kind of grain: Rye____, Oats____

29. Cultivation: Deep____, Shallow____

30. Width between row (in feet): 3____, 3¼____, 3½____

31. Spacing in row (inches): 10____, 12____, 14____, 16____, 18____, 20____

32. Uniformity of stand: Good____, Medium____, Poor____

33. Topping, when: Early_____, Medium_____, Late_____

34. No. days harvested after topping: Immediately____, Week____, 2 weeks____, 3 weeks____, More____.

35. Topping how: High_____, Medium_____, Low_____.

36. Sucker control: Hand_____, Chemical_____.

37. Sucker control: Complete_____, Some_____, Poor_____

38. Disease damage: Much_____, Some_____, None_____.

39. Insect damage: Much_____, Some_____, None_____.

40. Stage of harvest: Ripe_____, Green_____.

41. Was tobacco primed: Yes_____, No_____.

42. Farmer's reasons for high___, low____ or no higher____ yields.

APPENDIX B

CLASSIFICATION OF SOILS FOR TOBACCO IN WILLIAMSON COUNTY, TENNESSEE

Superior

Huntington B1
Etowah A1
Armour B1
Hermitage B1
Etowah B1
Sequatchie B2
Humphreys B1
Armour B2
Hermitage B2
Etowah B2
Greendale B1

Excellent

Huntington ch B1
Armour C1
Armour Cherty B1
Minvale B2
Armour C2
Godwin B1
Armour Cherty B2
Mt. View B2
Maury B2
Dellrose ch D1

Good

Egam B1
Captina B1
Captina B2
Hagerstown B2
Armour ch C2
Armour ch D2
Mt. View ch B2
Donerail B2
Maury C2
Pace B2

Fair

Lindside ch B1
Hampshire B2
Lindside B1
Lobelville B1
Talbott B2
Donerail C2
Mt. View ch C2
Ashwood C1
Dellrose ch E1
Pace ch D2
Lobelville ch B1
Baxter ch C2
Baxter ch D1
Armour ch D2

Poor

Colbert B1
Taft A1
Braxton C2
Hampshire C2
Mimosa ch C2
Talbott P C2
Talbott P B3
Mimosa ch D2
Braxton C3
Bodine ch E1

APPENDIX C

TABLE XXXVI

RELATIONSHIP OF TOBACCO YIELDS PRODUCED TO COMPARISON OF SPACINGS OF TOBACCO PLANTS WITHIN 3 FOOT ROWS AS REPORTED BY 34 FARMERS IN WILLIAMSON COUNTY, TENNESSEE, 1956 THROUGH 1960

Yield Group	No. of Farmers Reporting	Number of Farmers Reporting Spacings of Tobacco Plants Within 3 Foot Rows					
		10 in.	12 in.	14 in.	16 in.	18 in.	20 in.
Considerably below average (below 1000 lbs. per acre)	9	0	0	1	5	3	0
Below average (1000-1399 lbs. per acre)	10	1	0	2	4	3	0
Above average (1400-1799 lbs. per acre)	9	0	0	2	3	4	0
Considerably above average (1800 or more lbs. per acre)	6	0	0	3	2	1	0
Total Study	34	1	0	8	14	11	0

TABLE XXXVII

RELATIONSHIP OF TOBACCO YIELDS PRODUCED TO COMPARISON OF SPACINGS OF TOBACCO PLANTS WITHIN 3¼ FOOT ROWS AS REPORTED BY 34 FARMERS IN WILLIAMSON COUNTY, TENNESSEE, 1956 THROUGH 1960

Yield Group	No. of Farmers Reporting	Number of Farmers Reporting Spacings of Tobacco Plants Within 3¼ Foot Rows					
		10 in.	12 in.	14 in.	16 in.	18 in.	20 in.
Considerably below average (below 1000 lbs. per acre)	5	0	0	0	3	2	1
Below average (1000-1399 lbs. per acre)	5	1	0	0	3	1	0
Above average (1400-1799 lbs. per acre)	11	0	0	1	7	3	0
Considerably above average (1800 or more lbs. per acre)	13	0	1	5	6	1	0
Total Study	34	1	1	6	19	7	0

TABLE XXXVIII

RELATIONSHIP OF TOBACCO YIELDS PRODUCED TO COMPARISON OF SPACINGS OF TOBACCO PLANTS WITHIN 3½ FOOT ROWS AS REPORTED BY 76 FARMERS IN WILLIAMSON COUNTY, TENNESSEE, 1956 THROUGH 1960

Yield Group	No. of Farmers Reporting	Number of Farmers Reporting Spacings of Tobacco Plants Within 3½ Foot Rows					
		10 in.	12 in.	14 in.	16 in.	18 in.	20 in.
Considerably below average (below 1000 lbs. per acre)	22	0	1	2	13	5	1
Below average (1000-1399 lbs. per acre)	21	0	0	2	12	7	0
Above average (1400-1799 lbs. per acre)	16	0	1	4	5	6	0
Considerably above average (1800 or more lbs. per acre)	17	0	0	3	7	7	0
Total Study	76	0	2	11	37	25	1

APPENDIX D

FARMERS' STATED REASONS FOR YIELD LEVEL STATUS

Upon completion of each interview schedule each grower, according to his production level, was asked by the interviewer why his yields were low, no higher or high respectively.

A. Reasons given by tobacco growers who had considerably below average per acre yields (under 1000 lbs.) as to why their yields were low

1. Inadequate resources

   a) Land

      (1) "I reckon it's the ground."

      (2) "I reckon I haven't got the right kind of land."

      (3) "It could be the land."

   b) Labor

      (1) "I don't have nobody to work it. My young 'uns don't get out of school till June."

      (2) "Just boys making it."

      (3) "Most of time it's laziness. Sharecropper won't listen. He does everything late. I can't tend to it now. At one time I had the highest yield in the county."

2. Inefficient production practices

   a) Selection of site

      (1) "May have it at the wrong place."

   b) Timing (transplanting)

      (1) "Sometime it's late getting out."

      (2) "Been setting it out late."

c) Land preparation

(1) "Ground ain't been turned enough."

d) Fertilization

(1) "Ground needs something done to it."

(2) "I guess the ground needs something."

(3) "Not enough manure put on it."

(4) "Don't guess we put on enough fertilizer."

(5) "Improper fertilizer. Haven't been soil testing."

(6) "Ground been run too much. No manure."

(7) "On account of not fertilizing. The man working it don't want to spend money for fertilize."

(8) "Failed to top properly and failed to fertilize."

e) Topping and suckering

(1) "Tobacco burns at bottom. I can't sucker enough."

(2) "Failed to top properly and failed to fertilize."

3. Unfavorable weather

(1) "I guess it's the dry weather we've had."

(2) "Dry weather is all I can say."

4. Don't Know

(1) "I just don't know."

(2) "I don't know."

(3) "It quits growing and fires up at the bottom."

(4) "I don't know."

(5) "Don't know."

(6) "I'd love for you to tell me why."

(7) "I sho don't have any idea."

B. Reasons given by tobacco growers who had below or above average per acre yields (1000-1799 lbs.) as to why their yields were no higher.

1. Inadequate resources

a) Land

(1) "It's not tobacco land, too low. It's been in tobacco too long. Ground was poor to start with."

(2) "I realize I haven't got my land developed as much as some others."

b) Labor

(1) "I just don't have the time to do things when it needs it."

(2) "I can tell you, this help is so dog-gone sorry, just can't get them to do what ought to be done."

(3) "Lack of attention. Lack of fertilizer."

(4) "Poor attention. Not pulling suckers when they ought to be. Poor weed control."

(5) "I let the hand on the place grow it. I don't take much interest in it."

2. Inefficient production practices

a) Fertilization

(1) "Ground needs building up."

(2) "Lack of attention. Lack of fertilizer."

(3) "I didn't have the manure."

(4) "I didn't have enough manure."

b) Plant population

(1) "Haven't been getting a stand."

c) Topping and sucker control

(1) "Don't top and sucker enough."

3. Unfavorable weather

(1) "On account of the weather."

(2) "The weather has a lot to do with it. Sometimes it rains, sometimes it don't."

4. Don't know

(1) "Have big tobacco but it don't weigh."

(2) "It's good tobacco, but I don't get the height. Sometimes the bottom leaves fire up."

5. Superstition

(1) "I think my tobacco has been growing too silky. I believe if rows run east and west you'll get more tobacco. My rows run north and south, I don't want to run them up hill. My land is very high in phosphate. That might have something to do with it."

(2) "I don't believe in using fertilizer. I think that's what helped to bring about so many diseases."

(3) "I believe they have the tobacco seed bred too high."

C. Reasons given by tobacco growers who had considerably above average per acre yields (1800 and above lbs.) as to why they made high yields.

1. Adequate resources

a) Land

(1) "By putting it on good land, fertilizing and working it good."

(2) "Good land and proper fertilization, also keeping the suckers pulled."

(3) "Good ground to begin with."

(4) "Good land."

(5) "It's a good piece of ground and I plow it."

(6) "Deep soil, plenty of cow manure, handled it carefully."

b) Labor

(1) "Worked good, manure and fertilizer."

(2) "My hand believes in working tobacco good."

(3) "Well cared for, worked and suckers kept out. Good luck with seasons."

(4) "Have a good man working it."

(5) "My hand gives it proper care and uses plenty of fertilizer."

2. Efficient production practices

a) Fertilization

(1) "Plenty of manure. I believe in topping and letting it spread."

(2) "We manure it good and work it."

(3) "Green crop and manure turned and plenty of fertilizer."

(4) "Worked good, manure and fertilizer."

(5) "Rotation and fertilization."

(6) "I believe in using plenty of manure and fertilizer."

(7) "Fertilizer and cover crops."

(8) "I believe in using plenty of manure and fertilizer."

(9) "The manure and fertilizer is what does it."

(10) "I'm a manure man."

(11) "We manure it, turn a cover crop and been getting rains. Keep it worked. I don't believe in fertilizer."

(12) "I don't believe anything will beat manure."

(13) "Good land. Plowed deep when plants are little and shallow after it starts growing. Made soil test last year and upped yield 400 lbs."

(14) "My hand gives it proper care and uses plenty of fertilizer."

(15) "The reason is good plants, used manure and fertilizer."

(16) "A good stand, good fertilizer, take care of it."

(17) "I reckon it's the fertilizer."

b) Plant quality

(1) "The reason is good plants, used manure and fertilizer."

(2) "Doing what it needs when it needs it. Unless I get a 99 percent stand I don't think I'll make much. Set out good plants."

c) Topping and sucker control

(1) "Plenty of manure. I believe in topping and letting it spread."

(2) "I top as soon as I see a button. I top early and sucker it."

(3) "Good land and proper fertilization. Also keeping the suckers pulled."

(4) "Well cared for, worked and suckers kept out. Good luck with the seasons."

(5) "Manuring ground good, topping and suckering."

(6) "I think if a man tops early he'll get more weight."

d) Plant population

(1) "Unless I get a 99 percent stand I don't think I'll make much. . ."

(2) "A good stand, good fertilizer and take care of it."

3. Cultivation

(1) "Worked good, manure and fertilizer."

(2) "My hand believes in working tobacco good."

(3) ". . . fertilization and working it good."

(4) "Keep it worked."

(5) "I give it good cultivation."

4. Favorable weather

   (1) ". . . Good luck with seasons."

   (2) ". . . and been getting rains."

5. Don't know

   (1) "I don't know."

   (2) "I wouldn't know. Tobacco has done well."

   (3) "I don't know."