

March 11, 1959

I am submitting herewith a problem in lieu of thesis (Agronomy 502a) written by William M. Hale entitled "Relation of Certain Management Practices to Yields of Tobacco in Bradley County." I recommend that it be accepted for three quarter hours of credit in partial fulfillment of the requirements for the degree of Master of Science, with a major in General Agriculture.

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RELATION OF CERTAIN MANAGEMENT PRACTICES TO YIELDS
OF TOBACCO IN BRADLEY COUNTY

AGRONOMY 502a
A PROBLEM IN LIEU OF THESIS

Submitted
in
Partial Fulfillment in the Requirements
for the degree of
Master of Science

by
William M. Hale

March 1959

1269846

ACKNOWLEDGEMENTS

The author wishes to express his gratitude and appreciation to:

Dr. Frank F. Bell, member of his graduate committee, for his efforts as advisor and friend in directing this study.

Professors Laurence N. Skold, Chairman, Lewis H. Dickson, Vernon E. Ross, and Harold J. Smith for serving on the author's graduate committee and giving much helpful advice.

Dr. William D. Bishop, U. T. Extension Agronomist, for his many useful suggestions.

Mr. Gilbert N. Rhodes, U. T. Associate Extension Agronomist and Tobacco Specialist, for his cooperation and helpful suggestions.

Mr. John E. Paysinger, Bradley County Assistant Agent, for his help with the field work.

Dr. Ralph McCracken for his assistance in identifying soils in the field.

Members of the Bradley County Extension Staff for their many acts of cooperation and assistance.

The twenty-six farmers of Bradley County on whose farms the tobacco was grown.

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CHAPTER I

INTRODUCTION

This problem is a collateral study to one which has been completed on "The Relation of Soil Type and Certain Chemical Soil Tests to Yields of Tobacco in Bradley County" (2). Results of this study indicated a very strong positive correlation between soil type and yield of tobacco. Nevertheless, the fact that so many low yields were produced on excellent and good soils pointed to a need for further study in an effort to account for some of these low yields on good soils. A study was thus made based on the following objective: to determine the relation of certain management practices to yields of tobacco in Bradley County.

CHAPTER II

METHODS AND PROCEDURES

The tobacco growers who furnished data for this study are the same ones from which the detailed soil data were obtained and reported in the collateral study on tobacco. Background information on Bradley County, tobacco yield data, selection of growers from which to obtain detailed crop data, and the relation of certain soil studies to yields are given in the report (2).

In obtaining data for this study, each grower was interviewed personally by the author. Results of the interviews were assembled on a mimeographed questionnaire form, an example copy of which is included in the Appendix. Some 35 areas of information were secured on the production of each crop of tobacco, including plant bed management, varieties, cropping history, fertilization, and cultural practices.

CHAPTER III

RESULTS AND DISCUSSION

Plant Bed Practices

Soil Sterilization.

Burning was the method of plant bed sterilization used by all but three of the twenty-six growers. Calcium cyanamid was used by two growers in the high group and one in the low group.

Weeds were reported not to be a problem in approximately half of the plant beds of each group. Some weeds were reported in 26 beds by the high group and 16 by the low group. Many weeds were reported in seven beds by the high group and 13 by the low group.

Fertilization.

Fertilization of plant beds is shown in Table I. This table shows that growers fertilized their plant beds at rates averaging from approximately one-third above to more than double the amount recommended per 100 square yards. Fertilization experiments at the Tobacco Experiment Station, Greeneville, (4) showed that adequate phosphate and potash could be easily supplied at seeding without undue fear of a slight excess being detrimental to germination or to the quality of the plants. Nitrogen, on the other hand, must be more carefully regulated. High nitrogen applications produce plants which tend to be very succulent and, therefore, not as desirable for transplanting.

TABLE I

FERTILIZER TREATMENT OF TOBACCO PLANT BEDS ON TWENTY-SIX FARMS
SELECTED IN BRADLEY COUNTY FOR THE YEARS 1950 THROUGH 1954

Group	Average pounds per 100 square yards		
	N	P ₂ O ₅	K ₂ O
High	4.2	7.9	5.2
Low	3.6	10.7	7.5
Recommended (6)	2	6	4

Seeding Rate.

Table II gives the average seeding rate of the low and high yield groups on the tobacco beds. The high producers as an average sowed twice the amount of seed recommended (6) while the low producers sowed almost three times the maximum recommended rate. Excessive seeding rates generally produce stands which are too thick, resulting in tall, spindly plants that may not survive too well when transplanted (3). Shaw (7) found that plant survival in the field decreased progressively as the stand density in the plant bed increased.

Insect and Disease Control.

Insecticides were used on approximately the same number of beds (38 to 40 per cent) by each group. Fungicides were used to control or prevent damage from blue mold on 38 per cent of the beds in the high yield group and only three per cent of the beds in the low group.

Quality Plants.

The quality of the plants produced as rated by the farmer can be seen in Table III. The farmer considered the plants to be of excellent quality if they were "stocky," had four to six well developed leaves, five to seven inches in length, and survived well when set in the field.

Some reduction in quality of plants, and thereby reduced field survival, undoubtedly resulted from excessive fertilization and seeding rates by growers in both groups. However, the higher percentage of excellent and good plants grown by the high group was probably due to less excessive rates of fertilization and seeding and better protection against diseases.

TABLE II

TOBACCO SEED PER 9 X 100 FOOT BED ON TWENTY-SIX FARMS SELECTED
IN BRADLEY COUNTY FOR THE YEARS 1950 THROUGH 1954

Group	Struck teaspoons seed
High	5
Low	8.5
Recommended (6)	2 to 3

TABLE III

QUALITY OF TOBACCO PLANTS GROWN ON TWENTY-SIX SELECTED FARMS
IN BRADLEY COUNTY FOR THE YEARS 1950 THROUGH 1954

Group	Excellent	Good	Fair	Poor
High	12	47	3	3
Low	4	41	12	8

Cultural Practices

Varieties.

Kentucky 41-A, Kentucky 16, and Kentucky 35 were the three tobacco varieties planted most often. The number of times grown and percentage for each variety are shown in Table IV. No special pattern developed on varieties when the fact is considered that beds reported as mixed all contained Kentucky 41-A and Kentucky 16, which just about equalized numbers and percentages for each group.

Soil Preparation.

Fall turning or disking of the tobacco patch was done in the majority of cases by both groups of producers partly for the purpose of seeding the winter cover crop. Turning, bogging, or disking was usually begun early in the spring or in time to allow the green manure crop to decay completely. High producers used a disk harrow over the patch three to four times, while the low producers reported disking only twice before setting in most cases. Both groups used a section harrow, cultipacker, and/or wooden float as the last step in preparing the land.

TABLE IV

TOBACCO VARIETIES GROWN ON TWENTY-SIX SELECTED FARMS
IN BRADLEY COUNTY FOR THE YEARS 1950 THROUGH 1954

	<u>High Group</u>		<u>Low Group</u>	
	Number	Per Cent	Number	Per Cent
Kentucky 41-A	27	40	37	56
Kentucky 16	14	20	18	27
Kentucky 35	9	13	1	1.5
Other	7	10	9	14
Mixed (2 varieties)	12	17	1	1.5

Note: Some growers planted two beds of two varieties.

Fertilization

Fertilization of fields on which tobacco was produced each year is reported in Tables V, VI, VII, VIII, and IX, along with the soil type and yield per acre of tobacco. Soil type is shown in these tables by a letter (s) identified as follows:

<u>Symbols</u>	<u>Soil Name</u>	<u>Symbols</u>	<u>Soil Name</u>
B	Barbourville	L	Leadvale
C	Conosauga	M	Muse
Ca	Captina	Me	Melvin
D	Dewey	Mi	Minvale
De	Decatur	Mo	Montevallo
E	Emory	OC	Old Colluvial
F	Fullerton	P	Pace
G	Greendale	Ph	Philo
H	Hermitage	Pr	Prader
Ha	Hambleton	YC	Young Colluvial

Averages of all data shown in Tables V, VI, VII, VIII, and IX are reported in Table X. By combining the plant nutrients applied as mixed fertilizers and manure, both the high and low group averages of P_2O_5 and K_2O were equal to, or exceeded, the recommended amounts (1). The nitrogen added by the high group was equal to the amount of nitrogen recommended, but nitrogen added by the low group was approximately one-third lower than the recommended amount. Recent experiments at the Greeneville Tobacco Station (5) show that an increase in nitrogen from 80 pounds (which was the average of the low group) to the recommended 120 pounds would probably increase the yield of tobacco by 64 pounds per acre. Since growers used manure on nearly every crop of tobacco, deficiencies of the so-called secondary and minor elements were considered not likely to be critical (4).

TABLE V

FERTILIZER AND MANURE APPLIED, SOIL TYPE, AND YIELDS OF TOBACCO
IN POUNDS PER ACRE ON TWENTY-SIX TOBACCO FIELDS
SELECTED IN BRADLEY COUNTY FOR 1950

Farm No.	Soil pH	Sample P	Tests K	Soil Type	Yield	Av. Yield 1950-1954
<u>High Yields</u>						
8-3023	7.1	25	380	H	3040	2524
12-1228	6.1	25	360	E	2290	2170
11-1003	5.6	25	305	B.9, M.1	2070	2046
12-841	6.8	25	400	G.5, L.5	1988	1912
13-1469	6.8	25	400	H	1885	1930
10-987	6.1	23	220	P.9, OC.1	1836	2008
11-1080	5.5	25	400	G	1780	2063
12-1226	6.8	25	170	B	1765	1945
2-1286	5.6	15	190	F.25, G.75	1713	2116
11-1656	6.3	25	334	D.8, E.2	1716	1944
7-958	6.9	25	400	H	1642	2056
12-2010	4.8	22	242	G	1527	1989
2-1513	No Tobacco					
Average	6.0	24	317		1938	2059
<u>Low Yields</u>						
11-2012	6.3	25	277	M	1145	956
12-1005	5.2	12	178	MO	955	844
7-808	6.8	25	352	H	908	893
1-526	6.9	25	238	B	873	695
13-371	6.02	23	370	C	842	975
1-1371	5.6	25	165	Pr.8, L.2	788	740
13-1505	6.8	25	394	H.2, E.2	692	860
12-328	4.9	27	180	M	620	957
5-2243	5.8	7	218	C.75, L.25	613	540
12-305	5.2	12	178	MO	588	532
12-152	5.7	25	187	B	508	669
12-1255	5.9	25	305	L.7, B.3	166	909
11-704	No Tobacco					
Average	5.9	21	253		725	798

TABLE VI

FERTILIZER AND MANURE APPLIED, SOIL TYPE, AND YIELDS OF TOBACCO
IN POUNDS PER ACRE ON TWENTY-SIX TOBACCO FIELDS
SELECTED IN BRADLEY COUNTY FOR 1951

Farm No.	Soil Sample Tests			Soil Type	Yield	Av. Yield 1950-1954
	pH	P	K			
<u>High Yields</u>						
8-3023	7.1	25	380	H	2766	2524
2-1286	5.9	10	122	E.5, H.5	2710	2116
12-1228	4.6	25	308	H	2509	2170
10-987	6.1	23	220	P.9, OC.1	2487	2008
11-1080	5.5	25	400	G	2250	2063
12-841	6.8	25	400	G.5, L.5	2185	1912
12-2010	4.8	22	242	G	2060	1986
7-958	6.9	11	200	H	1972	2056
2-1513	5.4	25	250	De.75, E.25	1960	1984
11-1003	5.6	25	305	B.9, M.1	1946	2046
12-1226	5.8	19	247	H.75, E.25	1907	2170
11-1656	6.3	25	334	D.8, E.2	1833	1944
13-1469	6.8	25	400	H	1811	1930
Average	6.0	22	293		2184	
<u>Low Yields</u>						
13-371	6.02	23	370	C	1302	975
13-1505	6.8	25	394	H.8, E.2	1127	860
7-808	6.8	25	352	H	1083	893
12-305	5.2	12	178	MO	943	532
12-1255	5.9	25	305	L.7, B.3	888	909
12-1005	5.2	12	178	Mo	823	844
11-704	6.7	15	62	Ca	800	863
5-2243	5.8	7	218	C.75, L.25	740	540
12-328	4.9	27	180	M	636	957
1-526	6.9	25	238	B	632	695
1-1371	5.6	20	165	Pr.8, L.2	623	740
11-2012	6.3	25	277	M	595	956
12-152	5.7	25	187	B	147	669
Average	6.0	20	239		795	

TABLE VII

FERTILIZER AND MANURE APPLIED, SOIL TYPE, AND YIELDS OF TOBACCO
IN POUNDS PER ACRE ON TWENTY-SIX TOBACCO FIELDS
SELECTED IN BRADLEY COUNTY FOR 1952

Farm No.	Soil Sample Tests			Soil Type	Yield	Av. Yield 1950-1954
	pH	P	K			
<u>High Yields</u>						
2-1286	5.9	10	122	E.5, H.5	2360	2116
12-1226	5.9	25	220	H	2340	1945
12-2010	4.8	22	242	G	2136	1906
7-958	6.9	25	400	H	2046	2056
11-1080	5.5	25	400	G	1974	2063
8-3023	7.1	25	380	H	1940	2524
10-987	6.1	23	220	P.9, OC.1	1917	2008
11-1003	5.6	25	305	B.9, M.1	1865	2046
12-1228	4.6	25	308	H	1765	2170
11-1656	6.3	25	334	D.8, E.2	1760	1944
13-1469	6.8	25	400	H	1582	1930
2-1513	5.4	25	250	De.75, E.25	1580	1984
12-841	6.8	25	400	G.5, L.5	1555	1912
Average	6.0	23	306		1909	
<u>Low Yields</u>						
12-1255	5.8	26	168	G.5, L.5	1610	909
12-152	5.9	25	343	B	1352	669
11-2012	6.3	25	277	M	1240	956
13-1505	6.8	25	394	H.8, E.2	1123	860
1-1371	5.6	20	165	Pr.8, L.2	1117	740
11-704	6.7	15	62	Ca	912	863
7-808	6.8	25	352	H	902	893
12-1005	5.2	21	255	C.7, YC.3	893	844
13-371	6.02	23	370	C	880	975
1-526	6.5	20	232	B.85, Mi.15	650	695
12-328	4.9	27	180	M	503	957
12-305	5.2	12	178	Mo	358	532
5-2243	No Tobacco					
Average	6.0	22	248		962	

TABLE VIII

FERTILIZER AND MANURE APPLIED, SOIL TYPE, AND YIELDS OF TOBACCO
IN POUNDS PER ACRE ON TWENTY-SIX TOBACCO FIELDS
SELECTED IN BRADLEY COUNTY FOR 1953

Farm No.	Soil pH	Sample Tests P	Tests K	Soil Type	Yield	Av. Yield 1950-1951
<u>High Yields</u>						
12-1226	6.2	25	360	E	2676	2521
11-1080	5.5	25	100	G	2612	2063
11-1656	6.3	25	331	D.8, E.2	2160	1911
10-987	6.1	23	220	P.9, OC.1	2370	2008
2-1513	5.6	18	205	De.75, E.25	2360	1981
8-3023	7.1	25	380	H	2350	2521
12-1226	6.3	12	110	G	2310	1915
7-958	6.9	25	100	H	2210	2056
11-1003	5.6	25	305	B.9, M.1	2221	2016
12-811	6.8	25	100	G.5, L.5	2185	1912
13-1169	6.8	25	100	H	2060	1930
2-1286	5.1	8	188	F	2015	2116
12-1226	1.8	22	212	G	1910	1986
Average	6.1	22	303		2290	
<u>Low Yields</u>						
12-328	1.9	27	180	M	2153	957
11-701	6.8	22	152	Ca	1008	863
11-2012	6.3	25	277	M	815	956
12-1005	5.2	21	255	C.7, YC.3	797	811
12-1255	5.9	25	305	L.7, B.3	678	909
13-371	6.02	23	370	C	616	975
1-1371	7.0	25	213	L	500	710
13-1505	6.8	25	391	H.8, E.2	175	860
12-305	6.1	15	151	Ha.85, Mo.15	170	532
1-526	6.5	20	232	B.85, Mi.15	136	695
5-2213	5.8	7	218	C.75, L.25	267	510
12-152 No Tobacco						
7-808 No Tobacco						
Average	6.1	21	252		750	

TABLE IX

FERTILIZER AND MANURE APPLIED, SOIL TYPE, AND YIELDS OF TOBACCO
IN POUNDS PER ACRE ON TWENTY-SIX TOBACCO FIELDS
SELECTED IN BRADLEY COUNTY FOR 1951

Farm No.	Soil pH	Sample Tests P K	Soil Type	Yield	Av. Yield 1950-1951
<u>High Yields</u>					
7-958	6.9	25 100	H	2382	2056
12-2010	6.8	22 212	G	2313	1986
13-1169	6.8	25 100	H	2310	1930
11-1003	5.6	25 305	B.9, M.1	2126	2016
2-1513	5.1	25 250	De.75, E.25	2036	1981
11-1656	6.3	25 331	D.8, E.2	1950	1911
2-1286	5.9	27 173	F	1780	2116
11-1080	5.5	25 100	G	1700	2063
12-811	6.8	25 100	G.5, L.5	1618	1912
12-1228	6.1	25 360	E	1608	2170
10-987	6.1	23 220	P.9, OC.1	1130	2008
12-1226	6.8	25 170	B	1105	1915
8-3023	No Tobacco				
Average	6.1	25 301		1891	
<u>Low Yields</u>					
13-371	6.02	23 370	C	1237	975
12-1255	6.0	17 150	L.8, Me.2	1213	909
1-526	6.9	25 238	B	886	695
13-1505	6.6	25 210	H	882	860
13-328	5.0	25 175	Ph.7, M.3	871	957
12-1005	5.5	22 232	C	752	811
7-808	6.8	25 352	H	680	510
1-1371	7.0	25 213	L	671	710
11-701	6.8	22 152	Ca.8, G.1	633	863
12-305	6.1	15 151	Ha.85, Mo.15	300	532
11-2012	No Tobacco				
12-152	No Tobacco				
5-2213	No Tobacco				
Average	6.3	23 230		813	

TABLE X

AVERAGES OF FERTILIZER AND MANURE APPLIED AND YIELDS OF TOBACCO IN POUNDS PER ACRE ON TWENTY-SIX TOBACCO FIELDS SELECTED IN BRADLEY COUNTY FOR THE FIVE YEAR PERIOD, 1950 THROUGH 1954

	Pounds per acre			Tons per acre manure	Yield
	N	P ₂ O ₅	K ₂ O		
Producers with high average yields	67*	156	101*	12	2043
Producers with low average yields	41*	101	69*	8	809
Recommended	120	75	120		

* Each ton of manure applied contained about 5 pounds of N. and 7-8 pounds of K₂O. These amounts are not included in these figures.

The original analysis showed that the levels of P_2O_5 and K_2O were equal to or exceeded the recommended amounts and that the low group was 40 pounds under the recommended amount of N. The addition of this amount of N would probably increase yields by an estimated 64 pounds. Further analysis in Tables XI, XII, and XIII were made which show the comparisons of the mean pounds of applied N, P_2O_5 , and K_2O respectively. In all cases there were significant differences between the high and low groups of applied N, P_2O_5 and K_2O at the probability levels shown. This may account for some of the differences in yield.

The method of applying the fertilizer ranged from placing it all in the row to broadcasting it all on the field. Three-fourths or more of the fertilizer was applied broadcast 60 per cent of the time by high producers and 23 per cent by the low group. All of the fertilizer was placed in the row 50 per cent of the time by the low group and only 11 per cent by the high group. Most of the fertilizer which was broadcast was either drilled or disk harrowed into the soil. Manure was broadcast prior to turning in the fall and/or spring. Ammonium nitrate, nitrate of soda, or complete fertilizer was sometimes applied as a side dressing, but this was not a very common practice by either group.

Transplanting

Growers in the high group averaged getting their plants set in the field much earlier. Of this group, 86 per cent had their

TABLE XI

COMPARISON OF MEAN POUNDS PER ACRE OF APPLIED N ON SELECTED
TOBACCO FIELDS IN BRADLEY COUNTY FOR
THE YEARS 1950 THROUGH 1954

Year	Group	Average Amount of applied N	Difference Between Means	No. of Samples	L. S. D. 1-5-10-20
1950	High	140	41	12	*
	Low	99		12	
1951	High	146	39	13	*
	Low	107		13	
1952	High	135	59	13	*
	Low	76		12	
1953	High	173	64	13	*
	Low	108		11	
1954	High	153	57	11	*

* Difference significant at the probability level shown.

TABLE XII

COMPARISON OF MEAN POUNDS PER ACRE OF APPLIED P_2O_5 ON SELECTED
TOBACCO FIELDS IN BRADLEY COUNTY FOR
THE YEARS 1950 THROUGH 1954

Year	Group	Average amount of Applied P_2O_5	Difference Between Means	No. of Samples	<u>L. S. D.</u> <u>5-10-20</u>
1950	High	238	52	12	*
	Low	186		12	
1951	High	243	47	13	
	Low	196		13	
1952	High	238	54	13	*
	Low	184		12	
1953	High	270	81	13	*
	Low	189		11	
1954	High	254	73	12	*
	Low	181		10	

* Difference significant at the probability level shown.

TABLE XIII

COMPARISON OF MEAN POUNDS PER ACRE OF APPLIED K_2O_5 ON SELECTED
TOBACCO FIELDS IN BRADLEY COUNTY FOR THE
YEARS 1950 THROUGH 1954

Year	Group	Average amount of Applied K_2O_5	Difference Between Means	Samples	L. S. D. 5-10-20-30
1950	High	556	124	12	*
	Low	432		12	
1951	High	520	86	13	*
	Low	434		13	
1952	High	543	86	13	*
	Low	457		12	
1953	High	586	148	13	*
	Low	438		11	
1954	High	546	170	12	*
	Low	376		9	

* Difference significant at the probability level shown.

plants set by May 15 compared to 50 per cent of the low group.

Hand setting was the most common method used, with a few growers in each group using either mechanical hand setters or tractor planters.

The general practice of the growers was to transplant when moisture conditions were favorable and watering was not required. However, in many cases watering was done on at least part of the field. Plain water was used in most cases. One grower used nitrate of soda in the setting water one year and one grower used lindane two years to control soil borne insects. Each grower used his best judgment on whether natural moisture was sufficient or plants needed to be watered at setting, and no pattern of difference developed.

Spacing

Width of tobacco rows varied from 36 to 48 inches. Table XIV gives the row width for each crop of tobacco produced.

Setting tobacco in rows 42 inches apart is the recommended practice (6) and was the spacing used by 70 per cent of the high producers. About one-third of the low producers spaced their rows closer than recommended and one-third spaced them wider.

Spacing of plants in the row is shown in Table XV. Eighty six per cent of the high producers followed the recommended spacing (6) of 15 to 18 inches compared to 76 per cent of the low producers.

Cultivation

The first cultivation in most cases was done with a double

TABLE XIV

WIDTH OF ROWS IN TWENTY-SIX TOBACCO FIELDS SELECTED IN
BRADLEY COUNTY FOR THE YEARS 1950 THROUGH 1954

Inches	High Group		Low Group	
	Number	Per Cent	Number	Per Cent
36-38	13	20	23	35
40-42	45	70	21	32
45-48	6	10	22	33

TABLE XV

SPACING BETWEEN PLANTS IN TWENTY-SIX TOBACCO FIELDS
 SELECTED IN BRADLEY COUNTY FOR THE YEARS
 1950 THROUGH 1954

Inches	<u>High Group</u>		<u>Low Group</u>	
	Number	Per Cent	Number	Per Cent
Under 14	4	6	0	0
14-16	37	58	19	29
17-18	18	28	31	47
Over 18	5	8	16	24

foot, four foot, or other deeper type cultivator at a depth of three to six inches. For later cultivations, shallow-type cultivators such as scratchers ("gee-whiz", 1½ tooth, sweeps) would loosen the soil to a depth of two to five inches depending on the size of the plants, condition of the soil, or other factors which were considered. High producers cultivated an average of four to five times; low producers cultivated three to four times. Hoeing was sometimes the first cultivation and was often a part of future cultivations.

Insects

Most of the growers in both groups felt that they were doing a pretty good job of insect control and that their yields and profits were not materially reduced by insect damage.

High producers reported "some" budworm and hornworm damage on about half (53%) of the crops. "Some" grasshopper damage was reported on about one-third of the crops.

Low producers reported "some" budworm damage about two years out of five, and "some" hornworm damage about one year out of three. Grasshopper damage was not considered much of a problem by this group. Only one grower expressed any concern about possible damage by flea beetles.

Arsenic and meal for budworm and arsenic and lime for hornworms were standard insecticides used by all growers. However, each grower seemed to have his own formula, or method, for mixing. Proportions

reported most frequently were one part arsenic to four or five parts meal, and one part arsenic to five to ten parts lime. Time and frequency of application were as equally varied within each group. Some growers applied insecticides weekly for four to five weeks, others when there was evidence of damage.

Diseases

Some disease damage, mostly from wildfire, was reported an average of approximately one out of four years by the low producers and one out of ten years by the high producers. One high producer changed to a resistant variety because of some wilt in his tobacco the previous year. Another changed the location of his tobacco field because of a suspected disease condition in his soil.

Roots of plants in a number of different fields were examined for nematode damage. Some damage was found in several crops of both groups, but there appeared to be no practical way of evaluating the extent of the damage.

Topping and Harvesting

Nearly all crops producing high average yields had been topped by August 15 and about three-fourths of the low-yielding crops had been topped by this date. September 15 found most of the tobacco of all producers hanging in the barn.

Cropping System

All but three high producers practiced continuous cropping of

tobacco, usually with a winter cover crop. Typical reasons given for continuous cropping were, "Best land for tobacco," "Handy to house and barn for cutting, poisoning, checking," "No other place built up for tobacco," "Doing all right, no reason to change."

Low producers were divided about half and half between continuous cropping and rotation. Typical reasons given for rotating tobacco were "Want to keep down disease," "Makes better tobacco to change," "Does best if changed every two years."

Cover crops preceded approximately three-fourths of the crops of high producers and one-half of those of the low group.

CHAPTER VI

USE IN AN EXTENSION PROGRAM

Results of this study and the one correlated with it point up several areas of application to an extension program in Bradley County directed towards increasing yields of tobacco. Some recommendations are: greater emphasis and personal assistance on selecting the best type of soil available for producing tobacco; plant bed demonstration where recommended practices are compared with these normally used by one or more growers; field demonstrations comparing different methods of applying fertilizer; and spacing demonstrations involving different row widths and different distance between plants in the row.

BIBLIOGRAPHY



BIBLIOGRAPHY

1. Agronomy Staffs, U. T. Mimeograph. Tentative, Recommendation for Nitrogen, Phosphate, and Potash Application. 1956.
2. Hale, William M., The Relation of Soil Type and Certain Chemical Soil Tests to Yields of Tobacco in Bradley County. Unpublished Problem in lieu of Thesis, Knoxville, Tennessee, U. T., Library. 1959
3. Klingman, Glenn C., Crop Production in the South. New York. John Wiley and Sons, Inc. 1957.
4. Nichols, B. C., Bowman, D. R., and McMurtrey, J. E., Jr. Fertilizer Tests With Burley Tobacco. U. T., Agr. Exp. Sta. Bul. 252. 1956
5. Parks, W. L. Unpublished Data. U. T., Agr. Exp. Sta. 1958.
6. Rhodes, Gilbert N. and Matthews, Joseph N. Burley Tobacco Production in Tennessee. U. T., Agr. Ext. Ser. Pub. 358. 1956.
7. Shaw, Luther. Effects of Stand Density in the Plant Bed on the Yield of Transplantable Plants, Plant Characteristics, and Survival in the Field. Communication (Mimeograph). U. S. D. A. Agricultural Research Service. Waynesville, North Carolina. 1959.

APPENDIX

	1950	1951	1952	1953	1954
10. Was water and/or "starter" solution used when transplanting	_____	_____	_____	_____	_____
11. Method of seedbed preparation (time, implements, frequency)	_____	_____	_____	_____	_____
12. Depth of cultivation	_____	_____	_____	_____	_____
13. Distance between rows	_____	_____	_____	_____	_____
14. Distance between plants	_____	_____	_____	_____	_____
15. Time of topping	_____	_____	_____	_____	_____
16. Time of cutting	_____	_____	_____	_____	_____
17. Irrigation (Amount & frequency)	_____	_____	_____	_____	_____
18. Cropping system used in tobacco	_____	_____	_____	_____	_____
19. Reasons for continuous cropping and/or growing tobacco on different soil areas	_____	_____	_____	_____	_____
20. Last year tobacco (grown on this land)	_____	_____	_____	_____	_____
21. Uniformity of the tobacco plot (suitable or not suitable)	_____	_____	_____	_____	_____

	1950	1951	1952	1953	1954
22. Insect and/or disease damage (none, some, such)	_____	_____	_____	_____	_____
23. Insecticide and fungicides used (name)	_____	_____	_____	_____	_____
<u>Plant Bed</u>					
1. Seed source	_____	_____	_____	_____	_____
2. Variety	_____	_____	_____	_____	_____
3. Seeding rate	_____	_____	_____	_____	_____
4. Method of sterilization (Burning, calcium cyanamide, methyl bromide)	_____	_____	_____	_____	_____
5. Weed Population (none, some much)	_____	_____	_____	_____	_____
6. Amount and Analysis of Commercial fertilizer applied per sq. ft. bed	_____	_____	_____	_____	_____
7. Quality of plants (Excellent, good, fair)	_____	_____	_____	_____	_____
8. Insecticides and fungicides used on tobacco bed (Name)	_____	_____	_____	_____	_____
9. Control (good, fair, poor)	_____	_____	_____	_____	_____
<u>Soil Characterization</u>					
1. Soil type, slope and erosion	_____	_____	_____	_____	_____
2. Depth of surface and natural drainage	_____	_____	_____	_____	_____