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To the Graduate Council:

I am submitting herewith a thesis written by Harold Eli Gelfond entitled "Expectation of Productivity from the Soils of Henderson County, Tennessee Under Several Models of Land Use." I recommend that it be accepted for nine quarter hours of credit in partial fulfillment of the requirements for the degree of Master of Science, with a major in Agronomy.

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EXPECTATION OF PRODUCTIVITY FROM THE SOILS OF HENDERSON
COUNTY, TENNESSEE UNDER SEVERAL MODELS OF LAND USE

A Thesis

Presented to
the Graduate Council of
The University of Tennessee

In Partial Fulfillment
of the Requirements of the Degree
Master of Science

by
Harold Eli Gelfond
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TABLE OF CONTENTS

CHAPTER	PAGE
I. THE PROBLEM AND DEFINITIONS OF TERMS USED	1
The Problem	1
Definitions and Assumptions Used	2
Analysis of the Problem	6
II. REVIEW OF THE LITERATURE	7
III. METHODS AND PROCEDURES AND SOURCES OF DATA	24
Soil Survey Report	24
Individual Farm Survey	25
Conservation Needs Survey	30
Estimation of Yields	31
Estimation of Productivity	33
Analysis of Data	38
IV. THE PRESENT SITUATION	39
Yield of Major Crops	42
V. ALTERNATE AGGREGATE LAND USE MODELS	49
Inventory Groupings	49
Major Crops	51
VI. ALTERNATE MODELS OF LAND USE ON REPRESENTATIVE	
MEDIAN FARMS	57
Inventory Groupings	57
Major Crops	63
VII. EFFECT OF FERTILIZATION ON MAJOR CROPS	81
County in the Aggregate	81
Representative Farms	87

CHAPTER	PAGE
VIII. DISCUSSION OF RESULTS	92
Evaluation of Alternate Aggregate Models	96
Individual Farms	97
Evaluation of Alternate Models on Farms	99
General Discussion	99
IX. SUMMARY AND CONCLUSIONS	101
The Present Situation	101
Alternate County Land-Use Models	102
Alternate Individual Farm Land-Use Models	102
Fertilization of Major Crops	103
Forestry	104
Conclusions	104
LITERATURE CITED	107
APPENDICES	110
APPENDIX A. Soil management group classification of the soils of Henderson County	111
APPENDIX B. Estimated yields per acre at several inputs of fertilizer of cotton, corn, and soybeans by soil mapping unit	116
APPENDIX C. Estimated yields per acre of lespedeza, oats, alfalfa and pasture at several inputs of fertilizer by soil mapping unit	121
APPENDIX D. Classification by inventory groups in acres of the soil management groups of Henderson County	124

CHAPTER

PAGE

APPENDICES (continued)

APPENDIX E. Average weighted yields per acre for cotton and corn under several inputs of fertilizer by soil management group	125
APPENDIX F. Average weighted yields per acre of soybeans, lespedeza and oats under several inputs of fertilizer by soil management group	127
APPENDIX G. Average weighted yields per acre of alfalfa and pasture under several inputs of fertilizer by soil management group	129
APPENDIX H. Distribution in acres of major crops on soil management groups in alternate aggregate model A.	131
APPENDIX I. Distribution in acres of major crops on soil management groups in alternate aggregate model B.	132
APPENDIX J. Distribution in acres of major crops on soil management groups in alternate aggregate model C.	133
APPENDIX K. Distribution in acres of major crops on soil management groups in alternate aggregate model D.	134
APPENDIX L. Distribution in acres of major crops on soil management groups in alternate aggregate model E.	135

CHAPTER

PAGE

APPENDICES (continued)

APPENDIX M. Land use by inventory grouping in acres of the soils on representative farm one 1958.	136
APPENDIX N. Land use by inventory grouping in acres of the soils on representative farm two 1958.	137
APPENDIX O. Land use by inventory grouping in acres of the soils on representative farm three 1958.	138
APPENDIX P. Land use by inventory grouping in acres of the soils on representative farm four 1958.	139
APPENDIX Q. Land use by inventory grouping in acres of the soils on representative farm five 1958.	140
APPENDIX R. Distribution of major crops in acres on areas in alternate model A on representative farm two.	141
APPENDIX S. Distribution of major crops in acres on areas in alternate model B on representative farm two.	142
APPENDIX T. Distribution of major crops in acres on areas in alternate model C on representative farm two.	143
APPENDIX U. Distribution of major crops in acres on areas in alternate model D on representative farm two.	144
APPENDIX V. Distribution of major crops in acres on areas in alternate model E on representative farm two.	145

APPENDICES (continued)

APPENDIX W. Calculated distribution in acres of cotton and corn on bottom and upland soils in alternate aggregate models.	146
APPENDIX X. Total production of major crops at several inputs of fertilizer in alternate aggregate models . . .	147
APPENDIX Y. Total production of major crops at several inputs of fertilizer in alternate models on representative farm two.	149
APPENDIX Z. Forestry Information - Henderson County, Tennessee.	150

LIST OF TABLES

TABLE	PAGE
1. Acreage of Henderson County by land use categories as determined by Individual Farm Survey-1958.	40
2. Acreage of Henderson County by land use inventory groups as reported in Conservation Needs Survey 1958.	41
3. Monthly and annual precipitation, Wildersville, Tennessee	43
4. Yield per acre of the major crops of Henderson County as reported by Individual Farm Survey 1958.	45
5. Extent and total production of the major crops of Henderson County as reported by Individual Farm Survey 1958.	47
6. Acreage of inventory groups in alternate aggregate models.	50
7. Acreage of major crops grouped within cropland inventory groups in alternate aggregate models. . . .	52
8. Weighted average yields per acre of the major crops in the alternate aggregate models.	53
9. Total production of the major crops in the alternate aggregate models.	55
10. Extent of land inventory groups on median representa- tive farms of five farm groups	60
11. Acreage of land inventory groups on representative farms.	66

TABLE

PAGE

12.	Acreage of major crops in alternate models on representative farms.	71
13.	Capability unit classification of representative farms.	72
14.	Weighted average per acre yields of major crops in alternate models on representative farms	75
15.	Total production of major crops in alternate models on representative farms.	77
16.	Average weighted yields of major crops at several inputs of fertilizer in alternate aggregate models, per acre .	82
17.	Response to inputs of fertilizer expressed as percentages of the yield per acre of the highest inputs for the major crops in the alternate aggregate models.	83
18.	Average weighted yields of major crops at several inputs of fertilizer on representative farm two, per acre.	88
19.	Response to inputs of fertilizer expressed as percentages of the yield per acre of the highest inputs for the major crops on representative farm two.	89

LIST OF FIGURES

FIGURE	PAGE
1. Soil mapping areas of representative farm one.	58
2. Soil mapping units of representative farm one.	59
3. Soil mapping areas of representative median farm two	61
4. Soil mapping units of representative farm two.	62
5. Soil mapping areas of representative farm three.	64
6. Soil mapping units of representative farm three.	65
7. Soil mapping areas of representative farm four	67
8. Soil mapping units of representative farm four	68
9. Soil mapping areas of representative median farm five.	69
10. Soil mapping units of representative farm five	70

CHAPTER I

THE PROBLEM AND DEFINITIONS OF TERMS USED

For the past several years Henderson County has been recognized as one of the problem counties in Tennessee. Limited natural and financial resources have combined to create a chronic situation of low income for many farmers of this county. Proposals have been made which attempt to solve the problems in Henderson County. This thesis deals with the physical relationships upon which solutions to the agricultural problems of any county must be based.

The Problem

Statement of the problem

The major physical resources of the county are its soils. The main objective was to determine for various models the productivity of these soils for the major crops. The first step was to determine how the soils were being used and their total production at the present time.¹ The second step was to find out if total production of crops in the county could be increased by using the soils in a different manner in several models. The final step was to determine whether the gains in total production associated with changes in the allocation of soil resources were justified considering the addition of physical inputs necessary to reallocate the soil resources where additions are necessary.

¹/1957 crop year; infra. Chapter IV.

When land which is presently in cotton is reallocated to soybeans, no major inputs are necessary. However, when forest or gullied land is reallocated to crops, major inputs for land clearance, drainage, etc. are necessary before the reallocation can be made. The ratio of production change to acreage change was used to determine the final step.

Importance of the study

At least three governmental agencies are at the present time considering various proposals relative to the solution of the low income problem of farmers of Henderson County.² The information on the physical resources and their productive potentialities may serve as the basis for these and other plans which may be adopted. This study has combined several approaches for estimating the productive capacity of the county. The method used by the author may be of value in similar studies of problem counties.

Definitions and Assumptions Used

Definitions

The following definitions were adapted for this thesis from a USDA publication.³

²/Tennessee Valley Authority; UT Agricultural Experiment Station, and Soil Conservation Service.

³/USDA, Policy and Procedure for Development of National Inventory of Soil and Water Conservation Needs, Washington, D.C. pp. 10-11, 13. August, 1957.

Cropland. Land currently tilled including cropland harvested, crop failure, summer fallow, idle cropland, cropland in cover crops or soil-improvement crops not harvested or pastured, rotation pasture, and cropland being prepared for crops or newly seeded crops. Included also is land producing hay, vegetables, fruits, and nuts including those grown on farms for home use.

Forest. Lands which are at least 10% stocked by forest trees of any size and capable of producing timber or other wood products, or capable of exerting an influence on the water regime. Also included are lands from which the trees have been removed after having been 10% stocked and which have not been developed for other use.

Inventory land group. Acreage reported by the use to which it is put. Use to which land is put is considered in a general manner such as cropland, pasture, forest, or other land.

Other land. Farmsteads and idle wildlife areas and other areas not classified into cropland, pasture, forest, and built-up and urban areas.

Pasture. Land in grass or other long-term forage growth that is used primarily for grazing. Included in this category are grassland, nonforested pasture, and other grazing land with the exception of pasture in the crop rotation. It may contain shade trees or scattered timber trees with less than 10% canopy, but the principal plant cover is such as to identify its use primarily as permanent grazing land.

The following definitions were developed for use in this thesis.

Available other land. Acreage included in the other land category which may be used for agricultural purposes (production of crops). This land is suited for use as cropland, pasture, and forest but is not presently in production nor is it being used for an economic purpose such as a roadway or a housing site.

Soil management group. A group of soils that are nearly alike in potential for agricultural use, plant growth, and response to similar treatment and management. Soils within the soil management group are suited for similar crops.⁴

Soil response group. A combination of soils which share some common property. Soils that respond similarly to given rates of fertilization on a given crop are grouped together. If on one soil, the yield is known for several rates of fertilization, yields of the other soils of the group may be interpolated.⁵

Model. A system in which variable factors are fixed in one or more ways.

Soil mapping unit. A portion of the landscape that has similar characteristics and qualities and whose limits are fixed by precise definition. It is the unit about which the greatest number of precise statements and predictions can be made and is the basis for all

⁴/USDA, SCS, Soil Survey Henderson County, Tennessee (mimeographed preliminary copy), pp. 304a-310.

⁵/Bell, F. F. and Springer, M. E. Conference UT-TVA personnel. May 1959.

interpretive groupings of soils.⁶

Assumptions

The following assumptions were made for use in this thesis.

When soils are shifted from one use to another, or when more land is brought into production, the average cropping system will remain the same.⁷ The rate of fertilization of crops does not change when more acres are brought into production. For purposes of comparison one input of fertilizer was used for each crop in each alternate model. Normally, different levels of fertilization are used on different soils. All variables which affect the production of a specific crop are held constant while the soils in production are varied. This is done to ascertain the effect on the total county production of a specific crop by bringing more acres of soil into production from the chief inventory land groups.

Increasing the total amount of acreage in production normally calls for increased management skills by the producers of the county. It is assumed that when acres in production are expanded, the management skills necessary to obtain the increase in production are improved to the extent necessary to bring these acres into production. Such management skills would include knowledge of operating machinery to clear forests, drain marshes and swampy sites, and harvest the increased production.

⁶/USDA, Administrator's Memorandum SCS-136 (Washington, D.C.: May, 1958), p. 23.

⁷/The percentages of crops of total acreage of crops as reported by Individual Farm Survey, 1958.

Analysis of the Problem

The first step in the study of the productive potentialities of Henderson County was to consider the basic soil resources. Yields of the major crops in the county were determined for each of the soil mapping units reported in the county. The yields were interpolated from soil mapping units to soil response groups.

The major land use of each individual mapping unit was determined by first combining these units into soil management groups and then using the land-use data reported by capability unit in the Conservation-Needs Survey.⁸ The usual and the 1957 production figures for the major crops were determined from a survey by the Tennessee Agricultural Experiment Station and the Agricultural Economics Branch of the Tennessee Valley Authority.

Next to be considered was the projected production of major crops when the soils were used on several different models. The final step was to compare per acre production and total production of each of the land-use models including the present model. The objective of this analysis was to find out if production of the major crops could be increased substantially by merely shifting the soil resources from one use to another in the alternate models.

⁸/Survey conducted by SCS in Henderson County in 1958.

CHAPTER II

REVIEW OF THE LITERATURE

The use to which land is put has been considered in the literature over the range of recorded history. Man has tended to waste away quickly the soil resources of a newly settled region and then consider what to do with his now depleted resources. The one-crop economy of agriculture in the south quickly depleted the soils of their natural productivity. Cash crops were then shifted to soils which were not suited to intensive use, resulting in accelerated erosion which quickly turned some of the uplands into vast gullied areas. The stripping of the uplands of their natural cover of trees also created a more severe flooding hazard.

These conditions resulted in studies to determine what could be done to make use of the now depleted soil resources throughout the United States. The creation of the Tennessee Valley Authority was a prime factor in the examination of the soils of certain states. Such a study was carried on in Haywood County, N. C. during 1948 and 1949.⁹

The Haywood County study had two objectives. The first was the classification of farms in the county into groups having common problems and opportunities and determining their relative importance. The second was to analyze present and alternative systems of farming to determine desirable long-time systems for major farm groups and the

⁹North Carolina Agr. Exp. Sta. and Ext. Ser., Tennessee Valley Authority, and USDA, "Classification and Analysis of Farms, Haywood County, N. C. (Preliminary Report). 1949.

adjustment problems involved. The analysis was done to aid state and federal agencies in designing more effective programs of assisting farmers in working out improved farm plans.

The farms were classified according to their soil resources, size of farm, and type of farming. The major soil associations were used to classify the soil resources. Each soil association was sub-grouped according to the percentage of open land occupied by soils suitable for use in short rotations. The measure of size was the number of acres of open land. The major types of farming were: tobacco specialty, general, dairy, livestock (no tobacco), and family living.

The size of farm and type of farming were determined by information obtained from the Bureau of the Census. Ten or twelve farms representative of each size group were studied in the field. A case farm representative of each important group was studied in detail and its present organization and operation presented in detail. Alternative ways that offered the possibility of greater income under resource-conserving systems of farming were also presented. Income possibilities were estimated for each alternative system on the basis of two levels of prices and costs, those of 1945 and of 1940. Net incomes under both price levels were estimated on the basis of the same (fairly high) level of production practices.

The approach taken in the Haywood County study was to focus rather definitely on the problems and possibilities of individual farms as representative of the kinds of adjustments that were desirable

within their farm groups. Brief attention was given to the aggregate effects of these adjustments on the agriculture of the county if they had been put into effect.

Farms were classified in groups on the basis of three major characteristics: (1) soil association, (2) percentage of open land in "good" soil, and (3) size of farms in terms of number of acres of open land. "Good" soils were those suitable for use in short rotations. They were derived chiefly from alluvium or colluvium occupying the smoother slopes (less than 15%), were relatively fertile and were adapted to the production of a wide variety of crops.¹⁰

It was estimated that if the suggested land-use adjustments were adopted by the farmers, changes from the present use would be small in terms of the acreage involved. Cropland would increase by 1.5% and open permanent pasture by 3.5%. The added cropland would come from permanent pasture suited to cropping in systematic rotations with the use of proper conservation measures. Pasture area would be enlarged by clearing small areas of farm woodland. Some areas of steep, eroded pasture land would be reforested, but these would not compensate for the woodland cleared for pasture. Total production of pasture would increase as a result of greater carrying capacity. It was further estimated that the average acre of improved permanent pasture could produce about twice as many units of animal products as an average acre of present pasture.

The acreage of corn for grain and silage would decrease 7% for

¹⁰/Ibid., pp. 1, 6-7, 91-93.

the county, but the production would increase. Average increases of 30% in yield per acre would more than compensate for acreage reductions. Hay acreage would be increased by 40%. The additional acreage would come from land shifted out of corn production, using previously idle cropland, increasing double-cropping, and the small increase in total cropland area. An average yield increase of 75% would result from increasing the acreage of alfalfa and the adoption of better production practices for all hay crops.

The expanded production of hay and pasture would further support more beef and dairy cattle. Beef cattle would predominate during an adjustment period while dairy cattle would become more numerous as the market for dairy products increased. On large farms having little cropland and large areas of mountain pasture, the beef cattle enterprise would continue to be important. The suggested farm adjustments would not affect hog production.¹¹

Woodland contributed a minor proportion of the total farm income. The average timber yields were low, averaging 128 board feet on 11 case farms. Over-cutting and grazing were the primary reasons for low yield. Grazing livestock was a common practice. Woodland grazing and timber production in the same area was said to be incompatible.¹² Woodland improvement was not possible while grazing continued. Average annual timber yields per acre would be increased by 300% under simple systematic management.

¹¹/Ibid., pp. 81-82.

¹²/Ibid., p. 85.

A land-use study of a region such as a county requires definite methods and procedures for determining groups or classes of farms having similar land use suitabilities and management requirements. Osgood (11) reported on the measures and procedures devised by the Tennessee Valley Authority and Mississippi State University for use in their test-demonstration farm program in 1951. Methodology was developed for (1) using the most accurate and complete information available in drawing an efficient representative sample of farms within a soils and type of farming area, (2) classifying the soils of the farms in a system based on relative use suitabilities, and (3) using the system as a basis for grouping farms in a land quality-farm size classification.

Kind of land and size of farm were the two factors selected as the foundation elements within which classes of farms with most similar adapted land uses and management requirements could be developed. Open land (cropland plus open pasture) was used to determine the size of a farm. Soils were measured qualitatively by characteristics such as drainage, depth of top soil, texture, use suitabilities, and by the combinations these characteristics. Qualitative differences in soils of the different farms then appeared as differences in proportions of the same soils. These were differences in area of the various sections of the same underlying pattern or order in which the various soils tended to occur in relation to each other and to other identifiable features of the landscape. Classification of land was based on the pattern as a natural model constructed of all soils in the area in terms of acreages in the various sections of the pattern. Variations in

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adapted practices on individual farms were analyzed in terms of occurrence and extent of the various sections of the soil pattern on the farms.

The area studied included the upper coastal plain soils of Alcorn, Prentiss, and Tishomingo counties. Two-thirds of the 600,000 acres were woodlands, four-fifths of which were on farms. The topography was hilly to gently sloping, and varied in elevation from 400 to 600 feet above sea level. Cotton and corn accounted for nearly 90% of the acreage used for crops. The erosive nature of the soils, rugged topography, heavy rainfall, high temperatures, and the high proportion of intertilled crops created a severe soil erosion problem.

There was a tendency for farmers to use similar soils for similar purposes. These tendencies were based on long-continued trial-and-error experiences of the farmers in finding uses giving the highest net returns from the different kinds of land. Each use tended toward a definite position in relation to each of the other major uses and continued recurrence of the different uses on the various kinds of land made up the land use pattern of the area.

The wettest, most poorly drained soils of the three county area were used for hardwood timber production. Slightly better drained soils subject to overflow or too wet for cultivation were used for permanent pastures. The slightly better-drained soils, free from overflow and dry enough for cultivation during short periods in the drier parts of the year, were used for hay production.

Soils that were sufficiently drained and free from overflow so as to permit regular cultivation and plant growth over a season long enough

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for corn production, but which were too wet for cotton were generally used for corn. Still better drained soils which had the slope and top soil necessary to be suitable for cultivation were used for cotton. The tendency toward use of drained soils for cotton production increased as drainage increased. Soils that were too dry, eroded, or irregular in topography for cotton were used for pine and mixed pine-hardwood timber production.

The most important change in land use was in the return of the sandy hillsides to pines and mixed hardwoods as cotton production became unprofitable. Changes were also occurring on sizable acreages in the extension of pasture, hay, and corn into the wet hardwood areas through land clearing and drainage. The latter change was limited by the amount of acreage suitable for such clearing and drainage, and by the counter-acting influence of sand settling in drainage ditches on soils with little slope.

The soils were classified into use-management groups, and an attempt made to place in each group, soils suitable for similar uses and having similar management problems and requirements. Economic use suitability was set up as the major criterion in determination of groupings. Relative suitability for the different uses as determined by net returns under normal production conditions and prices was set as the major criterion in determining the order or place of individual soil conditions. A continuous list was based on the soil pattern as reflected by the land use pattern. This was called the "land use pattern scale". The list of soils

included all soil conditions or combinations of soil type, slope, and degree of erosion that were included in the soil survey report of that area. The list ranged from the most poorly drained soils (Bibb silt loam), represented by the wet side of the bottomland hardwoods soils, to the most excessively drained (Guin fine sandy loam F slope 3 erosion) soils, at the most rugged edge of the pine-hardwood section.

In terms of soil erosion, the order was a rather gradual variation, from soils over which the rate of waterflow was too slow for much soil movement, through those with deposits from erosion of other soils; to those with moderate to excessive erosion. In terms of soil texture, the finer textured soils containing silt and clay were down the scale, while the coarser, sandier soils were up the scale. Pan layers in the B caused the soil to be placed farther down the scale in the wet end, while in the excessively-drained end of the scale, these restrictions to water movement caused placement of the soils farther up the scale. Pans made wet soils wetter and dry soils drier. Relative economic use suitability was the final determinant of placement of each soil condition or mapping unit in the scale.

This scale provided a base for equilibrium use of the different soils, given a price situation. Uniformity in the gradual change of soils with position in the scale gave a base for similar uniformity in patterns of adjustments of other factors and practices to these soils. For example, planting dates of corn ranged gradually from April 10 for the sandy, excessively drained soils to about June 10 for soils at the

wet end of the range over which corn is grown. Problems in determining adjustments of other factors to the various soils as arranged in the land use pattern scale were separated into significantly different related groups, specifically defined, and reduced to manageable numbers through sampling at systematically selected intervals along the scale.

Productivity was considered only in relation to a specific use, and the productivity for that use was considered in relation to productivity for other major uses set out as bases for the land use pattern scale. The scale ratings were based on the use to which the soil was put and its relative productivity in that use rather than on the problems or required management practices that were associated with the use and productivity of the soil. An organized list of 95 soil conditions was made (11).

The simplex method of the linear programming technique was used during the decade of the 1950's to determine crop production programs which would maximize total profit for different soil areas and levels of resource ownership (5). In Iowa, Bowlen and Heady carried on an analysis in which an optimum (revenue maximizing) crop program was determined for 114 main soil associations. Six resource quantities were considered for each soil association, and the analysis was repeated for a second price period; in all, 168 situations were considered. Only one combination of resource inputs per unit of product was considered for each crop and each area. The lack of yield data made necessary only one combination of resource inputs per unit of product even though the simplex method of analysis lent itself to the consideration of several

combinations of resource inputs per unit.

The simplex analysis substantiated the hypothesis that the optimum plan will differ from farm to farm, even on the same soil type, if the quantity of resources available for production is different. The optimum plan varied among areas due to relative differences in crop yields. The optimum production plan of one period may be less favorable in another price period because of changes in price ratios over time. The second price period was considered to demonstrate the widest variation in relative crop prices during recent years.

The findings of the study were demonstrated by the results obtained in Logan Township. When capital was severely limited, corn and flax were found to be the most profitable combination of crops for part of the land (1948-52 average price levels) while part of the acreage was not planted. As the quantity of available capital was increased, part of the unused acreage and part of the flax acreage were planted to corn. The most remunerative use of resources with unlimited capital was found in the production of corn exclusively. The use of 1941-44 price ratios (oats and soybeans were relatively higher priced in 1941-44 than corn compared to 1948-52) caused soybeans to be included in the optimum plan in only one area, Washington Township. The inclusion of soybeans was associated with low available capital. Soybeans were replaced by corn as the capital quantity was increased in spite of the favorable price of soybeans.

The allocation of resources between pasture improvement and other opportunities on individual farms was investigated in Iowa in 1956 (10).

The optimum investment in pasture improvement from the aspect of the farm as a whole was studied in the southern pasture area of Iowa. The supply of each resource was taken into account as well as a number of alternative uses for the resources. Four cropping alternatives, four systems of improving permanent pastures, three types of beef-feeding enterprises, both spring- and fall-farrowed hogs, a beef cow-calf enterprise, a supplementary farm laying flock and renting out of unimproved pasture were considered as possible investment alternatives. The optimum farm plan was selected from the alternatives for each of several resource situations by applying the linear programming technique.

The farm situation used as the basis of the study was a farm size of 160 acres which consisted of 110 acres of cropland, 38 acres of permanent pasture, and 12 acres of idle land, roadways, and farmstead. The farm had adequate machinery and crop storage facilities for the crop program. Six capital levels and three labor levels made up the resource situations. The capital levels were--\$1,000, \$2,000, \$4,000, \$8,000, \$16,000, and unlimited capital. The labor supply levels were--260 man-hours from the operator alone per month; operator 260 hours plus 130 man-hours from family in June, July, and August; and unlimited labor supply.

Investment in permanent pasture improvement was consistent with the objectives of maximizing farm profits if the resources were available to invest in enterprises that could use the increased production of pasture forage and if alternatives more profitable than those enterprises using permanent pasture were fully exploited. Farm profits would have

been greater if the permanent pasture had been left unimproved and the resources used in some other alternative unless the above two conditions were met.

Spring and fall hog enterprises brought a higher return on capital than any of the beef enterprises. Hogs brought a lower return per man-hour of labor than the beef enterprises. Where there was an abundance of labor, the beef enterprises were unable to compete with the hogs for available capital. The result was that permanent pasture went unused or was rented out.

The beef-feeding enterprises using permanent pasture provided an opportunity for taking advantage of a large supply of capital with a limited labor supply. The beef-feeding enterprises expanded as the supply of capital became more abundant relative to the supply of labor. Then the permanent pasture was renovated to provide pasture forage for the increased number of animals in the program.

Farm profits were sacrificed by restricting the size of the hog enterprises.

Idle land was appraised in Potter County, Pa. (6). In the northeast, large areas of land once farmed have passed into low-value, second-growth forests for lack of planned use. The objectives were to determine for a representative county in the Appalachian Mountain region of Pennsylvania the extent of idle land and its ownership; the productive qualities of idle land as compared with agricultural and forest land in the same area; and the feasibility of using idle land for some productive purpose either by its present owners or by society in general.

In 1953, in Potter County, idle land exceeded 40,000 acres, an area equivalent to 69% of the cropland in the county the same year. Idle land was widespread among all classes, but was most common on properties occupied by part-time and nonfarm families. The majority of commercial farmers had negative labor incomes in 1954 after allowance for production costs, depreciation, and returns on investment. The range of average incomes for 1954 was \$600 for elderly and retired families to \$3,600 for off-farm workers in Potter County.

Inadequate size was a cause of low income on many commercial farms. Addition of an acre of cropland on those farms could raise net farm income by \$25. Improved management and greater use of complementary resources were other ways of increasing farm income. Poor quality was not the primary reason for idle land on nonfarm properties. Off-farm work was the prevalent reason. Idle land was found on 11 1/4 soil types which cut through all ranges of soil productivity which would bring a wide range of returns if added to existing farm units. Fifty percent of the idle land of Potter County was found suited to crop production; on the other hand, a considerable acreage of land used for crops did not appear suited to crop production.

Low land values were a reflection of the general lack of agricultural prosperity. This was the basic reason why persons who were not farmer-oriented had been able to acquire a large part of the land area of the county. These people were primarily interested in the land for residential, timber, or other nonfarm purpose.

An evaluation of the farms by farm income groups showed that the basic factor in determining farm income was acreage of cropland (6). A 1% increase in the acreage of land in crops was associated with an increase in net income of almost 1%. Gains in income on larger farms from additional lands was greater than on smaller farms because of higher management level and the use of complementary resources. The assumptions regarding added income from additional land were that (1) the cropland added would be of a similar quality to cropland already in production and (2) that production techniques and level of management would be similar to those prevailing on farms that had positive income.

Soil conservation and improvement practices were evaluated economically in western Iowa (8). Conservation practices differed in effects on yield, ability to control erosion, and costs of adoption. Soil losses were larger under a cash-grain system of farming than under a livestock farming system. Terraces controlled erosion most effectively when used with a livestock system of farming and a rotation that contained meadow.

During the decade of the 1950's, many counties in Virginia were classified by land use and ownership. Patterson and Fulton (12) studied Washington County, Virginia. The classification of farm properties was based on the normal earning opportunity of properties in their present condition. Seven classes were delineated. Properties in the different classes were intermixed throughout the county. Factors considered in the classification were--soil, community development, size of property building improvements, etc. The best farms were the largest, other things being equal. Most of the farm land was used for livestock farming

beef cattle, dairy cattle, or sheep. Of all farm land, 50% of the ownership was in pasture and hay. Forest accounted for 35% of the acreage of the county (127,800 acres). Of the total farm properties in the county, 50% were part-time. The total of the better-than-average properties was 19.1%, while the total of sub-marginal farms was 15%.

Haren (8) reported on the land resources of Fluvanna County, Va. Three-fifths of the total land area or 100,000 acres were suited for crops. An additional one-fifth (40,000 acres) could produce permanent pasture. Complete development of the land resources of the county required that woods or brush be cleared from two-thirds of the land. One-fourth of the acreage in crops and one-eighth of that in pastures would need to be shifted to more convenient uses.

Existing crop and pasture fields needed enlargement in order to develop the better situated soils, efficiently utilize farm machinery, and reduce the cost of erosion control. Future value of the timber crop was dependent upon increased fire protection, selective cutting, and removal of undesirable trees. The cost of complete clearing and stumping of additional land at 1956 prices would amount to \$75 to \$100 per acre.

Of the 2,500 privately owned properties in the county, it was estimated that 350 could be developed into large-scale farms; while without additional consolidation the remaining 2,000 units could be developed for part-time farming or residential purposes. Much of the capital required for expansion of farming would have to come from sources outside the county.

In 1954, a soil and land use survey was conducted in several townships in northern Michigan (15). A similar study in 1927 covered Kaskaska County. The major land use changes in agricultural portions of the tri-township community between 1927 and 1954 were an increase in tillable pasture (14.8%), a decrease in idle or abandoned grassland (14.5%), a decrease in nontillable pasture (6.9%), and an increase of idle or abandoned brushland (7.5%).

Between 1929 and 1949, the average farm size increased from 164 acres to 205 acres; the family sized farm markedly increased during this period. The small acreages of organic soils which were cropped in 1927 reverted to forest by 1954. With time, the land use trends in adjustments on the different soil groups differed appreciably. Pasture land increased on the mineral soils indicative of a shift toward livestock enterprises. There was an increase in forest land on the sandiest soil group, while additional clearing of forest was done on the finest textured mineral soils. The aggregate of cropland and pasture increased on all mineral soils at the expense of idle, abandoned, or forest land; however, they both decreased on organic soils.

The percentage of the land used for cropland decreased with increasing slope gradients above 6% within each soil management group. The percentages in forest increased with increase of slope gradients. More of a given slope class was used for cropland on the less sandy soil group than on the more sandy soil group.

A further report on Potter County, Pa. was issued in 1959 (7). The costs and returns involved in using idle land for cropland, pasture,

and forestry were calculated for the conditions and skills that prevailed in Potter County. The soils found on idle land were classified by soil productivity ratings and soil management groups.

Crop productivity ratings ranging from 100 to 0 were assigned to all soils in the county found on idle land based on the land's inherent characteristics and crop yields. One general productivity rating for harvested crops was developed and in addition, nine specialized productivity ratings were prepared; five for major agricultural crops and four for major types of forest production.

The 114 soils found on idle land were classified into 16 management groups based on depth, slope, drainage, and stoniness; 35 of the soils had serious limitations for crop production, the other 79 were somewhat better, but differed widely in natural characteristics. The idle acreage was well distributed among the 16 groups. The 16 soil management groups were based on a classification prepared by the Soil Conservation Service in connection with the soil survey of Potter County. Generalized and specific crop productivity ratings were made for the 16 management groups and for the 114 soils on which idle land was found.

The authors concluded that the use of idle land for cropland or pasture is promising for farm enlargement or replacement of poorer lands. The development of new farms from idle land was not considered promising. Forest management was promising for owners who had considerable time and capital. There were certain forest uses which could be undertaken by those whose time and capital were limited.

CHAPTER III

METHODS AND PROCEDURES AND SOURCES OF DATA

Soil Survey Report

Numerically arranged legend

The complete legend of the soil mapping units in Henderson County represents the primary source of data concerning the kind and extent of the mapping units found in the county.¹³ Mapping symbols are listed individually with extent of acreage and are combined into correlated soil mapping units. The correlated soil name is that used in the actual soil survey report of the county. The capability unit is given for each correlated soil name.

Approximate acreage of soils

This report lists by correlated mapping unit and capability unit the approximate acreage of all the soils of the county.¹⁴ It is the correlated mapping units for which yields are estimated at several levels of fertilization.

Soil survey report

Information of a general and specific nature concerning the soils of the county is contained in this report.¹⁵ In addition to describing

¹³/Sease, E. C., Breinig, C. B. Numerically arranged legend, Henderson County, Tenn. January 22, 1958.

¹⁴/USDA, SCS Soil Survey Report, Henderson County, Tenn. Preliminary Report.

¹⁵/Ibid.

the soils, a brief section is devoted to ecological conditions, and the types of agricultural enterprises carried on in the county. The estimated yields per acre of the principal crops under two levels of management for all of the correlated mapping units is given in the report. These yields were the base yield figures which were used in interpolating the yields for several levels of fertilization within the soil response groups.

Individual Farm Survey

In the summer of 1958, a joint survey was conducted of 10% of the farms of Henderson County by the Tennessee Agricultural Experiment Station and the Agricultural Economics Branch of the Tennessee Valley Authority. TVA personnel interviewed a randomly selected group of farmers in the Beechy River watershed. The Agricultural Experiment Station interviewed a random sample of farmers in the other areas of the county.

Detailed information concerning all facets of the operation of farms were included in the questionnaire which the interviewer filled out at the time he met with the interviewee. Information relating to kind, extent, and use of soil resources was extrapolated from the questionnaires by the author. Land use and yield data for crops, usual and 1957, were totalled and a weighted average obtained for each inventory land group and individual crop. Total figures were multiplied by a factor of 10 to arrive at the county wide figures.

In addition to treating the 220 farms cumulatively, the farms were divided into five groups classified according to the proportion of cleared land which fell in each of six soil groups. The soil groups were based on a combination of 18 land-capability units.

Soil groups¹⁶

Group one. Units included were IIe-1, IIe-2, IIIe-1, IIIe-2. These are well-drained upland or second bottom soils. All of these soils have a fragipan at a depth of 20 to 30 inches except IIe-1.¹⁷ They are nearly level to moderately sloping with slight to moderate erosion and are subject to more severe erosion when found on steeper slopes. Most row crops can be grown on these soils, but should not be grown more than two years in succession. Corn may suffer from drought during a normal growing season. These soils respond well to fertilization.

Group two. Units included were IIw-1 and IIIw-2. These are somewhat poorly to moderately well-drained soils with very little or no erosion. They are subject to overflow. With proper drainage and management, these soils are suited to continuous row cropping. Most crops commonly grown in this area are suited to these soils. Cotton may be late maturing during wet seasons.

¹⁶/Infra. Appendix A for listing of soils within capability units.

¹⁷/Definition: dense and brittle pans or layers in soils that owe their hardness to extreme density or compactness. In USDA Yearbook of Agriculture, Soil. p. 758. 1957.

Group three. Units included were IIIw-1 and IIIe-3. IIIw-1 soils are nearly level silty soils with fragipans at approximately two feet. They are somewhat poorly drained, low to fair in moisture supplying capacity, and have low natural fertility. The dominant problem is moderately severe water excess while the secondary problem is the moisture fragipan. IIIe-3 soils are gently sloping and sloping, well-drained, deep, with moderate natural fertility and good moisture supplying capacity. The dominant problem is moderate erosion.

Group four. Units included were IVe-1, IVe-2, IVe-3, and VIe-1. These are moderate to well drained upland or second bottom soils. They may vary from moderately to severely eroded, and sloping to strongly sloping soils. IVe-2 has a fragipan at a depth of 20 to 30 inches. These soils are best suited for hay and pasture. They can be cultivated once in five or six years under special management practices.

Group five. Units included were IVw-1 and IVw-2. IVw-1 soils are flat or almost level poorly drained upland or terrace soils with little or no erosion. These soils have silty surfaces and pale yellow, finer textured subsoils over a fragipan or clay layer at 14 to 24 inches deep. Water moves slowly through the pan or clay layer. These soils are very wet in winter and continue so until late spring. In wet seasons, crops tend to drown out in low places; they are also droughty in dry summer months. Natural fertility is low and reaction is acid.

IVw-2 soils are nearly level, somewhat poorly drained soils having little or no erosion. The brown surface is easily worked and is underlain

by gray or yellow subsoils. They are subject to overflow and have a high water table. Crops drown out in wet seasons, especially in low-lying areas. These soils are suitable for continuous cropping with proper management and drainage.

Group six. Units included are VIe-2, VIe-3, VIIe-1, and VIIe-2. These are moderately to well-drained upland or second bottom soils. They are sloping to steep, and are severely eroded or subject to severe erosion. These soils are suited only for permanent vegetation, either pasture or trees--better protected if left in trees. VIIe-2 is gravelly with a low water-holding capacity.

Farm groups

The 220 farms in the Individual Farm Survey were classified into five soil groups. The acreage in cleared land for soil groups 1-5 was the basis of the following farm group classification in percentages.

Farm group one -- 50% or more in 1 and/or 3.

Farm group two -- 40% or more in 2.

Farm group three -- less than 50% in 1, 3, and 4; or less than 40% in 2 and 5.

Farm group four -- 50% or more in 4.

Farm group five -- 40% or more in 5.

Aggregate county data

Aggregate acreage for the various categories of land use was calculated from the individual farm survey as follows. The totals for cropland, pasture, woodland, other land, and waste and gullied land for the 220 farms were computed. This total was multiplied by a factor of 10 to arrive at the aggregate acreage of the county. The totals for the

land-use groups were also multiplied by a factor of 10 to arrive at the aggregate data for the county. The factor 10 was used because the individual farm survey used a random sample of 10% of the farms of the county.

The reported acreage of each crop and the usual and 1957 total production of each crop for the county in the aggregate was determined as follows. Totals of acreage for the farm groups of the major crops were calculated, and multiplied by 10 to give county or total farm group data. Weighted average yields were calculated for each crop, both usual and 1957 within the farm groups. These yields were multiplied by total acreage to give both usual and total production for each farm group and for the county as a whole.

Representative median farms

The following was done for this thesis. Total acres operated by an individual farmer was the criterion used in determining the median sized farm in each of the five farm groups.¹⁸ The final selection of the median farm for each group was based on how closely the farm came to representing the average farm for its group in land-use characteristics. Detailed soil maps were obtained for each of the median farms and each soil management group was placed on an overlay to the map. The present use of the soils on the representative farms was shown on the first overlay and subsequent changes in the use of the soils were shown in subsequent tables. Data concerning type and extent of crops found on the median farms were taken from the average farm of each farm group.

^{18/} Includes acres owned and acres rented.

Conservation Needs Survey

Personnel of the Soil Conservation Service carrying out a national program of development of an inventory of soil and water conservation needs, surveyed Henderson County during 1958.¹⁹ Twenty land capability units were sub-classified into four inventory land groups--cropland, pasture, forest, and other land.

The following was done for this thesis. Within each capability unit, each inventory land group was calculated as a percentage of the total acreage within that unit. These factors were then multiplied by the total acreage of the capability unit as reported in the soil survey report. This method resulted in the adjustment of the data of the conservation needs survey to the actual acreage as mapped by the soil scientists. The original 20 capability units were expanded to 35 soil management groups so that the yields of the major crops could be estimated for each soil management group.

The portion of other land which was not available for production of crops was determined by applying a factor. It was calculated by dividing the total acreage of other land in the individual farm survey by the total other land acreage of the conservation needs survey. The two surveys defined other land differently. The other land of the individual farms survey could not be used for production of crops while part of the other land of the conservation needs survey was available for production of crops. Therefore the factor of 17% was calculated to

¹⁹/USDA, SCS Preliminary Conservation Needs Data, Henderson County, Tennessee. pp. 1-2. April 24, 1959.

determine how much of the other land reported in the conservation needs survey was not available. This factor was applied to each soil management group and the result was subtracted from the total other land for each group to give available other land.

Estimation of Yields

Assumptions

The yields estimated for the soil response groups were the average expectable yields for a 10-year period with reasonable management skills.²⁰ Rainfall was average; the soils were drained and protected from overflow. Yield leaks were considered because fields are not planted 100% by farmers, and turn-rows and wet spots result in part of each field not being used for production. Cultural practices were taken to be of good management.

On the basis of previous research, the following assumptions concerning availability of nutrients were made. The bottom soil groups received fairly uniform rates of fertilizer by farmers.²¹ Bottomland and soils such as Hyman silt loam were assumed low in available potassium and available phosphorous.²² pH of the soil was 5.5 and required two tons of lime to increase it to 6.5; one ton of lime necessary for each

²⁰/Conference of UT and TVA personnel including Bell, F. F., Springer, M. E. and Riggs, F. May, 1959.

²¹/Bell, F. F. Characteristics and Productive Capacity of Grenada and Related Soils in Western Tennessee. Unpub. Ph.D. thesis, Iowa State College, Ames, Iowa. pp.51-58. 1956.

²²/Ibid., pp. 26-27.

one-half unit increase in pH.²³ Two tons of lime per acre were recommended each 7 years. Acidity resulting from the application of ammonium nitrate fertilizer would be adjusted by addition of lime.

The upland soils represented by Dulac B2 were assumed low in available potassium and available phosphorous and the pH was 5.0.²⁴ The recommended rate of liming to increase the pH to 6.5 was $3\frac{1}{2}$ tons per acre every 7 years. Another upland soil group, including Shubuta C2 was assumed low in available potassium and available phosphorous with a pH of 5.0.²⁵ Four tons of lime per acre were required each 7 years to maintain the pH at 6.5.

Varieties of the crops used (12) and planting dates (1) were those recommended by the University of Tennessee. Insects were under reasonable control. Yields were estimated under three levels of fertilization for cotton, corn, and oats and for two levels of fertilization for the other crops.

Soil response groups

All the soil mapping units of the correlated soil report were classified into seven soil response groups on the basis of similarity of response to fertilization for cotton, corn, oats, lespedeza, alfalfa soybeans, and pasture.²⁶ Yield estimates for these crops were first

²³/Rule-of-thumb--rate differs with individual soils.

²⁴/Bell, op. cit., p. 26.

²⁵/Ibid. p. 27.

²⁶/Infra. Appendixes B and C.

obtained from the soil survey report under two levels of management.²⁷

The yield estimates of B management were adjusted by calculating factors for different inputs of fertilizer for one soil in each soil response group. For example in soil response group one; Hymon silt loam was the soil selected. The B management yield for this soil was 85 bushels of corn per acre. It was estimated that for an input of 65 pounds of total plant nutrients, the yield would be 50 bushels per acre (low rate). The estimated yield of 50 bushels was divided by 85 bushels to obtain the factor for the low rate; the factor was .588. At the medium rate of 134 pounds of nutrients, the estimated yield was 80 bushels. The medium rate factor was calculated by dividing 80 over 85 which gave the factor .941 at 200 pounds of nutrients, the estimated yield was 95 bushels. The factors were multiplied by the B management yields of all the soils in soil response group one to obtain the yields at the low, medium, and high fertilization rates. The same procedure was used for the other crops in all seven soil response groups.

Estimation of Productivity

Information pertaining to the extent of soils allocated into cropland, pasture, forest, and other land was available only by land capability unit. The soil mapping units were therefore combined into capability units. There were several units such as VIe-5 in which the soils were so different for the production of some crops as to preclude them from being in the same group. Capability units such as VIe-5 were

²⁷/USDA, SCS Soil Survey op. cit., pp. 304-311.

further classified into soil management groups which included soils that were suited for the same crops. Weighted yields were calculated for each crop for each input of fertilizer on all 35 soil management groups. These weighted yields were those used in calculating the total productivity of the seven major crops in the alternative land use models.

County in the aggregate

Estimated productivity for the seven major crops was calculated for all inputs of fertilizer under the present land use model (A) and under several alternate ones (B, C, D, E). In model A, the soil management groups were classified by land use according to the data obtained from the conservation needs survey. Within the cropland inventory group, acreage was distributed among the seven major crops according to the percentages of cropland each occupied in 1957, as calculated from the individual farm survey. Pasture, forest, and other land remained constant. Production of pasture was determined on the soil management groups upon which it was reported, but the seven major crops were distributed within the acreage of the cropland inventory group so as to maximize production of each crop on soils best suited for each crop. Intensity of use was considered in allocating the row-crops among the soil management groups. The recommendations of the land-use capability classification were used to determine intensity of use.²⁸ In all subsequent models, pasture was considered as one of the major crops. Percentages that each of the major crops

²⁸/USDA, SCS Land Capability Table op. cit., pp. 1-71s.

including pasture occupied were re-calculated using the data from the individual farm survey.

In model B, all of the acreage of the categories cropland and pasture were combined and considered as one category. Total acreage of each crop was calculated. The crops were distributed as with model A.

The following refers to models B through E. The seven major crops were allocated on the acreage of cropland as row crops and non-row crops. In decreasing order of allocation, row crops were allocated--cotton, corn, and soybeans on cropland row crop acreage. The order for non-row crops was--oats, alfalfa, lespedeza, and pasture, allocated on cropland non-row crop acres. The acreage of each crop was restricted by the percentage of that crop of all crops reported in the individual farm survey. Row-crops--cotton, corn, and soybeans were calculated separately on the basis of 100% row crops acreage, and the non-row crops--alfalfa, oats, lespedeza, and pasture were calculated on the basis of 100% non-row crop acreage. Total cropland was divided into row-crop and non-row crop acres according to the intensity of use data of the land-capability classification. The calculated percentages of row-crops were multiplied by total row-crop acres. This gave the total acreages for the three row crops. Non-row crop acreages for the four non-row crops were obtained in a similar manner.

Model C included within cropland all previous cropland, pasture, and forest. An added restriction on cotton acreage was the quota allotted

to Henderson County by the Agricultural Stabilization and Conservation Committee for the most recent year which was 1958 (2). This limited total cotton acreage to 18,000 acres. All acreage in excess of 18,000 acres of cotton was added to the total acreage of corn. In model D cropland includes all previous cropland, pasture, forest, and available other land.

In the final model E, all soil management groups of land classes VI and VII were put in forest and the remainder of the soils of model D remained in cropland. Soil management group five which included IVw-2 remained constant through the first four models. The soils in this group are poorly drained and could not readily be changed from their present uses. This contrasted with the other groups wherein it was assumed that the changes in use of the groups could be accomplished within the county in a relatively short time.

Representative median farms

Production of all the major crops reported within each farm group was calculated for each of the representative farms of each of the five farm groups. The percentages of row and non-row crops were calculated separately for each farm group and then applied as crop factors to the median farm of each group. The row and non-row crops were each calculated on a basis of 100% of the acreage of each. Row-crop factors were multiplied by the row-crop acres and the non-row crop factors were multiplied by the non-row crop acres.

Soil maps of the median farms were obtained and a list of all soil mapping units with extent of acreage was made. Each area on the farm

which contained a soil mapping unit was assigned a number and designated as a soil area. The individual farm survey for each of the representative farms was checked to obtain detailed data on each farm. The percentages of total acres within each of the land inventory groups were calculated for each farm group. These factors were multiplied by total acreage of each representative farm to obtain the acreage of each inventory group.

Visual inspection of the farm maps was used to determine the allocation of each of the soil areas into cropland, pasture, forest, and other land. In model A, row and non-row crops were allocated on all soil management groups which were classified as cropland while pasture, forest, and other land were constant. Allocation of crops in decreasing order was--cotton, corn, soybeans, alfalfa, oats, and lespedeza. The objective was to maximize production of each crop within the restrictions of order of allocation and kind and extent of soil resource.

In all of the following models, pasture was considered as one of the non-row crops and followed lespedeza in order of allocation. Non-row crop factors were recalculated to include pasture. Total acreage in the cropland and pasture inventory groups were combined in model B, with the crops allocated on this new group, while forest and other land were constant. In model C, all of the acres in forest were added to the previous combined group and once again the crops were planned with other land remaining fixed. All available other land was added to the combined category in model D, omitting only those acres not capable of production such as a house site in non-available other land. Model E included as cropland all of the acres of model D except those of soil management groups 21-35 which were planned as forest.

Analysis of Data

County in the aggregate

In each of the models, one input of fertilizer was used with each crop so that total production of each crop could be measured and compared. This method was adopted in order to ascertain the effect of changes in land use on individual crops for both acreage and production assuming that the proportion of crops would remain the same. The objective was to determine the change in production of each major crop when moving from one model to another. Each time that more land was added to cropland, the composition of the soils in cropland changed.

The average yield per acre of each crop in each of the five models was calculated. Average yield per acre of each crop was a quantitative measure of the productive ability of the soils upon which that crop was planned in a particular model.

Response to inputs of fertilizer was calculated for each of the crops in each of the five models. Weighted average yields per acre were calculated for each input of fertilizer in each of the models. Responses to inputs of fertilizer were calculated by dividing the yields of the low and medium rates by the yields of the high rates and converting the results into percentages. The measured responses to inputs were determined by subtracting percentages of the lower inputs from those of the higher ones.

CHAPTER IV

THE PRESENT SITUATION

The present situation was determined from survey data collected in 1958 concerning that year and the previous crop year, 1957.

Land Use

Individual farm survey

Of the 328,900 acres reported in the county, 41% was in cropland, 11.4% in pasture, 39.2% in forest, 3.6% in gullied and waste land, and 8.4% in other land. A more detailed breakdown of land use both in total acres and percentages is given in table 1. The percentage of cropland decreased from 50.6% in group one to 30.9% in group four, while the percentage of forest increased from 24.1% in group one to 44% in group four. The results of the individual farm survey indicate that the type of soils found on a farm determine to some extent to what use they will be put by the farmer.

Conservation needs survey

The adjusted survey data²⁹ report a total of 329,580 acres in the county; 320,700 of which are available for crop production. Of the latter acreage, 22.2% was in cropland, 2.9% in pasture, 46.7% in forest, and 28.2% in other land. Table 2 includes by land inventory group, data on a county-wide basis both in total acres and percent.

²⁹/Preliminary Conservation Needs Data, Henderson County. April 24, 1959.

Table 1.--Acreage of Henderson County by land use categories as determined by Individual Farm Survey-1958.

Farm group	Total acres	Average acres (per farm)	Cropland		Pasture		Forest		Gullied and waste		Other land	
			Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent
1	17,400	80	8,800	50.6	2,300	13.2	4,200	24.1	1,200	6.9	900	5.2
2	79,200	140	39,200	49.5	11,900	15.0	19,000	24.0	4,700	5.9	4,400	5.6
3	88,800	170	36,900	41.5	12,600	14.2	30,800	34.7	4,600	5.2	3,900	4.4
4	126,900	160	39,200	30.9	15,200	12.0	55,800	44.0	10,000	7.9	6,700	5.2
5	16,660	150	6,800	41.0	1,900	11.4	6,500	39.2	600	3.6	800	4.8
Total	328,900		130,900		43,900		116,300		21,100		16,700	

NOTE: Data in acres were rounded to the nearest 10 units. Data in percent were rounded to the nearest 0.1%.

Table 2.--Acreage of Henderson County by land use
inventory groups as reported in Conservation
Needs Survey 1958.

	Cropland	Pasture	Forest	Other land
Total acres	75,070	9,020	147,360	89,260
Percent	22.2	2.9	46.7	28.2

NOTE: Supra. table 1.

Yields of Major Crops

The yields reported in the individual farm survey were given by the individual farm operators. Each farmer reported the 1957 yield of the crops that he grew and the usual yield which he expected of the same crops.

Climatological data--1957 (14)

Heavy rains resulted in floods several times during the year, but an extended dry spell at the height of the summer came just at the worst time for several crops. It was unusual that so much damage could be attributed to both flood and dryness during the same year. February was unseasonably warm and October was unusually cool. Destructive storms were more damaging than in 1956, and included the passage of hurricane Audrey on June 28.

August weather conditions were ideal for cotton boll weevils, and the most severe infestation of these pests developed since 1923. Wet weather in September and early October caused excessive boll rot in cotton and delayed opening of the bolls; it also intensified the boll weevil infestation. Fields of late cotton on the lowlands were heavily damaged by flooding in November while substantial portions of the corn, cotton, soybeans, and grain sorghum crop remained in the fields resulting in heavy losses (14). Climatological data are summarized for average and for 1957 in table 3.

Yield data

Weighted per acre yields were calculated for all crops reported

Table 3.--Monthly and annual precipitation, Wildersville,
Tennessee

Month	Average (16) (inches) 1918-40	1957 (14) (inches)
January	5.96	11.43
February	3.76	8.80
March	4.76	2.90
April	4.44	4.58
May	4.66	5.98
June	4.05	6.85
July	4.22	2.71
August	4.07	3.65
September	2.96	7.31
October	3.14	2.28
November	3.52	10.97
December	4.99	5.42
Total annual	50.53	72.88

in the individual farm survey for all five farm groups and for the county in the aggregate. Cotton and corn yields were further divided as bottomland and upland. Usual and 1957 yields were reported in table 4. In 1957, the yields of lint cotton per acre on bottomland and upland soils were 440 and 480 pounds, respectively. The usual yields per acre of upland cotton were higher in all farm groups than the 1957 yields. This was not the case for bottomland cotton. In farm groups 1 and 4, 1957 yields were higher than usual yields, while in groups 2 and 3, usual yields were higher than 1957 yields. Poor drainage accounts in part for the lower reported yields of bottomland cotton.

The usual yields of corn on bottomland soils were higher than the 1957 yields for all groups except group one. On upland soils, the usual yields were higher in all groups except group two. In the aggregate, both usual and 1957 corn yields were higher on bottomland than on upland. Bottomland soils have greater water supplying capacities in July and August than upland soils. Heavy spring rains do not affect corn as much as they do cotton.

Soybean yields were higher both usual and 1957 in all groups which reported the crop in 1957. Heavy fall rains prevented harvest of soybeans in many parts of the county. Lespedeza yields were higher in 1957 than usual in all groups except group four, in which no difference was noted. Greater than average rainfall contributed to the high lespedeza yields in 1957.

Table 4.--Yield per acre of the major crops of Henderson County as reported by Individual Farm Survey 1958.

Farm group	Cotton		Corn		Soybeans	Lespedeza	Oats	Alfalfa
	Bottom-land	Upland	Bottom-land	Upland				
	Lbs. Lint		Bu.		Bu.	Tons Dry Hay	Bu.	Tons Hay
Usual Yields								
1	430	460	32	25	..	1.0	..	1.5
2	580	510	43	36	14	1.0	18	1.5
3	440	560	50	31	22	0.9	43	2.2
4	560	540	36	34	..	0.7	..	1.7
5	500	550	38	31	..	0.7	..	...
Mean	520	530	43	31	16	0.9	26	1.7
1957 Yields								
1	440	440	37	24	..	1.2	..	1.5
2	460	440	28	48	4	1.3	13	1.5
3	290	500	35	26	7	1.1	13	2.1
4	600	520	29	27	..	0.7	..	0.8
5	500	390	29	18	..	1.0	..	...
Mean	440	480	30	28	4	1.1	10	1.3

NOTE: Yields were rounded as follows: Cotton - 10 lbs. lint; Corn - 1 bu.; Soybeans - 1 bu.; Lespedeza - 0.1 ton; Oats - 1 bu.; Alfalfa - 0.1 ton.

Oats, however, yielded higher usual than in 1957. Heavy spring and fall rains created a harvesting problem, resulting in much loss.

Alfalfa yields were higher usual than 1957 in groups 3 and 4. In groups 1 and 2, there were no differences in yields, both usual and 1957. In the aggregate, alfalfa yielded higher usual than 1957.

Farmers lost cuttings of alfalfa both in spring and fall because the heavy rainfall and the early warm weather in February caused early growth which was killed by late spring frost.

Crop production

Production of the major crops of the county was calculated for each farm group and for the county in the aggregate. Total acreages of the major crops and total production were calculated both usual and 1957. Complete data are found in table 5.

Total production of corn, cotton, soybeans, oats, and alfalfa was greater under usual conditions than in 1957. Lespedeza was the only crop of those considered which had a greater total production in 1957 than usual. Most of the production of cotton and corn occurred in farm groups 2, 3, and 4. Soybeans and oats were produced only within farm groups 2 and 3. Hay crops with the exception of alfalfa were reported on all farm groups.

Within the limits of the data, it seemed that farm operators used knowledge concerning the characteristics of the soils on their farms in selecting which crops to grow. Alfalfa occurred in all farm groups except group five whose farms are characterized by poorly drained upland soils upon which alfalfa does not grow well (4). Farm groups 2 and 4

Table 5.--Extent and total production of the major crops of Henderson County as reported by Individual Farm Survey 1958.

Farm group	Cotton		Corn		Total		Soybeans Bu.	Lespedeza Tons Hay	Oats Bu.	Alfalfa Tons Hay
	Bottom-land	Upland	Bottom-land	Upland	Bottom-land	Upland				
	Lbs. Lint	Lbs. Lint	Lbs. Lint	Lbs. Lint	Lbs. Lint	Lbs. Lint				
1	137,600	791,200	928,800	59,200	41,250	100,450	0	680	0	75
2	1,032,400	703,800	1,736,200	586,950	40,320	627,270	12,880	3,720	21,240	180
3	752,400	1,999,200	2,751,600	319,000	136,400	455,400	5,500	3,645	23,220	220
4	912,800	1,949,400	2,862,200	110,160	102,680	212,840	0	2,163	0	408
5	15,000	396,000	411,000	21,280	12,400	33,680	0	357	0	0
Total	2,850,200	5,839,600	8,689,800	1,096,590	333,050	1,429,640	18,380	10,565	44,460	883
1957 Production										
1	140,800	756,800	897,600	68,450	39,600	108,050	0	816	0	75
2	818,800	607,200	1,426,000	382,200	53,760	435,960	3,680	4,836	15,340	180
3	495,900	1,785,000	2,280,900	223,300	114,400	337,700	1,750	4,455	7,020	210
4	978,000	1,877,200	2,855,200	85,680	81,540	167,220	0	2,163	0	192
5	15,000	280,800	295,800	16,240	7,200	23,440	0	510	0	0
Total	2,448,500	5,307,000	7,755,500	775,870	296,500	1,072,370	5,430	12,780	22,360	657
Acreage in Acres										
1	320	1,720	2,040	1,850	1,650	3,500	0	680	0	50
2	1,780	1,380	3,160	13,650	1,120	14,770	920	3,720	1,180	120
3	1,710	3,570	5,280	6,380	4,400	10,780	250	4,050	540	100
4	1,630	3,610	5,240	3,060	3,020	6,080	0	3,090	0	240
5	30	720	750	560	400	960	0	510	0	0
Total	5,470	11,000	16,470	25,500	10,590	36,090	1,170	12,050	1,720	510

NOTE: All crops except hay were rounded to the nearest 10 units. Hay was rounded to the nearest 1 ton.

are characterized by having well-drained soils and within these two farm groups, all of the major crops occurred. Group three which was characterized by having a mixture of soils also had all of the major crops reported on its farms. Groups 1 and 5 which had poorly drained soils were noteworthy for the absence of soybeans and oats.

CHAPTER V

ALTERNATE AGGREGATE LAND USE MODELS

Within the present farm enterprise system,³⁰ five different uses of the soils of the county were derived. Plans for each of the alternate models were made which included the productive use³¹ to which each soil management group was put. In all of the alternate models except E, land was shifted from one inventory group to another by entire land inventory groups.

Inventory Groupings

Cropland, pasture, forest, and available other land were the inventory groups into which the county in the aggregate was planned. Table 6 summarizes the land use data by inventory grouping for the five alternate models--A, B, C, D, and E. The cropland category was further subdivided into bottomland and upland row-crop acres, and non-row crop acres. Bottomland included soil management groups 1-5, while upland included groups 6-35. Permanent pasture was considered as an inventory group in model A. In models B through E, the pasture inventory group was planned as cropland. Permanent pasture was then considered as one of the major crops in models B through E.

³⁰/Percentages of cotton, corn, soybeans, oats, alfalfa, lespedeza reported in Ind. Farm Survey in acres, and pasture reported in Cons. Needs Survey in acres. These percentages formed the aggregate cropping system for the county.

³¹/Productive use refers to both positive and negative use, including all five land inventory groups.

Table 6.--Acreage of inventory groups in alternate aggregate models

Model	Cropland		Pasture	Forest	Available other land
	Row-crop	Non-row crop			
A	48,990	26,080	9,020	147,360	73,710
B	53,200	30,890	0	147,360	73,710
C	67,620	137,910	0	25,920	73,710
D	81,520	194,880	0	25,920	2,840
E	81,520	61,890	0	161,750	0

NOTE: All data are rounded to nearest 10 units.

Major Crops

Crops were sub-classified into row crops and non-row crops for planning purposes in allocating them. Factors were calculated for cotton, corn, and soybeans based on data of the individual farm survey. A separate set of factors was calculated for lespedeza, alfalfa, oats, and pasture for models B through E, and a third set for lespedeza, alfalfa, and oats for model A. Acreages of soybeans and oats included all acres upon which these crops were grown. Table 7 summarizes the acreages of the major crops within the five models.

Average weighted yields

Average weighted per acre yields were calculated for each crop within each model. One input of fertilization was selected for each crop and used for each crop in all situations. A summary of the weighted yields is given in table 8. The yields are not the same in all models because the composition of the soil management groups within the cropland inventory group was different for each model.³²

The yield of row-crops including corn, cotton, and soybeans did not vary significantly between models. This occurred because these crops were planned only on row-crop acres which occurred in turn only within soil management groups 1-20. From models A-E, the total acreage in row crops increased by 66% or 32,530 acres. At the same time, non-row crop acreage from models A to D increased by 640% or 168,800 acres. This increased acreage from forest and available other land affected lespedeza,

³²/Infra., Appendices H through L.

Table 7.--Acreage of major crops grouped within cropland inventory groups in alternate aggregate models.

Model	Cotton	Corn	Soybeans	Lespedeza	Oats	Alfalfa	Pasture
A	14,310	33,020	1,660	19,900	5,350	830	9,020
B	15,540	35,850	1,810	15,010	4,050	620	11,210
C	18,000	47,320	2,300	67,020	18,070	2,760	50,060
D	18,000	60,750	2,770	94,710	25,530	3,900	70,740
E	18,000	60,750	2,770	30,080	8,110	1,240	22,460

NOTE: Pasture acreage in model A is that of the pasture inventory group and is not planned within the cropland inventory group in A. All figures are rounded to nearest 10 digits.

Table 8.--Weighted average yields per acre of the major crops in the alternate aggregate models.

Model	Cotton		Corn	Soybeans	Lespedeza	Oats	Alfalfa	Pasture
	No flooding	Flooding						
	Lbs. Lint		Bu.	Bu.	Tons Hay	Bu.	Tons Hay	Cow-acre-days
A	670	490	65	24	1.1	40	3.7	90
B	670	490	65	24	1.3	41	3.7	60
C	660	490	61	24	1.0	33	3.7	50
D	670	490	62	24	1.0	31	3.7	40
E	670	490	62	24	1.3	40	3.7	60

NOTE: Yields are rounded to the following nearest units. Cotton - 10 lbs.; Corn - 1 bu.; Soybeans - 1 bu.; Lespedeza - 0.1 ton; Oats - 1 bu.; Alfalfa - 0.1 ton; Pasture - 5 cow-acre-days.

oat, and pasture yields as these crops were planned on soil management groups which gave lower per-acre yields than they had been planned on in previous models. In model E, all non-row crop acres from soil management groups 21-35 were planned as forest. This reduced the total acreage of the non-row crops and resulted in increased per-acre yields for all non-row crops except alfalfa. The limited acreage of alfalfa enabled this crop to be planned on soil management groups which had the same weighted per-acre yield of the crop in all models.

Total production

Total production was calculated for each of the major crops under one level of input of fertilizer per crop for all of the models. The results are tabulated in table 9. With flooding, cotton production increased by 26% from models A to D, and this was also true for no flooding. This increase in production was accompanied by a 26% increase in acreage. The increase in production was 2,514,000 and 1,848,200 pounds of lint for no flooding and flooding conditions respectively, for an increase of 3,690 acres from models A to D, E.

Corn production increased by 75% from model A to D, E, while corn acreage increased by 84%. The increase in production was 1,604,100 bushels and the increase in acreage was 27,730 acres. Soybean production increased by 64% or 26,100 bushels from models A to D, E while acreage increased by 67% or 1,110 acres.

Lespedeza production from model A to D increased by 310% or 68,950 tons while acreage increased by 380% or 74,810 acres. Oat production from model A to D increased by 280% or 588,600 bushels while

Table 9.---Total production of the major crops in the alternate aggregate models.

Model	Cotton		Corn	Soybeans	Lespedeza	Oats	Alfalfa	Pasture
	No Flooding Lbs. Lint	Flooding	Bu.	Bu.	Tons Hay	Bu.	Tons Hay	Cow-acre-days
A	9,540,300	7,028,000	2,142,500	40,500	22,170	213,800	3,100	821,400
B	10,351,500	7,626,200	2,317,000	42,800	19,610	167,700	2,290	648,000
C	11,968,200	8,818,800	2,896,300	55,700	64,020	593,400	10,210	2,401,400
D	12,054,300	8,876,200	3,746,600	66,600	91,120	802,400	14,430	2,862,500
E	12,054,300	8,876,200	3,746,600	66,600	38,250	320,900	4,590	1,323,100

NOTE: All data are rounded to the nearest 10 units.

acreage increased by 380% or 20,180 acres. Alfalfa production increased by 370% or 11,330 tons from models A to D, while acreage, too, increased by 370% or 3,070 acres. Pasture production increased by 250% or 2,041, 100 cow-acre-days from models A to D, while acreage increased by 680% or 61,720 acres.

If the percentage of increase in production is equal to the percentage of increase in acreage, it may be inferred that the soils in the two models being compared are equivalent for production of that particular crop. If the percentage of increase in production is less than the percentage of increase of acreage, then the soils are not equivalent. The latter model will now have a lower yield per-acre for the particular crop than the former model. If the increase in productivity ratio is greater than the increase in acreage ratio, the soils are again not equivalent. This time the latter model has a higher production per-acre than the former model.

CHAPTER VI

ALTERNATE MODELS OF LAND USE ON REPRESENTATIVE MEDIAN FARMS

Each representative median farm of each of the five farm groups was planned using the average land-use and enterprise system data of the aggregate of each farm group. Five alternate models--A, B, C, D and E were planned for each representative farm. Soils of these farms were sub-classified into areas which were in turn classified into the same soil management groups which were used in the aggregate planning of the county.

Inventory Groupings

All farms

The soils of each of the five representative farms were classified by land use into five land inventory groups. Data of land use were extrapolated from the average inventory group data of each farm group. Factors for each category were calculated and multiplied by the total operated acreage of each farm to determine the acreage in each inventory group on each farm. These data are summarized in table 10. Percentage of the total operated acreage of each farm in cropland, pasture, forest, and other land is also presented in table 10. The percentage of cropland varied by 15.8% from a high of 50.6% in group 1 to a low of 34.8% in group 4. Pasture acreage varied by 8.2% from a high of 15.2% in group 2 to a low of 7.0% in group 4. Forest acreage varied by 17.1% from a high of 41.0% in group 5 to a low of 23.9% in

GROUP I 39E

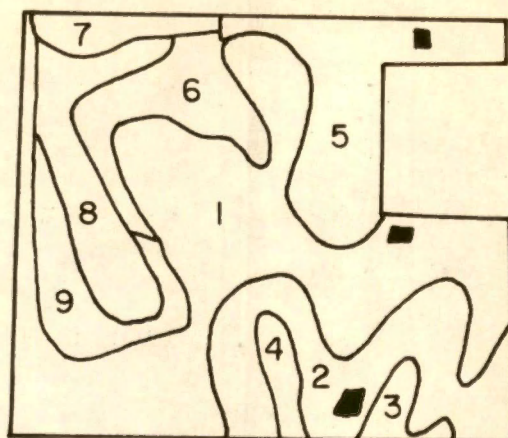


Fig. 1.--Soil mapping areas of representative farm one.^a

a/ Infra. Appendix M.



Fig. 2.--Soil mapping units of representative farm one.^a

a/ Infra. Appendix M.

Table 10.--Extent of land inventory groups on median representative farms of five farm groups.

Farm group	Total acres	Cropland		Pasture		Forest		Other land		Available other land	
		Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent
1	58.2	29.4	50.6	7.4	12.7	14.0	24.0	7.4	12.7	3.0	
2	149.0	73.0	49.3	23.0	15.2	36.0	23.9	17.0	11.6	10.0	
3	119.0	50.0	41.9	16.0	13.9	42.0	34.9	11.0	9.3	5.0	
4	119.0	41.0	34.8	8.0	7.0	49.0	40.8	21.0	17.4	15.5	
5	86.0	17.0	19.8	10.0	11.8	55.0	63.9	4.0	4.2	2.5	

NOTE: Total acres of each representative farm is equal to the total of cropland, forest, pasture, and other land. Percentages were calculated on basis of total cropland, pasture, forest, and other land. Available other land was determined by map inspection.

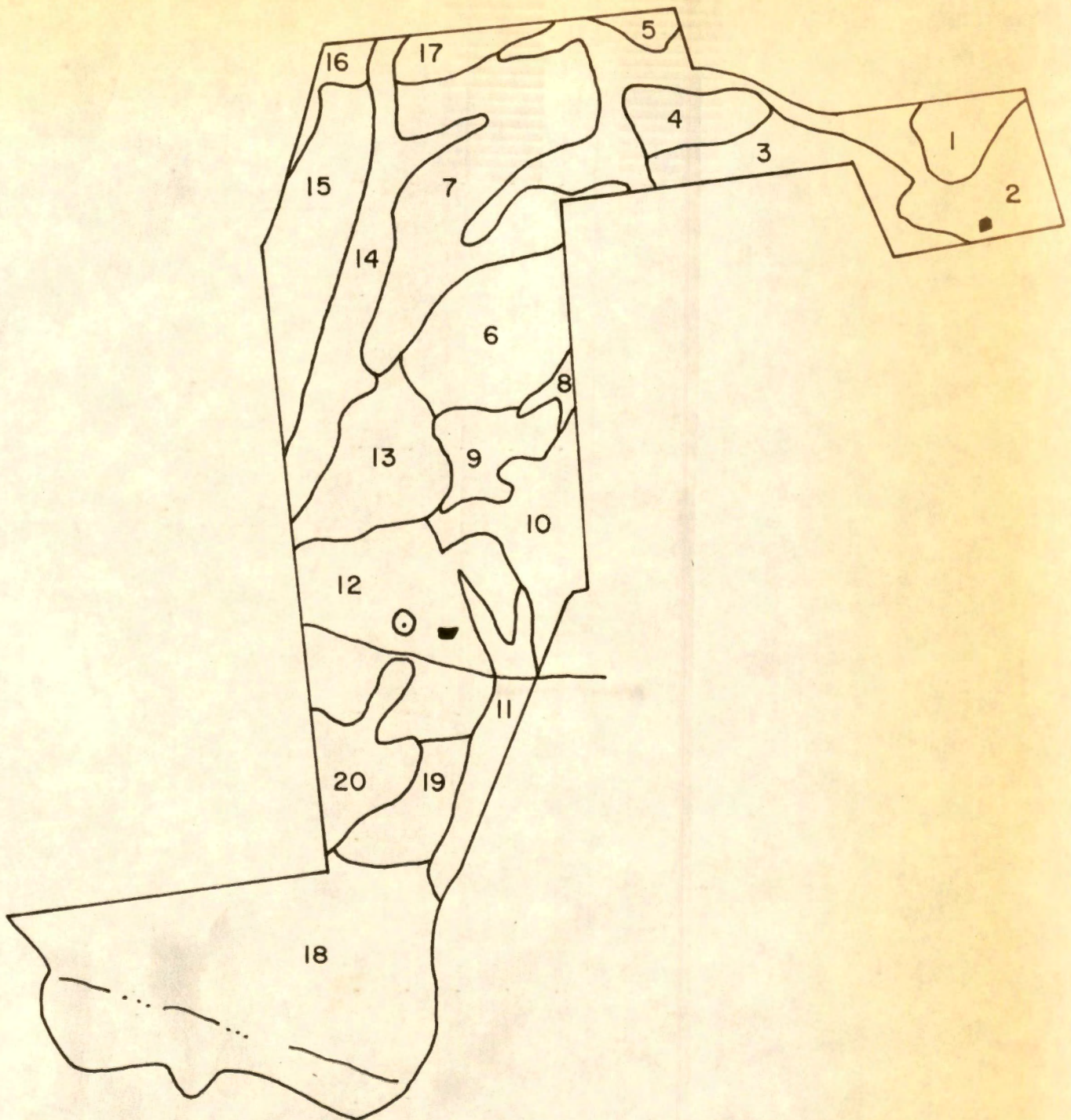


Fig. 3.--Soil mapping areas of representative median farm two.^a

a/ Infra. Appendices N, R, S, T, U, and V.



Fig. 4.--Soil mapping units of representative farm two.^a

a/ Infra. Appendices N, R, S, T, U, and V.

group 2. Other land varied by a maximum of 13.2% from the high of 17.4% in group 4 to the low of 4.2% in group 5.

Representative farms

Land-use data by inventory groups was compiled for each of the representative farms. Five land-use models A, B, C, D, and E were planned for each farm. The five representative farms--1, 2, 3, 4, and 5 are summarized by land use models in table 11.

Major Crops

The major crops were planned on cropland within the five land-use models on each of the five farms. The row-crops--cotton, corn, and soybeans were planned only on row-crop acres. The non-row crops--lespedeza, oats, and alfalfa in model A (including pasture in models B through E) were planned only on non-row crop acres. Percentages of each crop were extrapolated from the average data from the aggregate of each farm group. Data on the extent of each crop on each farm within each situation are presented in table 12.

Capability unit classification of the farms

The five representative farms have different soil resources. The kind of soil resources influenced how the land was used on each farm, and what crops were planned within the cropland inventory group. In table 13 the total operated acres of each farm were classified into land capability units by using the soil survey field sheets. The percentage

GROUP 3 87C

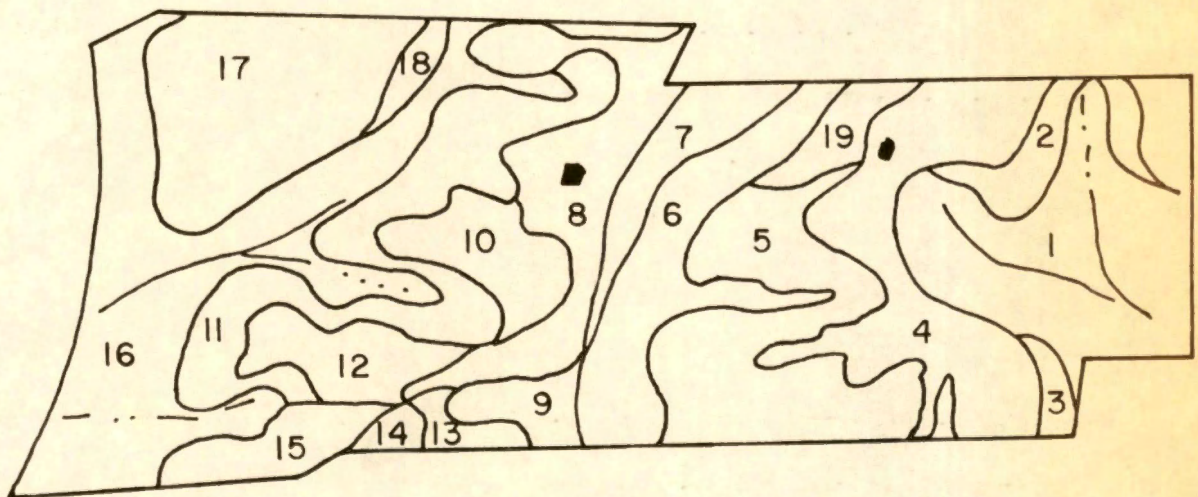


Fig. 5.--Soil mapping areas of representative farm three.^a

a/ Infra. Appendix O.



Fig. 6.--Soil mapping units of representative farm three.^a

a/ Infra. Appendix O.

Table 11.--Acreage of land inventory groups on representative farms.

Model	Cropland		Pasture	Forest	Available other land
	Row- crop	Non-row crop			
Farm One					
A	12.5	16.9	7.4	14.0	3.0
B	13.7	23.1	0.0	14.0	3.0
C	22.3	28.5	0.0	0.0	3.0
D	22.3	31.5	0.0	0.0	0.0
E	22.3	28.4	0.0	3.1	0.0
Farm Two					
A	41.2	31.8	23.0	36.0	10.0
B	41.2	54.8	0.0	36.0	10.0
C	45.2	86.8	0.0	0.0	10.0
D	49.2	92.8	0.0	0.0	0.0
E	49.2	14.8	0.0	78.0	0.0
Farm Three					
A	26.0	24.0	16.0	42.0	5.0
B	26.0	40.0	0.0	42.0	5.0
C	27.5	80.5	0.0	0.0	5.0
D	29.8	83.2	0.0	0.0	0.0
E	29.8	21.2	0.0	62.0	0.0
Farm Four					
A	13.5	27.5	8.0	49.0	15.5
B	21.5	27.5	0.0	49.0	15.5
C	41.5	56.5	0.0	0.0	15.5
D	50.7	62.8	0.0	0.0	0.0
E	50.7	17.8	0.0	45.0	0.0
Farm Five					
A	9.3	7.7	10.0	55.0	2.5
B	11.0	16.0	0.0	55.0	2.5
C	51.0	31.0	0.0	0.0	2.5
D	53.5	31.0	0.0	0.0	0.0
E	53.5	3.5	0.0	27.5	0.0

NOTE: Acreages were rounded to the nearest 0.1 acre.

GROUP 4 IB

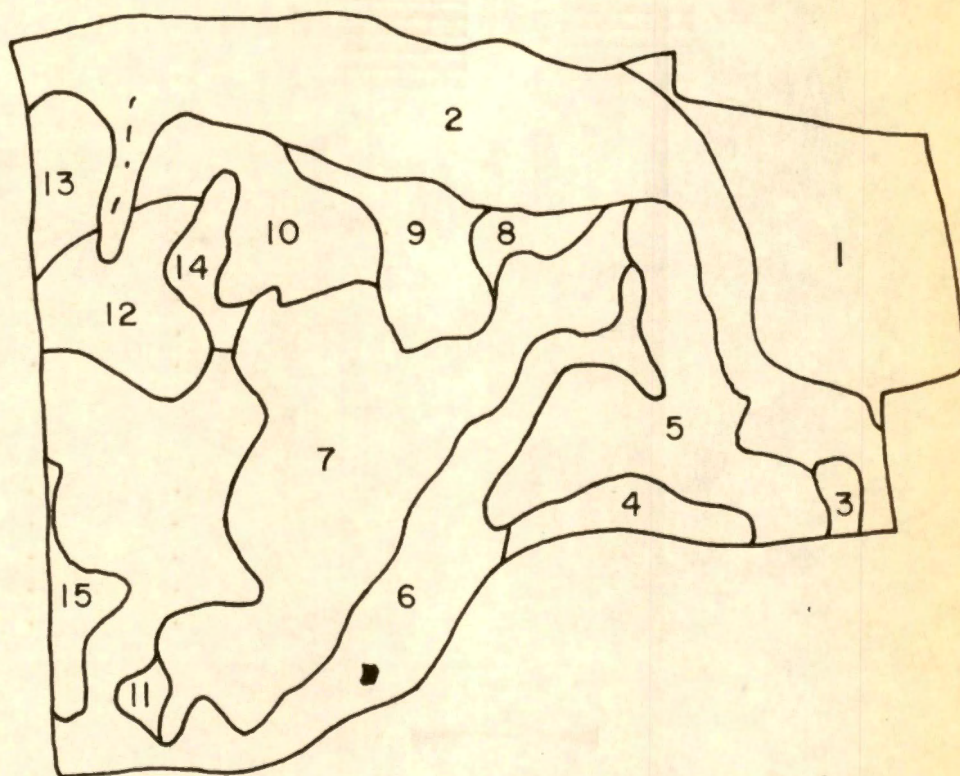


Fig. 7.--Soil mapping areas of representative farm four.^a

a/ Infra. Appendix P.

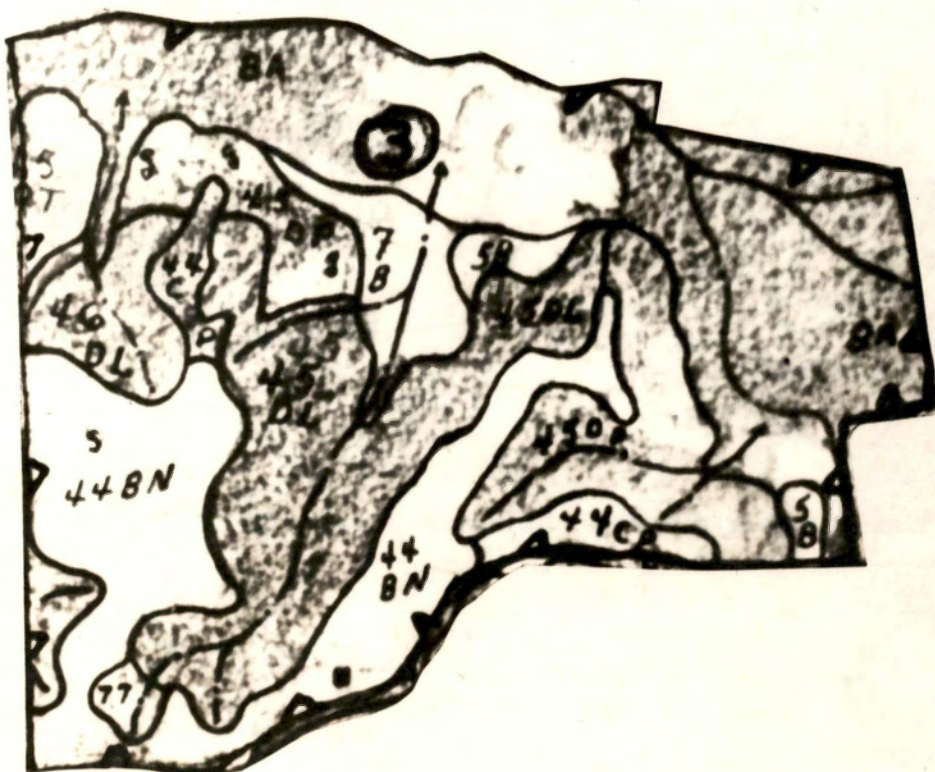


Fig. 8.—Soil mapping units of representative farm four.^a
Scale: 1 inch equals 660 feet.

a/ Infra. Appendix P.

GROUP 5 56C

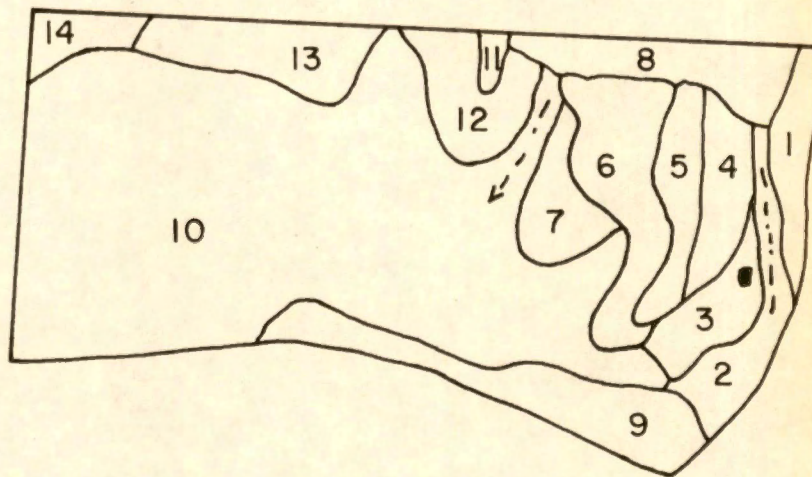


Fig. 9.--Soil mapping areas of representative median farm five.^a

a/ Infra. Appendix Q.

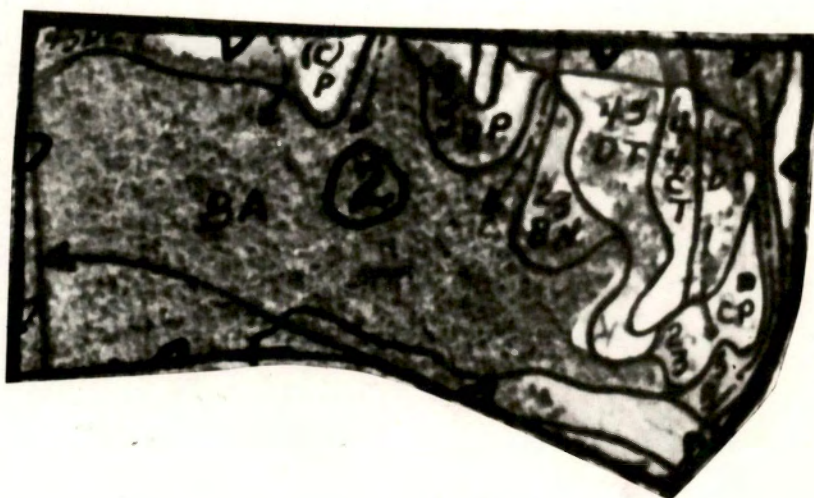


Fig. 10.--Soil mapping units of representative farm five.^a
Scale: 1 inch equals 660 feet.

a/ Infra. Appendix Q.

Table 12.--Acreage of major crops in alternate models
on representative farms.

Model	Cotton	Corn	Soybeans	Lespedeza	Oats	Alfalfa	Pasture
<u>Farm One</u>							
A	4.6	7.9	0.0	13.6	3.3	0.0	7.4
B	5.0	8.7	0.0	5.4	1.3	0.0	16.4
C	8.2	14.1	0.0	6.7	1.6	0.0	20.2
D	8.2	14.1	0.0	7.4	1.8	0.0	22.3
E	8.2	14.1	0.0	6.7	1.6	0.0	20.1
<u>Farm Two</u>							
A	7.0	32.1	2.1	23.5	7.5	0.8	23.0
B	7.0	32.1	2.1	11.9	3.8	0.4	38.7
C	7.7	35.2	2.3	18.8	6.0	0.6	61.4
D	8.4	38.3	2.5	20.1	6.4	0.7	65.6
E	8.4	38.3	2.5	3.3	1.0	0	10.5
<u>Farm Three</u>							
A	8.3	16.5	1.2	18.2	5.8	0.0	16.0
B	8.3	16.5	1.2	9.4	3.0	0.0	27.6
C	8.7	17.5	1.3	18.8	6.0	0.0	55.7
D	9.5	18.9	1.4	19.5	6.2	0.0	57.5
E	9.5	18.9	1.4	4.8	1.7	0.0	14.7
<u>Farm Four</u>							
A	5.5	8.0	0.0	22.6	3.3	1.6	15.5
B	8.9	12.6	0.0	4.5	0.7	0.3	22.0
C	17.1	24.4	0.0	9.3	1.4	0.6	45.2
D	20.8	29.9	0.0	10.3	1.5	0.7	50.3
E	20.8	29.9	0.0	3.1	0.4	0.0	14.3
<u>Farm Five</u>							
A	3.4	4.3	1.6	7.7	0.0	0.0	10.0
B	4.0	5.1	1.9	3.4	0.0	0.0	12.6
C	18.5	23.8	8.7	6.6	0.0	0.0	24.4
D	19.5	24.9	9.1	6.6	0.0	0.0	24.4
E	19.5	24.9	9.1	0.7	0.0	0.0	2.8

NOTE: Acres were rounded to the nearest 0.1 acre.

Table 13.--Capability unit classification of representative farms.

Capability Unit	Acres	Percent of total acres
<u>Farm One</u>		
IIe-2	23.5	40.4
IIIw-1	8.0	13.7
IIIw-2	7.0	12.0
IVe-2	15.7	27.0
VIIe-3	4.0	6.9
Total	58.2	100.0
<u>Farm Two</u>		
IIe-1	4.0	2.7
IIw-1	7.0	4.7
IIIw-2	41.0	27.5
IIIe-3	0.5	0.3
IVe-3	3.0	2.0
VIe-3	28.0	18.8
VIe-5	29.5	19.8
VIIe-3	36.0	24.2
Total	149	100.0
<u>Farm Three</u>		
IIe-2	3.5	2.9
IIIe-2	1.0	0.8
IIIw-2	18.0	15.1
IVe-2	24.5	20.5
VIe-5	34.0	28.5
VIIe-3	30.0	25.2
Total	119	100.0
<u>Farm Four</u>		
IIw-1	3.0	2.5
IIIe-3	23.0	19.1
IIIw-2	4.0	3.3
IVw-2	39.0	32.4
IVe-3	5.0	4.1
VIe-3	41.0	34.0
VIIe-3	5.5	4.6
Total	120.5	100.0

Table 13.--(Continued)

Capability unit	Acres	Percent of total acres
<u>Farm Five</u>		
IIw-1	5.0	5.8
IIe-2	3.0	3.4
IIIw-2	6.5	7.5
IIIe-3	0.5	0.5
IVe-2	2.5	2.9
IVw-2	42.0	48.8
VIe-3	12.5	14.5
VIIe-3	14.0	16.2
Total	86.0	100.0

NOTE: Acreage was rounded to nearest 0.1 acre. Percentages were rounded to nearest 0.1%.

of each capability unit of total operated acreage was then calculated. Further breakdown of capability units into soil mapping units is found in Appendix A.

Average weighted yields

Average weighted yields were calculated for each of the major crops on each of the representative farms in each of the five land-use models. The results are summarized in table 14.

Average weighted yields were calculated by dividing the aggregate production of each crop within each model by the total acreage of each crop. These reported yields were rounded as follows (9)--cotton to the nearest ten pounds, corn to the nearest bushel, soybeans to the nearest bushel, lespedeza to the nearest tenth of a ton, oats to the nearest bushel, alfalfa to the nearest tenth of a ton, and pasture to the nearest five cow-acre days. Consequently calculation of total production by multiplying average weighted yield per acre by total acres of each crop will not give exact results.

Total production

Production of each major crop was calculated for each area on which it occurred. Then the production from all of the areas was added to determine total production. This information is summarized in table 15.

On farm one without flooding, from models A to D, E, cotton production increased by 124% while acreage increased by 78%. With flooding, cotton production increased by 72% while acreage increased by

Table 14.--Weighted average per acre yields of major crops in alternate models on representative farms.

Model	Cotton		Corn Bu.	Soybeans Bu.	Lespedeza Tons Hay	Oats Bu.	Alfalfa Tons Hay	Pasture Cow-acre-days
	No flooding Lbs. Lint	Flooding Lbs. Lint						
Farm One								
A	500	500	46	-	1.4	37	-	45
B	500	500	44	-	1.5	38	-	75
C	630	480	45	-	1.5	38	-	65
D	630	480	45	-	1.5	38	-	60
E	630	480	45	-	1.5	38	-	65
Farm Two								
A	670	490	68	38	1.0	29	3.7	35
B	670	490	68	38	1.1	33	3.7	50
C	680	500	68	38	1.0	30	3.7	45
D	670	500	69	38	1.0	29	3.7	45
E	670	500	69	38	1.3	43	-	55
Farm Three								
A	650	480	58	30	1.2	27	-	55
B	650	480	58	30	1.2	33	-	40
C	650	480	57	30	1.1	31	-	45
D	650	480	56	30	1.1	30	-	45
E	650	480	56	30	1.2	38	-	45

Table 14,---(Continued)

Model	Cotton		Corn	Soybeans	Lespedeza	Oats	Alfalfa	Pasture
	No flooding	Flooding						
Farm Four		Lbs. Lint	Bu.	Bu.	Tons Hay	Bu.	Tons Hay	Cow-acre-days
A	660	490	44	-	1.0	29	3.3	100
B	640	470	47	-	1.3	29	3.3	80
C	600	440	50	-	1.3	29	3.3	70
D	590	440	51	-	1.3	29	3.3	70
E	590	440	51	-	1.3	29	-	85
Farm Five								
A	680	500	62	38	1.1	-	-	60
B	670	500	57	38	1.3	-	-	55
C	610	450	53	30	1.1	-	-	50
D	610	450	54	30	1.1	-	-	50
E	610	450	54	30	1.4	-	-	70

NOTE: Yields were rounded as follows:

Cotton - nearest 10 lbs.

Corn - nearest 1 bu.

Soybeans - nearest 1 bu.

Lespedeza - nearest 0.1 ton

Oats - nearest 1 bu.

Alfalfa - nearest 0.1 ton

Pasture - nearest 5 cow-acre days

Table 15.---Total production of major crops in alternate models on representative farms.

Model	Cotton		Corn	Soybeans	Lespedeza	Oats	Alfalfa	Pasture
	No Flooding	Flooding						
	Lbs. Lint	Lbs. Lint	Bu.	Bu.	Tons Hay	Bu.	Tons Hay	Cow-acre-days
Farm One								
A	2,300	2,300	362	0	19.5	122	0.0	333
B	2,500	2,500	381	0	8.1	49	0.0	1,200
C	5,150	3,960	636	0	10.0	61	0.0	1,304
D	5,150	3,960	636	0	11.1	68	0.0	1,299
E	5,150	3,960	636	0	10.0	61	0.0	1,300
Farm Two								
A	4,700	3,460	2,183	80	24.2	216	3.0	765
B	4,700	3,460	2,183	80	13.0	126	1.5	1,861
C	5,200	3,826	2,406	87	19.7	180	2.2	2,812
D	5,655	4,162	2,629	95	20.9	188	2.6	2,898
E	5,655	4,162	2,629	95	4.3	43	0.0	578
Farm Three								
A	5,395	3,984	957	36	20.2	175	0.0	480
B	5,395	3,984	957	36	11.3	100	0.0	1,092
C	5,655	4,176	995	39	21.5	184	0.0	2,502
D	6,175	4,560	1,068	42	22.5	189	0.0	2,580
E	6,175	4,560	1,068	42	5.8	65	0.0	662

Table 15.---(Continued)

Model	Cotton		Corn	Soybeans	Lespedeza	Oats	Alfalfa	Pasture
	No flooding	Flooding						
	Lbs. Lint	Lbs. Lint	Bu.	Bu.	Tons Hay	Bu.	Tons Hay	Cow-acre-days
Farm Four								
A	3,635	2,680	350	0	23.4	96	5.3	1,545
B	5,685	4,199	590	0	5.8	20	1.0	1,789
C	10,195	7,561	1,227	0	12.1	41	2.0	3,159
D	12,230	9,078	1,519	0	13.4	44	2.3	3,473
E	12,230	9,078	1,519	0	4.0	12	0.0	1,246
Farm Five								
A	2,300	1,692	266	61	8.3	0	0.0	575
B	2,690	1,980	291	72	4.6	0	0.0	678
C	11,215	8,310	1,272	261	7.5	0	0.0	1,200
D	11,830	8,765	1,332	273	7.5	0	0.0	1,200
E	11,830	8,765	1,332	273	1.0	0	0.0	190

NOTE: Production was rounded to the nearest whole digit for all crops except hay where it was rounded to nearest 0.1 ton.

78%. Corn production from models A to D, E increased by 76% while corn acreage increased by 78%. From models A to D, lespedeza production decreased by 43% while acreage decreased by 46%. Oat production decreased by 44% while oat acreage decreased by 46% from models A to D. Pasture production from models A to D increased by 290% while its acreage increased by 202%.

Farm two. Cotton production, with no flooding from models A to D, E; increased by 20% and with flooding increased by 21% while its acreage increased by 20%. Corn production from model A to D, E increased by 20% while its acreage increased by 19%. Soybeans production and acreage both increased by 19% from models A to D, E. Lespedeza production and acreage both decreased by 14% from models A to D. From models A to D, oat production decreased by 13% while oat acreage decreased by 15%. Alfalfa from models A to D decreased in production by 13% and in acres by 12%. Pasture from models A to D increased production by 280% and increased acres by 180%.

Farm three. In both cases of no flooding and flooding, cotton production increased by 14% while cotton acreage increased by the same 14% from models A to D, E. Corn production increased by 12% while corn acreage increased by 14% from A to D, E. Both soybean production and acreage increased by 17% from A to D, E. The following non-row crop comparisons were made between models A and D. Lespedeza production increased by 11% while its acreage increased by 7%. Oat production

increased by 8% while its extent increased by 7%. Pasture production increased by 440% while acreage increased by 260%.

Farm four. The following row crops were compared between models A and D, E. Both in no flooding and flooding, cotton production increased by 240% while cotton acreage increased by 280%. Corn production increased by 330% while corn acreage increased by 270%. The following non-row crops were compared between models A and D. Lespedeza production decreased by 43% while its acreage decreased by 54%. Oat production and acreage both decreased by 54%. Alfalfa production and acreage both decreased by 56%. Pasture production increased by 125% while its extent increased by 224%.

Farm five. The following comparisons were made between models A and D, E. With no flooding, cotton production increased by 414%; with flooding, cotton production increased by 418% while cotton acreage increased by 474%. Corn production increased by 400% while its extent increased by 480%. Soybean production increased by 348% while its acreage increased by 468%. The next comparisons were made between models A and D. Lespedeza production decreased by 10% while its extent decreased by 14%. Pasture production increased by 109% while its acreage increased by 144%.

CHAPTER VII

EFFECT OF FERTILIZATION ON MAJOR CROPS

Several different inputs of fertilizer were established, and yields were estimated for the major crops of Henderson County.³³ These estimates were made for one soil mapping unit of each soil response group. By interpolation, yields for all of the other mapping units in each of the seven soil response groups were calculated for each input of fertilizer.

County in the Aggregate

Total production of each major crop for each input of fertilizer was calculated for each of the five land-use models. Average weighted yields per acre were then computed by dividing the total production for each of the fertilizer inputs for a particular crop by the total extent (in acres) of that crop. For each crop, the weighted yield per acre for the highest input of fertilizer was considered to be 100%. The response to fertilization was measured as percentage of the yield per acre of the highest input of fertilizer. Table 16 reported the average weighted yield per acre for all inputs of fertilizer for all five land-use models. Table 17 presented the response to fertilization calculated as the percentage of the high input rate for each major crop in all five land-use models.

³³/Conference UT and TVA personnel. Bell, F. F. and Springer, M. E. May 1959.

Table 16.---Average weighted yields of major crops at several inputs of fertilizer in alternate aggregate models, per acre.

Model	Cotton									
	No Flooding					Flooding				
	a.	b.	c.	a.	b.	c.	a.	b.	c.	
	Lbs. Lint									
	Cotton									
	a.					b.				
	c.					c.				
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Table 17.--Response to inputs of fertilizer expressed as percentages of the yield per acre of the highest inputs for the major crops in the alternate aggregate models.

Model	Cotton												Lespedeza			Oats			Alfalfa		Pasture	
	No Flooding			Flooding			Corn			Soybeans												
	a.	b.	c.	a.	b.	c.	a.	b.	c.	a.	b.	c.	a.	b.	c.	a.	b.	a.	b.	a.	b.	
A	72	92	100	72	92	100	52.9	85.4	100	49.6	100	62	100	79	89	100	73	100	54	100		
B	72	92	100	72	92	100	53.0	85.4	100	50.4	100	64	100	80	89	100	73	100	40	100		
C	72	92	100	72	92	100	53.1	85.7	100	47.9	100	54	100	77	35	100	73	100	40	100		
D	72	92	100	72	92	100	53.0	85.7	100	47.9	100	56	100	79	90	100	73	100	38	100		
E	72	92	100	72	92	100	53.0	85.7	100	47.9	100	60	100	79	89	100	73	100	44	100		

NOTE: Supra. table 16.

The response to the three inputs of fertilizer was the same for cotton in all five land-use models. Cotton was planned as the highest value crop on the highest yielding soil management groups which all fell in the Hymon silt loam soil response group. The average cotton yield per acre was rounded to the nearest pound and the fertilizer response ratio was rounded to the nearest one percent. The results infer that the basic soil resources on which cotton had been allocated were the same in their response to similar inputs of fertilizer. In all five models, there was a percentage differential of 20% between the low and medium rates and an 8% difference between the medium and high rates.

The fertilization response ratios indicate which portion of the response curve the soil resource is in. If the percentage ratio was small, the response to the additional input of fertilizer was great. Such an instance occurred between the low and high input rates for cotton. For one input of the high rate, the increase in yield per acre was 28%. If the soils had a natural fertility of the medium input, then the response would have been 8%, if the additional input has been added. In soils which have a low yield potential, the response to the same input of fertilizer will be greater than in soils which have higher productive potential for the same crop for soils which have response curves of the same shape. The average weighted yields when compared for the same crop between alternate models indicate the productivity of the soils within each model for each crop. In considering the fertilizer input analysis, the assumption was made that all variable factors which determine production

were kept constant or increased sufficiently to give the calculated response from the unit of fertilizer.

The response to fertilization for corn was similar in all models. Between the first and second inputs the yield of corn per acre increased by 32% to 33%. Between the second and third inputs, yield per acre increased by 14% to 15%. Corn was planned as the second in value among the row crops. As acreage was converted from the various inventory groups into cropland, more corn was planned on the bottomland soils which had a higher productive potential for corn.

The response to fertilization for soybeans was similar in all models. Soybeans were planned as least in value of the row crops. As more acreage was converted to cropland, soybeans were planned on soil management groups with lower productive potential because of the order of value of the row crops. The response for the second input in all of the models did not differ significantly.

The response input ratios for lespedeza varied from 64% in model B to 54% in model C. The greatest response to the second input was in model C, in which the response was a 46% increase in yield per acre. The least response occurred in model B where the increase in yield per acre from the second input was 36%. The inverse relationship between response to inputs of fertilizer and the productive potential of the soil management groups were again illustrated with lespedeza. The soils in model C showed the greatest response to the second input while having the lowest per acre yields for lespedeza at both input levels.

The response to inputs of fertilizer in oats was the same in all models. The response to the second input of fertilizer was 9% to 11%. The increase in yield per acre (response) for the third input was 10% to 11% in all models. Oats was the highest value non-row crop in order of planning; consequently it was planned on groups which had high potential for oat productivity.

The response to inputs of fertilizer was the same in all five alternate models for alfalfa. The response to the second input of fertilizer was a 27% increase in yield per acre. Alfalfa was limited in acreage in the county aggregate cropping system. It was ranked second in order of allocating the non-row crops and thus occurred in all five alternate models on groups which had a relatively high production potential for it.

The response to the same inputs of fertilizer was different for pasture in all five alternate land-use models. The input ratios varied from a high of 54% in model A to a low of 38% in model D. The responses to the second input in terms of increased cow-acre-days per acre for the five models were respectively--46% in A, 60% in B, 60% in C, 62% in D, and 56% in E. Pasture was allocated last of all the non-row crops. As the total acreage of cropland increased from models A through D, pasture was planned on groups with succeeding lower productive potential for pasture. However, in model E, the total amount of cropland was reduced as all groups from 20 through 35 were planned as forest. Thus, pasture was allocated in E on groups which had a higher productive potential for pasture than those on which it had been planned in models B, C, and D.

Representative Farms

Fertilizer response analysis was computed for only one of the representative farms. Representative farm two was selected because of its large acreage, variability of soil management groups, and because all of the seven major crops were grown on the farms in this group. In each of the alternate models, total production was calculated for each crop by adding the total yields of each of the areas upon which the crop was planned. Average weighted yields per acre were then calculated for each of the inputs. The ratios of the average weighted yields per acre of the first and second (if applicable) inputs over the yields of the final input (second or third) were calculated for each of the major crops in each alternate model. Table 18 reported the average weighted yields of the major crops for all inputs within the five land-use models on representative farm two. Table 19 reported response to fertilizer inputs of the major crops in all five models on representative farm two.

The response to inputs of fertilizer on cotton was the same in all land-use models under both conditions of flooding. With no flooding, the responses to the second input was a 26% increase in yield per acre. The response to the third input was 8%. In all five models, cotton was planned on the bottomland soil management groups which had the highest potential for cotton production. With flooding, the response to the second input was 27%, while the response to the third input was 8%.

The response to the inputs of fertilizer was the same in all five models for corn. The response to the second input was a 32% increase in

Table 18.---Average weighted yields of major crops at several inputs of fertilizer on representative farm two, per acre.

Model	Cotton																												
	No flooding						Flooding																						
	a.	b.	c.	a.	b.	c.	a.	b.	c.	a.	b.	c.																	
	Lbs. Lint																												
	Bu.																												
A	484	671	731	357	494	534	Corn			Soybeans			Lespedeza			Oats			Alfalfa			Pasture							
							a.	b.	c.	a.	b.	a.	b.	a.	b.	a.	b.	a.	b.	a.	b.								
							Bu.			Bu.			Tons Hay			Bu.			Tons Hay			Cow-acre-days							
							26			29			0.5			18			0.5			26			2.7			13	
							33			36			1.0			38			1.0			29			3.7			33	
B	484	671	731	357	494	534	Corn			Soybeans			Lespedeza			Oats			Alfalfa			Pasture							
							a.	b.	c.	a.	b.	a.	b.	a.	b.	a.	b.	a.	b.	a.	b.	a.	b.						
							Bu.			Bu.			Tons Hay			Bu.			Tons Hay			Cow-acre-days							
							26			29			0.5			18			0.5			26			2.7			17	
							33			36			1.1			38			1.1			29			3.7			48	
C	487	675	735	358	497	537	Corn			Soybeans			Lespedeza			Oats			Alfalfa			Pasture							
							a.	b.	c.	a.	b.	a.	b.	a.	b.	a.	b.	a.	b.	a.	b.	a.	b.						
							Bu.			Bu.			Tons Hay			Bu.			Tons Hay			Cow-acre-days							
							26			29			0.5			18			0.5			26			2.7			18	
							33			36			1.0			38			1.0			29			3.7			46	
D	486	673	731	358	496	536	Corn			Soybeans			Lespedeza			Oats			Alfalfa			Pasture							
							a.	b.	c.	a.	b.	a.	b.	a.	b.	a.	b.	a.	b.	a.	b.	a.	b.						
							Bu.			Bu.			Tons Hay			Bu.			Tons Hay			Cow-acre-days							
							26			29			0.5			18			0.5			26			2.7			17	
							33			36			1.0			38			1.0			29			3.7			44	
E	486	673	731	358	496	536	Corn			Soybeans			Lespedeza			Oats			Alfalfa			Pasture							
							a.	b.	c.	a.	b.	a.	b.	a.	b.	a.	b.	a.	b.	a.	b.	a.	b.						
							Bu.			Bu.			Tons Hay			Bu.			Tons Hay			Cow-acre-days							
							26			29			0.5			18			0.5			26			2.7			25	
							33			36			1.0			38			1.0			29			3.7			55	

Table 19.--Response to inputs of fertilizer expressed as percentages of the yield per acre of the highest inputs for the major crops on representative farm two.

Model	Cotton												Soybeans			Lespedeza			Oats			Alfalfa			Pasture	
	No flooding			Flooding			Corn			a.		b.		a.		b.		a.		b.		a.		b.		
	a.	b.	c.	a.	b.	c.	a.	b.	c.	a.	b.	a.	b.	a.	b.	a.	b.	a.	b.	a.	b.	a.	b.			
A	66	92	100	67	92	100	53	85	100	47	100	53	100	71	81	100	73	100	39	100						
B	66	92	100	67	92	100	53	85	100	47	100	53	100	71	80	100	73	100	35	100						
C	66	92	100	67	92	100	53	85	100	47	100	51	100	72	81	100	73	100	39	100						
D	66	92	100	67	92	100	53	85	100	47	100	52	100	72	80	100	73	100	38	100						
E	66	92	100	67	92	100	53	85	100	47	100	53	100	70	80	100	-	-	45	100						

NOTE: Supra. Note table 16.

bushels per acre. The response to the third input of fertilizer was a 15% increase in yield per acre. Corn was allocated second to cotton among the row crops on the row-crop acres and was planned on both bottomland and upland soil management groups.

The response to the same inputs of fertilizer was the same in all five land-use models for soybeans. The response to the final input of fertilizer was a 53% increase in bushels per acre. Soybeans were planned as last in order of the row crops.

The response to inputs of fertilizer for lespedeza was not significantly different between models. Lespedeza was planned on only non-row crop acres and was allocated third after oats and alfalfa on the non-row crop acres.

The response to fertilization on oats was similar in all models. The response to the second input was ranged from 8 to 10%. The responses to the third input of fertilizer for the five models ranged from 19 to 20%.

The response to fertilizer inputs on alfalfa were the same in all models in which alfalfa occurred. The response to the second input of fertilizer was a 27% increase in yield per acre in models A, B, C, and D. Alfalfa was planned on soil management group six in models A, B, C, and D. It did not occur in model E, because the calculated acreage of alfalfa was too small for any farmer to place on a farm.

The response to inputs of fertilizer on pasture ranged from a high of 65% in model B to a low of 55% in E. The productivity of the soils in model B was least for pasture. The soil management group of model E had

the greatest productive potential for pasture. In row-acre-days per acre, the response in decreasing order was: B = 65%, A,C = 61%, and E = 55%. Pasture was planned last of all the non-row crops.

CHAPTER VIII

DISCUSSION OF RESULTS

County in the Aggregate

In 1957, 22.2% of the acreage of Henderson County was used as cropland. If this acreage were to be expanded, land which was in pasture, forest or idle (other land) would have to be added to existing farms or be made into new farms. The latter solution does not seem to be a practical one. The capital necessary for new farm units would have to come from outside the county. Any additions to cropland would have to come from land on present farming units or in close proximity to them.

A very strong influence on the possible shifting of land from one use to another should be the soils upon which the major uses are allocated. The 1957 pattern of land use was in large part a result of the experiences of the farmers of the county since the county was settled. The nature of the major soils of the county are such that poor land selection for a crop by a farmer will lead to almost complete failure for that crop. The soils seem to lack an intermediate level for crop production. Appendix E shows how readily yield per acre drops off for each of the seven crops considered when put on less desirable soil. The nature of these soils has been a primary cause of the 1957 land-use pattern. To change this basic pattern would require basic changes in the physical characteristics of the soils themselves or in their productive potentialities.

Changes within the 1957 acreage of pasture and cropland for the seven major crops considered would increase production of the row-crops if adequate drainage was present on soil management groups 1-5 (bottomland soils). One fact that became evident in planning the alternate land-use models was that the row crops (cotton, corn, soybeans) were being grown with more intensity of use on some acres than was recommended by the Soil Conservation Service in 1957. This overintensification resulted in low per acre yields and caused accelerated erosion on the upland soils. Table 6 shows the amount of acres on upland soils which could be used for row-crop production in the five alternate models. The calculations for total acres of cotton and corn for each alternate model were originally computed for bottomland (soil management groups 1-5) and upland (6-20) soils. For model A, the total acreage for upland cotton and corn was computed to be 19,010 acres while the total of row-crop acres of the upland soils was 10,970 acres. Model A represented the 1957 land-use pattern. This indicates that cotton and corn were being grown on the upland soils more frequently than recommended.

Though the results indicated that the total amount of cropland could not be expanded, there was evidence that several of the crops could be increased in total acreage without appreciable loss of yield per acre. Cotton which expanded on bottomland acres could increase its acreage to the maximum permitted by quota from the present 14,310 acres to the quota of 18,000 acres. In order for this expansion to take place, it would be necessary to clear some forest and put some idle land back into production as cropland. Some of the IIIw-2 land would have to be drained.

Using yield per acre as a criterion for expanding acreage of crops, the results indicated by table 8 suggest that corn, soybeans, lespedeza, and alfalfa acreage can be expanded to the maximum within the present enterprise system without any undue effect upon yield per acre. The question would still remain as to who would pay the necessary capital to put these acres into production.

If the present enterprise system of the county were changed the proportion of the major crops would change too. If pasture could expand on some of the acres on which corn, cotton, and soybeans now occur, it could be advisable to increase its acreage. However, under the present system, an increase in pasture acreage would place it on soils which would give low productivity.

The most important change in land use which could be adopted in the county within a relatively short time would be the shifting of the major row-crops (cotton, corn) from the upland soils to the bottomland soils. The bottomland soils must be drained and adequately fertilized to obtain the productivity which had been estimated for them. Better, more intensive use, can be made of the 1957 acreage of pasture which was allocated on many soil management groups upon which pasture cannot compete with valuable crops such as cotton and corn. Farmers will be able to put pasture successfully on fields where at present they obtain no stand if they will put on the recommended practices such as seed planting rates, planting dates, and rotational grazing. At the present time so little improvement is done on many pastures that establishment

is poor except on the most productive soils.

If all the factors of production except fertilization are held constant, production may be said to vary directly with inputs of fertilizer. This procedure was followed for all the major crops, with several inputs of fertilizer being considered for each crop. Appendix X summarizes this data for the alternate aggregate models. In the present (1957) land use model (A), cotton production with no flooding was 6,844,900 pounds of lint under the low rate and 10,398,900 pounds of lint under the high rate.

From a careful examination of appendix X, it can be seen that production of each of the seven crops was increased appreciably by the addition of additional inputs of fertilizer. It is in the analysis of the effects of additions of inputs of fertilizer on the major crops of the county that a major contribution to the welfare of the farmers of the county can be made by agricultural research workers. Some evidence of which portion of the response curves for each crop that each input represents may be obtained from careful examination of tables 17 and 18. Average weighted yields of the major crops in 1957 and the usual situation were reported in table 4. If these yields are compared with those calculated for several inputs of fertilizer in table 17 (model A), it may be concluded that fertilizer inputs for all crops except cotton in 1957 were those of the low rate (or lower) of table 17 for the usual yields of the individual farm survey. It seems obvious therefore that production of all crops may be substantially increased by raising rates of fertilization for the major crops.

Evaluation of Alternate Aggregate Models

Models B and E are the most practicable alternatives for the county to the present model (A). Pasture was planned last in order of crops in this thesis. Of the major crops, pasture is in no position to compete with such important cash crops as corn and cotton on soil management groups 1-4. Appendix D shows that much of the pasture in the present model (A) occurs on soil management groups which are suited to much more intensive use. In model B, pasture was reallocated to other soil management groups (Appendix I), while more intensive crops were planned on the groups that were in pasture in A. Model B could be easily accomplished by the county. Major inputs for large-scale drainage and land clearing would not be necessary to accomplish the changes of model B.

What is accomplished in B is an incomplete reallocation of the soil resources of the county; cropland and pasture are the only inventory groups involved. The complete adjustment and reallocations of acreage is seen in model E. The extent of major land use in E was shown in table 6. Under the present land suitability classification, row-crop acreage (the amount of acres in row-crops each year) could be expanded by 66% over A, and in non-row crops by 133%. The total acreage of forest would increase by 14,390 acres over A. One noteworthy fact to consider is that total production of each major crop would increase over that in A (table 9). Considerable expenses for land clearance, drainage, purchasing and resale of idle land would be incurred if model E were adopted.

In the short run, model B would be the one recommended as a means of increasing production of the key cash crops. Over time for the long run, model E would offer the county brightest prospects for maximum use of its soil resources for agriculture under the present technology and type of agriculture practiced in the county.

Individual Farms

When considering the possibilities for expansion of cropland on individual farms, the soil resources of the farm must be carefully examined to ascertain their most economic use and productive potential. The five representative farms each have different land-use patterns which are based in part on the experience of the farm operator in managing his soils.

Within the 1957 cropping system of each farm group, it seems evident that row-crop acreage can be expanded on each farm without appreciably reducing the average yield per acre. This expanded acreage would come from land which was formerly in pasture or forest on the farm. Adequate drainage and fertilization would be necessary to accomplish the reallocation. Each farm operator is however confronted with the problem of raising the necessary capital and on the bottom soils with the hazards of flooding which he cannot individually control.

The lack of intermediate soil resources upon which most non-row crops occur should become evident from a careful analysis of model E of each of the representative farms as reported in table 11. The total acreages for cropland divided into row crop, non-row crop, and forest acres shows that

in farm group one, there were sufficient acreages for expansion of non-row crops. In farm groups 2, 3, 4, and 5 however, there were not available sufficient intermediate soil resources to expand the non-row crops on, even though row-crop acreage expanded considerably. In four of the five farm groups, when row-crops were increased in extent on the bottom soils, non-row crop acreage decreased because the preponderance of the added acres fell in soil management groups 21-35 which were allocated as forest in model E.

Fertilisation at increased rates may be expected to increase production of all crops on individual farms. A complete analysis of total production of the major crops under several inputs of fertilizer is found in appendix K. This analysis was completed for representative farm two, Model A which represented the 1957 land-use pattern for all the farms in farm group two should be studied carefully. Production of corn, for example increased from 1,360 bushels under the low input to 2,566 bushels under the high rate. This represents an increase in total corn production of 47% due to fertilisation alone (holding all other factors of production constant) in model A.

The 1957 (present) rates of fertilization by the farmers of group two can be ascertained by comparing the weighted yields of the crops of group two in table 4 with the weighted yields at several inputs of fertilizer of model A in table 18. The fertilization rates of the farmers of group two closely approximated the low input rates of table 18. The only exception was lespedeza which approximated the high rate. Fertilization thus seems

to be one of the critical factors to be taken into consideration in raising the productivity of the major crops on individual farms.

Evaluation of Alternate Models on Farms

The soil resources and their present use on an individual farm will largely determine to what use models may be used. If a farm had 100 acres and all of it was in soil management group 34 (gullied land), it would be a complete waste of time to work out alternate models because forestry would be the only productive alternative. There are farms in which the alternate model analysis will prove fruitful. In addition to considering land use, several farm enterprise systems should be considered. Each enterprise system would be treated to an individual set of alternate models where applicable.

The analysis of representative farm two sets forth step by step the process to be carried out for individual farms. Information from each of the representative farms may be extrapolated for the farm group as a whole. It should not be attempted for individual farms in a farm group because of the great variability between farms.

General Discussion

The two major conclusions reached were that bottomland soils should be used more intensively and that higher rates of fertilization should be adopted for the major crops in the county. Mass education of all farm operators in the county is necessary to implement a program which will lead to higher crop productivity. One of the favored approaches had been

the demonstration farm. Such farms have appeared in Henderson County from time to time, but do not seem to have accomplished their purpose. If a farmer viewed a successful demonstration, he may have been impressed but he left the demonstration still lacking funds and means to implement what he saw on his farm.

An approach used in northern states such as Pennsylvania and New Jersey is to have agricultural workers visit each farm in the county and at least work out a suitable farm plan for each farm visited. Each farmer is also given an opportunity to have adequate drainage facilities put on his farm at a nominal cost to him. Young students at rural high schools are encouraged to build such facilities using equipment furnished by governmental agencies to local farmers at nominal fees to the farmer. Fertilizer tests are set up on each farm when practicable and a program of financial aid has been worked out with local bankers and merchants supplying low interest loans to farmers.

This form of direct aid to farmers will take a period of years to accomplish. At the end of that period substantial results will have taken place where necessary on each farm in the county. The individual farm survey and the conservation needs survey have demonstrated that vital information from agricultural research agencies has either not reached the farmers of the county, or that the farmers have not been able to implement this information on their farms due to limited individual resources. Thus the author encourages a new direct approach to the farmers of the county as a means of better communication and implementation.

CHAPTER IX

SUMMARY AND CONCLUSIONS

The study of the soil resources of Henderson County was undertaken as an attempt to ascertain the productivity of these soils. Information was drawn for the study from two surveys and from several agricultural workers. Three stages were delineated: the recent past, the near future, and the distant future. Examination of the past revealed important information concerning productivity of several crops on several large blocks of soil. Construction of several models of land use was undertaken to enable careful analysis of the soil resources for both the near and the distant future.

The Present Situation

The total area of Henderson County is 329,580 acres, of which 97% is suited for crop and forest production. In recent years, this acreage has consisted of 22% cropland, 3% pasture, 47% forest, and 28% idle land. Yields reported in 1957 were lower than usual for all crops except lespedeza because of unusually severe weather. Crop production in 1957 consisted of the following: cotton--1,790 bales, corn--106,420 bushels, soybeans--5,430 bushels, oats--22,360 bushels, lespedeza--12,790 tons, and alfalfa--660 tons.

Alternate County Land-Use Models

Each of the five constructed county models had varying amounts of soil resources in cropland, pasture, forest, and idle land. Model A consisted of the 1958 land-use pattern; model B combined the cropland and pasture categories of A into cropland; model C combined cropland, pasture, and forest of A as cropland; model D combined all of A into cropland; and model E excluded that portion of D which was in land class VI or greater from cropland, including it as forest.

Extent, average yields, and total production were calculated for each crop in each model. Average yield per acre did not vary significantly between models for cotton, corn, soybeans, and alfalfa. The models demonstrated that under a medium level of fertilization, acreage of cotton and corn could be increased substantially without reducing average yield per acre. Cotton production could increase by 26% and corn production by 75%. Substantial expansion of pasture acreage would have to occur on class VI soils, leading to considerably reduced per acre yields.

Alternate Individual Farm Land-Use Models

Models similar to those constructed for the county were designed for each median farm of the five major groups of farms found in the county. Cropland on these farms varied from 51% to 35% of total farm acreage. The same calculations computed for the county models were made for the farm

models. For farm group two, the median farm had 33% of its acreage in good bottomland soils. An analysis of the models for this farm showed that corn, cotton, and soybeans acreage could be increased by 20% without reducing average yield per acre. Pasture acreage on this farm could be increased without unduly decreasing per acre yield.

Fertilization of Major Crops

Several inputs of fertilizer were postulated for each crop, and yields were estimated for each input by soil mapping unit. The response to each additional input of fertilizer was calculated for each crop in each county land-use model. Response to three inputs for cotton was the same in all models; being 20% for the second input and 8% for the third. For corn, response to the medium input was 32% and for the high input 15%. Lespedeza showed a response of 46% for one input; alfalfa responded to one input by 27%. Response to the medium input for oats was 10%, and the same response was exhibited for the high input. For one input, pasture showed a varying response between models; ranging from 46-62%.

Similar inputs were postulated for each crop on the median farm of group two. All crops except pasture showed similar responses in all models. Response to the medium input was 27% and to the high input 8% in cotton. For corn, the medium input response was 32% and the high input 15%. Among the hay crops, lespedeza showed a response of 48% and alfalfa 27%, both for one additional input. The medium input for oats resulted in a 9% response, while the high input resulted in 20%. For one input, pasture resulted in several responses among the models varying from 55% to 65%.

Forestry

For land which is being used as forest, certain determinations should be made when considering shifts to other uses. Value of the present stand, value of the future production of the stand, cost of conversion, and income from the new use should be computed for input-output analysis. Each stand of trees should be further investigated to determine the yield in board feet per acre, quality of the lumber, and reproduction of the stand. Productivity of the soils for forestry should be computed, and net returns compared by economic analysis with pasture and other crops with which forestry competes. Only after such careful analysis can a decision on shifting be made.

Conclusions

The pattern of land use established by farmers in the county resulted in large part from experiences in working with their soils. Poor land selection for a particular crop on most soils in the county leads to almost complete crop failure. Upland soils in 1958 had too heavy a concentration of row crops, resulting in reduced yields and increased erosion hazards.

Adequate drainage would permit increases in the acreage of row crops. Cotton acreage can be increased up to its quota limit without any loss in average yield per acre. Acreage of crops such as corn, soybeans, lespedeza, and alfalfa can be increased without reducing average yields. Large increases in the acreage of pasture would considerably

reduce per acre yields because the expansion would occur on soils of low productivity.

The reallocation of cotton and corn from upland to bottomland soils will result in greatly increased production per acre and can be accomplished by increased drainage and selected clearing of some woodlands. Production of each major crop can be increased appreciably by increasing rates of fertilization. Inputs of fertilizer were of the low rate for all crops except cotton in 1958.

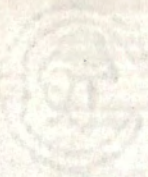
Selected as being most promising for the county were two models, B and E. Model B increased production of the cash crops--cotton and corn by shifting them to more productive soils. This model (B) was selected as being most practicable for the short-run.

In model E, all soils which were suited for production were reallocated among crops and forest. Production of all crops was increased over that determined for the 1958 land-use model (A). Consequently, model E was selected as the model most likely to bring maximum production over the long-run from the soils of the county to their operators.

One of the major limitations of this thesis was the adoption of uniform cropping systems for each set of models considered. Further investigations should be conducted considering several alternative cropping systems for the sets of models, including substitution of one crop for another. Alternative enterprises should be studied for their effects on changing cropping systems and on the marketing of agricultural products.

The productivity of individual farm and county models should be converted into monetary values. This would enable the most economically feasible models to be brought to attention. Such computations would aid in the evaluation of the many proposals which have been made concerning the low income position of many farmers in the county.



CRANES  CREST

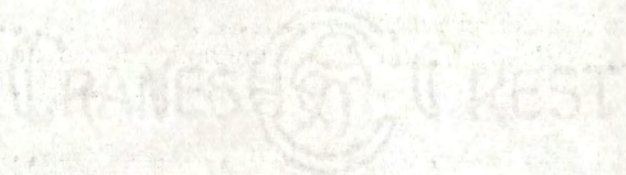
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APPENDICES

APPENDIX A

Soil management group classification of the soils of Henderson County

Soil management group SMG	Acres of SMG	Capa- bility unit	Correlated soil name	Corre- lated symbol	Row-crop use intensity in percent	Acreage of corre- lated symbol
1	1,120	IIw-1	Hymon sil.	4A	100	560
			Hymon fsl	5A	100	560
2	11,620	IIw-1	Hymon sil	4B	100	6,130
			(loc allv)			
			Hymon fsl	5B	100	4,960
			(loc allv)			
			Shannon sil	2A	100	530
			(loc allv)			
3	17,310	IIIw-2	Ina fsl	7A	100	5,970
			Ina sil	6A	100	15,890
4	28,100	IIIw-2	Ina fsl	7B	100	5,970
			(loc allv)			
			Ina lfs	17B	100	780
			(loc allv)			
			Ina sil	6B	100	21,350
			(loc allv)			
5	32,420	IVw-2	Beechy sil	8A	drained 100	27,710
			Beechy fsl	9A	100	4,710
6	8,240	IIe-1	Lexington sil	44BN	50	6,300
			Dexter fsl	34BN	50	700
			Dexter sil	24BN	50	810
			Silerton sil	54BN	50	430
7	11,170	IIe-2	Dulac sil	153BN	50	3,770
			Dulac & Tippah sil	53BL	50	130
			Dulac & Tippah sil	53BN	50	360
			Freeland fsl	33BN	50	220
			Freeland sil	23BN	50	5,060
			Tippah sil	63BL	50	200
			Tippah sil	63BP	50	180
			Tippah sil	63CL	50	210
			Providence sil	43BN	50	1,040

APPENDIX A (continued)

Soil management group SMG	Acres of SMG	Capa- bility unit	Correlated soil name	Corre- lated symbol	Row-crop use intensity in percent	Acreage of corre- lated symbol
8	7,500	IIIe-2	Dulac sil	153CL	33	700
			Dulac sil	153CN	33	740
			Dulac sicl	153BP	33	590
			Dulac & Tippah sil	53CL	33	360
			Dulac & Tippah sil	53CN	33	550
			Dulac & Tippah sicl	53BP	33	440
			Freeland sil	23BP	33	490
			Freeland sil	23CN	33	1,130
			Providence sil	43BP	33	560
			Providence sil	43CL	33	620
			Providence sil	43CN	33	520
9	250	IIIe-3	Ruston fsl	46CL	33	250
10	15,540	IIIe-3	Lexington sil	44CL	33	2,560
			Lexington sil	44CN	33	2,820
			Lexington sicl	44BP	33	1,130
			Lexington-Ruston soils	45CL	33	3,230
			Lexington-Ruston soils	45CN	33	750
			Dexter fsl	34CN	33	130
			Dexter fscl	34BP	33	140
			Dexter sil	24CL	33	180
			Silerton sil	54CL	33	2,710
			Silerton sil	54CN	33	1,890
11	660	IIIe-4	Calloway sil	62BN	25	660
12	4,580	IIIw-1	Calloway sil	62B1	25	270
			Hatchie sil	22BN	25	4,310
13	13,840	IVe-1	Dulac sicl	153CP	17	3,660
			Dulac & Tippah sicl	53CP	17	2,550
			Freeland fscl	33CP	17	380
			Freeland sil	23CP	17	3,640
			Tippah sil	63CP	17	480
			Providence sil	43CP	17	2,610
			Providence sil	43(C)P	17	520

APPENDIX A (continued)

Soil management group SMG	Acres of SMG	Capa- bility unit	Correlated soil name	Corre- lated symbol	Row-crop use intensity in percent	Acreage of corre- lated symbol
14	410	IVe-2	Dulac sil	153(C)L	17	410
15	170	IVe-3	Ruston scl	46CP	17	170
16	22,170	IVe-3	Lexington sicl	44CP	17	10,470
			Lexington-Ruston soils	45CP	17	4,580
			Lexington-Ruston soils	45(C)L	17	870
			Dexter fscl	34CP	17	740
			Dexter sicl	24CP	17	520
			Silerton sil	54(C)L	17	190
			Silerton sil	54(C)N	17	50
			Silerton sicl	54CP	17	4,750
17	230	IVe-5	Cuthbert-Silerton soils	56(C)L	17	230
18	6,160	IVe-5	Shub.-Cuth. sil soils	55CL	17	1,380
			Shu-Cuth-sil soils	55CP	17	3,080
			Shu-Rust-sil soils	155CL	17	720
			Cuth-sil soils	56CL	17	560
			Shubuta-Cuthbert sc	57CP	17	420
19	520	IVs-1	Sandy alluvial land	10	0	520
20	2,070	IVw-1	Almo sil	31AL	17drained	2,070
21	780	VIe-2	Dulac sicl	153(C)P	0	780
22	1,240	VIe-2	Dulac & Tippah sicl	53(C)P	0	700
			Freeland sil	23(C)P	0	540
23	630	VIe-3	Silerton sicl	54(C)P	0	630

APPENDIX A (continued)

Soil management group SMG	Acres of SMG	Capabi- lity unit	Correlated soil name	Corre- lated symbol	Row-crop use intensity in percent	Acreage of corre- lated symbol
24	5,840	VIe-3	Ruston fsl Ruston scl	46DL 46DP	0 0	3,570 2,270
25	3,890	VIe-3	Lexington sicl Lex-Ruston soils	44(C)P 45(C)P	0 0	1,270 2,620
26	27,200	VIe-3	Lex-Ruston soils	45DL	0	27,200
27	1,710	VIe-5	Shu-Rust-Sil soils	155(C)P	0	1,710
28	660	VIe-5	Cuthbert-Silerton soils	56CP	0	660
29	1,560	VIe-5	Cuth-Sil soils Dulac-Cuth soils	56(C)P 60(C)P	0 0	720 840
30	24,290	VIe-5	Shu-Cuth-Sil soils Cuth-Sil soils Cuth-Sil soils Shu-Cuth l	55DL 56DL 56DP 58DL	0 0 0 0	4,350 10,610 4,090 5,240
31	13,440	VIe-5	Shu-Cuth-Sil soils Shu-Rust-Sil soils Shu-Rust-Sil soils Shu-Cuth sc Dulac-Cuth soils	55DP 155DL 155DP 58DP 60DL	0 0 0 0 0	2,950 3,360 3,400 2,350 1,380
32	15,090	VIIe-1	Lex-Ruston soils	45DP	0	15,090
33	2,090	VIIe-1	Ruston fsl	46EL	0	2,090
34	46,440	VIIe-3	Moderately gullied: Cuth-Sil materials Lex-Rust materials Severely gullied: Cuth-Sil materials Lex-Rust materials	54(C)T 45DT 87 77	0 0 0 0	9,920 28,730 1,050 6,740
35	640	VIIe-4	Shu-Cuthbert l Ruston scl	57EL 46EP	0 0	420 220

APPENDIX A (continued)

NOTE: The following abbreviations were used in this table.^a In correlated soil names column, the texture abbreviations were:

f - fine
s - sand
si - silt
c - clay
l - loam

In correlated symbols column, the following slope classification was used:

A - 0 - 2 percent - level
B - 2 - 5 percent - gently sloping
(local alluvium soils, 2-7 percent - gently sloping)
C - 5 - 8 percent - sloping
(C) - 8 -12 percent - strongly sloping
D -12 -25 percent - moderately steep
E -25 percent, plus - steep

In correlated symbols column, the following erosion classification was used:

L - virtually uneroded
N - moderately eroded
P - severely eroded
T - moderately gullied

The following miscellaneous abbreviations were used:

loc - local	Sil - Silerton
allv - alluvium	Rust - Ruston
Lex - Lexington	
Shu - Shubuta	
Cuth - Cuthbert	

^aSoil Survey Staff, Soil Survey Manual (USDA Agr. Handbook No. 18 Washington, D. C. 1951) p. 139.

CRANES CREST APPENDIX B

Estimated yields per acre at several inputs of
fertilizer of cotton, corn, and soybeans
by soil mapping unit

Soil mapping unit	Cotton			Corn			Soybeans	
	a.	b.	c.	a.	b.	c.	a.	b.
	Lbs. Lint			Bushels			Bushels	

Soil Response Group One:

1	4A	500	690	750	50	80	95	22	40
2	4B	500	690	750	50	80	95	22	40
1	5A	484	667	725	44	70	84	22	40
2	5B	484	667	725	45	72	86	22	40
3	7A	450	621	675	35	56	67	16	36
4	7B	467	644	700	35	56	67	16	38
4	17B	400	552	600	26	42	50	15	35
3	6A	467	644	700	47	75	89	18	38
4	6B	483	667	725	47	75	89	18	38
2	2A	517	713	775	53	85	101	25	42

Soil Response Group Two:

153BN	360	507	574	31	52	58	15	30
153CL	333	470	531	24	40	45	12	24
153CN	328	462	523	23	38	43	11	22
153(C) L	267	376	425	19	32	36	-	-
153BP	334	470	531	26	44	50	14	26
153CP	320	451	510	23	39	44	10	20
60(C) P	-	-	-	-	-	-	-	-
60DL	-	-	-	-	-	-	-	-
53BL	339	477	540	31	52	58	15	30
53BN	334	470	531	29	48	54	14	28
53CL	307	432	489	24	40	45	12	24
53CN	293	413	468	23	38	43	11	22
53BP	307	432	489	24	40	45	13	26
53CP	285	402	455	19	32	36	10	20
53(C) P	-	-	-	-	-	-	-	-
33BN	347	488	552	29	48	54	14	28
33CP	267	376	425	19	32	36	10	20
23BN	360	507	574	31	52	58	15	30
23BP	339	477	540	26	44	50	14	28
23CN	333	470	531	24	40	45	14	28
23CP	293	413	468	19	32	36	12	24
23(C) P	-	-	-	-	-	-	-	-

APPENDIX B (continued)

Soil mapping unit	Cotton			Corn			Soybeans	
	a.	b.	c.	a.	b.	c.	a.	b.
	Lbs. Lint			Bushels			Bushels	
63BL	347	488	552	24	40	45	14	28
63BP	320	451	510	23	38	43	12	24
63CL	307	432	489	23	38	43	12	24
63CP	267	378	425	19	32	36	10	20
43BN	374	526	574	31	52	58	15	30
43BP	333	470	531	26	44	50	14	28
43CL	333	470	531	24	40	45	14	28
43CN	328	462	523	23	38	43	12	24
43CP	293	413	468	19	32	36	10	20
43(C)P	-	-	-	-	-	-	-	-

Soil Response Group Three:

55CL	299	384	446	18	30	35	10	20
55CP	285	366	425	16	26	31	9	18
55DL	-	-	-	-	-	-	-	-
55DP	-	-	-	-	-	-	-	-
155CL	299	384	446	16	27	33	10	20
155(C)P	257	329	382	15	25	30	-	-
155DL	-	-	-	-	-	-	-	-
155DP	-	-	-	-	-	-	-	-
56CL	228	292	340	14	23	27	10	20
56CP	214	274	319	12	19	23	8	18
56(C)L	-	-	-	-	-	-	8	16
56(C)P	-	-	-	-	-	-	-	-
56DL	-	-	-	-	-	-	-	-
56DP	-	-	-	-	-	-	-	-
58DL	-	-	-	-	-	-	-	-
57EL	-	-	-	-	-	-	-	-
57CP	285	366	425	16	26	31	10	20
58DP	-	-	-	-	-	-	-	-
46CL	-	-	-	-	-	-	10	20
46DL	-	-	-	-	-	-	-	-
46EL	-	-	-	-	-	-	-	-
46CP	-	-	-	-	-	-	-	-
46DP	-	-	-	-	-	-	-	-
46EP	-	-	-	-	-	-	-	-

Soil Response Group Four:

44EN	386	544	617	38	64	72	18	38
44CL	345	486	552	31	52	58	15	34

APPENDIX B (continued)

Soil mapping unit	Cotton			Corn			Soybeans	
	a.	b.	c.	a.	b.	c.	a.	b.
	Lbs. Lint			Bushels			Bushels	
44CN	332	467	531	26	44	50	14	32
44BP	345	486	552	31	52	66	15	35
44CP	292	411	468	19	32	36	12	24
44(C)P	-	-	-	-	-	-	-	-
45CL	319	449	510	22	36	40	12	20
45CN	305	430	489	19	32	36	10	18
45CP	292	411	468	17	28	32	8	16
45(C)L	279	393	446	17	28	32	-	-
45(C)P	-	-	-	-	-	-	-	-
45DL	-	-	-	-	-	-	-	-
45DP	-	-	-	-	-	-	-	-
34BN	372	524	595	35	58	65	16	34
34CN	319	449	510	24	40	45	13	27
34BP	319	449	510	29	48	54	14	32
34CP	292	411	468	19	32	36	11	22
24BN	345	486	552	31	52	58	18	35
24CL	319	449	510	26	44	50	15	34
24CP	292	411	468	19	32	36	12	24
54BN	358	505	574	31	52	58	15	30
54CL	345	486	552	26	44	50	14	28
54CN	319	449	510	24	40	45	13	27
54(C)L	266	374	425	19	32	36	12	24
54(C)N	255	355	404	22	37	42	11	22
54CP	266	374	425	19	32	36	12	24
54(C)P	239	337	382	17	28	32	10	20

Soil Response Group Five:

62BL	319	449	511	19	31	35	12	26
62BN	292	411	468	18	30	33	12	26
31AL	280	392	443	16	26	29	10	25
22BN	319	449	510	18	30	33	14	28

Soil Response Group Six:

8A	400	560	600	35	55	65	10	30
9A	373	521	560	31	48	57	10	28
10	-	-	-	-	-	-	-	-

Soil Response Group Seven:

54(C)T	-	-	-	-	-	-	-	-
45DT	-	-	-	-	-	-	-	-
87	-	-	-	-	-	-	-	-
77	-	-	-	-	-	-	-	-

APPENDIX B (continued)

NOTE: Yield per acre was estimated under conditions of adequate drainage and no flooding. The yields may be converted to conditions of poor drainage and flooding by calculating a flooding factor based on crop loss over a long period of time on a particular site. This factor would be multiplied by the estimated yield data to compute the yield for flooding and poor drainage conditions. The following fertilizer inputs were used for the cotton, corn, and soybean estimates for the various soil response groups:

Cotton: Soil response groups one and six; pounds of lint per acre.

- a. 20# N, 25# P₂O₅, 25# K₂O.
- b. 70# N, 35# P₂O₅, 35# K₂O.
- c. 100# N, 50# P₂O₅, 50# K₂O.

Cotton: Soil response groups two, three, four, five; pounds of lint per acre.

- a. 20# N, 25# P₂O₅, 25# K₂O.
- b. 50# N, 35# P₂O₅, 35# K₂O.
- c. 75# N, 50# P₂O₅, 50# K₂O.

Corn: Soil response groups one and six; bushels per acre.

- a. 15# N, 25# P₂O₅, 25# K₂O.
- b. 70# N, 40# P₂O₅, 32# K₂O.
- c. 120# N, 40# P₂O₅, 40# K₂O.

Corn: Soil response groups two, three, four, five; bushels per acre.

- a. 15# N, 25# P₂O₅, 25# K₂O.
- b. 35# N, 30# P₂O₅, 30# K₂O.
- c. 50# N, 40# P₂O₅, 40# K₂O.

Soybeans: Soil response groups one, two, three, four, five, six; bushels per acre.

- a. no fertilizer added
- b. 200#: 0-20-20

Yields were rounded to the nearest 1 unit.

APPENDIX C

Estimated yields per acre of lespedeza, oats, alfalfa and pasture at several inputs of fertilizer by soil mapping unit

Soil mapping unit	Lespe-deza		Oats			Alfalfa		Pasture	
	a.	b.	a.	b.	c.	a.	b.	a.	b.
	Tons Hay			Bushels		Tons Hay		Cow-acre-days	

Soil Response Group One:

4A	1.3	2.0	-	-	-	-	-	90	160
4B	1.3	2.0	42	49	58	2.0	4.0	70	140
5A	1.2	1.9	-	-	-	-	-	70	135
5B	1.2	1.9	41	48	57	2.0	3.8	65	125
7A	1.2	1.8	-	-	-	-	-	55	130
7B	1.2	1.8	37	44	52	-	-	70	120
17B	1.2	1.8	35	41	49	-	-	30	50
6A	1.2	1.9	-	-	-	-	-	60	135
6B	1.2	1.9	40	46	55	-	-	75	120
2A	1.3	2.1	44	52	62	3.0	4.0	120	180

Soil Response Group Two:

153BN	1.0	1.5	34	39	49	-	-	50	90
153CL	0.9	1.4	29	33	41	-	-	50	90
153CN	0.8	1.3	23	26	32	-	-	45	80
153(C)L	0.8	1.2	22	25	31	-	-	40	80
153BP	0.9	1.4	30	34	42	-	-	25	60
153CP	0.8	1.2	25	29	36	-	-	20	50
153(C)P	0.7	1.0	18	21	26	-	-	15	45
60(C)P	0.6	0.9	16	18	23	-	-	15	40
60DL	0.3	0.6	-	-	-	-	-	12	33
53BL	1.0	1.5	34	39	49	-	-	55	90
53BN	0.9	1.4	32	36	45	-	-	50	80
53CL	0.8	1.3	28	32	40	-	-	50	80
53CN	0.8	1.3	26	30	38	-	-	40	70
53BP	0.8	1.3	30	34	42	-	-	30	60
53CP	0.8	1.2	25	29	36	-	-	20	35
53(C)P	0.7	1.0	18	21	26	-	-	20	35
33BN	1.0	1.5	32	36	46	-	-	60	115
33CP	0.8	1.2	22	25	31	-	-	20	40
23BN	1.0	1.5	34	39	49	-	-	65	120
23BP	0.9	1.4	27	31	39	-	-	30	60
23CN	0.8	1.3	27	31	39	-	-	60	100
23CP	0.8	1.2	22	25	31	-	-	20	45
23(C)P	0.7	1.0	20	23	29	-	-	20	45

APPENDIX C (continued)

Soil mapping unit	Lespe- deza		Oats			Alfalfa		Pasture	
	a.	b.	a.	b.	c.	a.	b.	a.	b.
	Tons Hay		Bushels			Tons Hay		Bushels	
63BL	0.9	1.4	30	34	42	-	-	50	85
63HP	0.8	1.3	27	31	39	-	-	45	75
63CL	0.8	1.3	27	31	39	-	-	45	75
63CP	0.8	1.2	22	25	31	-	-	20	65
43BN	1.0	1.5	34	39	49	-	-	70	100
43HP	0.9	1.4	30	34	42	-	-	25	60
43CL	0.9	1.4	30	34	42	-	-	70	100
43CN	0.8	1.3	26	30	38	-	-	60	85
43CP	0.8	1.3	25	29	36	-	-	15	40
43(C)P	0.7	1.0	17	20	25	-	-	15	40

Soil Response Group Three:

55CL	0.7	1.2	24	28	34	1.8	3.0	35	80
55CP	0.6	1.0	22	25	31	1.7	2.9	25	65
55DL	0.6	1.0	-	-	-	-	-	30	75
55DP	0.3	0.6	-	-	-	-	-	23	61
155CL	0.7	1.2	24	28	34	1.8	3.0	30	75
155(C)P	0.6	1.0	19	22	27	1.7	2.9	25	60
155DL	0.3	0.6	-	-	-	-	-	20	48
155DP	0.3	0.6	-	-	-	-	-	16	38
56CL	0.7	1.2	23	27	33	1.5	3.0	40	75
56CP	0.6	1.1	21	25	30	1.5	3.0	20	35
56(C)L	0.6	1.1	21	25	30	-	-	35	70
56(C)P	0.6	1.0	19	22	27	-	-	20	35
56DL	0.6	1.0	-	-	-	-	-	35	70
56DP	0.5	0.9	-	-	-	-	-	20	35
58DL	0.6	1.0	-	-	-	-	-	30	75
57EL	0.1	0.2	-	-	-	-	-	20	35
57CP	0.6	1.1	23	27	33	1.8	3.0	20	60
58DP	0.3	0.6	-	-	-	-	-	19	56
46CL	0.6	1.1	24	28	34	-	-	45	80
46DL	0.3	0.6	-	-	-	-	-	29	51
46EL	0.2	0.4	-	-	-	-	-	18	33
46CP	0.5	0.9	17	20	24	-	-	36	64
46DP	0.3	0.6	-	-	-	-	-	23	41
46EP	0.1	0.2	-	-	-	-	-	15	26

APPENDIX C (continued)

Soil mapping unit	Lespe- deza		Oats			Alfalfa		Pasture	
	a.	b.	a.	b.	c.	a.	b.	a.	b.
	Tons Hay		Bushels			Tons Hay		Cow-acre-days	
<u>Soil Response Group Seven:</u>									
54(C) T	0.1	0.2	-	-	-	-	-	10	30
45DT	0.1	0.2	-	-	-	-	-	10	30
87	0.1	0.2	-	-	-	-	-	10	30
77	0.1	0.2	-	-	-	-	-	10	30

NOTE: Yields per acre were estimated assuming adequate drainage and no flooding. The above yields may be converted to conditions of poor drainage and flooding by calculating a factor on a specific site for crop damage over a long period of time, (failure). This factor would be multiplied by the above yields to obtain yields under flooding or inadequate drainage. The following inputs were used in estimating yields for the various soil response groups.

Lespedeza: Soil response groups one, two, three, four, five, and seven; in tons dry matter per acre.

a. no fertilizer added.

b. 20# P₂O₅, 20# K₂O.

Oats: Soil response groups one, two, three, four, five; bushels per acre.

a. split application: 30# N, 30# P₂O₅, 30# K₂O.

b. 30# N, 60# P₂O₅, 40# K₂O.

c. split application: 60# N, 60# P₂O₅, 40# K₂O.

Alfalfa: Soil response groups one, three, and four; in tons of hay per acre.

a. no fertilizer added.

b. establishment: 15#N, 120# P₂O₅, 120# K₂O.

maintenance: 45# P₂O₅, 150# K₂O.

Pasture: Soil response groups one through seven; in cow-acre-days per acre.

a. no fertilizer added.

b. establishment: 800# 6-12-12.

maintenance: 400# 6-12-12.

Yields were rounded to the nearest units as follows: Lespedeza - 0.1 ton; Oats - 1 bu.; Alfalfa - 0.1 ton; Pasture - 1 cow-acre-day.

APPENDIX D

Classification by inventory groups in acres of the soil management groups of Henderson County

Soil manage- ment group	Total acres	Acres for agri- culture	Crop- land	Pasture	Forest	Total other land	Unvail- able other land	Avail- able other land
1	1,120	1,090	710	30	50	300	50	250
2	11,620	11,300	7,250	360	540	3,150	530	2,620
3	17,310	16,840	10,620	900	2,130	3,190	540	2,650
4	28,100	27,340	17,240	1,460	3,460	5,180	880	4,300
5	32,420	31,540	2,200	0	25,420	3,420	580	2,840
6	8,240	8,020	5,870	890	190	1,070	180	890
7	11,170	10,870	7,580	690	1,500	1,100	190	910
8	7,500	7,300	3,510	720	2,320	750	130	620
9	250	240	30	10	180	20	0	20
10	15,540	15,120	1,850	340	11,330	1,600	270	1,330
11	660	650	540	30	0	80	10	70
12	4,580	4,460	2,500	0	1,960	0	0	0
13	13,840	13,470	4,680	760	1,870	6,160	1,050	5,110
14	410	400	140	20	60	180	30	150
15	170	160	30	0	50	80	10	70
16	22,170	21,570	3,910	570	6,570	10,520	1,790	8,730
17	230	220	10	0	170	40	10	30
18	6,160	6,000	340	0	4,660	1,000	170	830
19	520	510	0	0	0	510	510	0
20	2,070	2,020	860	580	490	90	20	70
21	780	760	170	0	100	490	80	410
22	1,240	1,200	270	0	160	770	130	640
23	630	610	20	10	530	50	10	40
24	5,840	5,680	180	50	4,980	470	80	390
25	3,890	3,780	120	30	3,310	320	50	270
26	27,200	26,490	820	240	23,200	2,230	370	1,860
27	1,710	1,660	90	20	1,150	400	70	330
28	660	640	30	10	440	160	30	130
29	1,560	1,520	80	20	1,050	370	60	310
30	24,290	23,630	1,230	260	16,350	5,790	980	4,810
31	13,440	13,070	680	140	9,050	3,210	530	2,680
32	15,090	14,690	980	480	6,320	6,910	1,170	5,740
33	2,090	2,040	140	70	870	960	160	800
34	46,440	45,180	360	320	15,570	28,530	4,850	23,680
35	640	630	30	10	430	160	30	130
Total:	329,580	320,700	75,070	9,020	147,360	89,260	15,550	73,710

NOTE: All data are rounded to the nearest 10 acres.

APPENDIX E

Average weighted yields per acre for cotton and corn under several inputs of fertilizer by soil management group

Soil management group	Cotton						Corn		
	No Flooding			Flooding					
	a.	b.	c.	a.	b.	c.	a.	b.	c.
	Lbs. Lint						Bushels		
1	490	680	740	360	500	540	48	77	91
2	490	680	740	360	500	540	48	77	91
3	470	650	710	350	480	520	45	72	85
4	470	650	710	350	480	520	45	72	85
5	400	550	590	290	410	440	34	54	64
6	380	530	610	-	-	-	37	62	70
7	360	500	570	-	-	-	31	51	58
8	330	460	520	-	-	-	24	40	46
9	-	-	-	-	-	-	-	-	-
10	330	470	530	-	-	-	26	43	49
11	290	410	470	-	-	-	18	30	33
12	320	450	510	-	-	-	18	30	33
13	290	400	460	-	-	-	20	33	37
14	290	400	460	-	-	-	20	33	37
15	-	-	-	-	-	-	-	-	-
16	290	400	460	-	-	-	19	31	35
17	-	-	-	-	-	-	-	-	-
18	280	360	420	-	-	-	16	27	32
19	-	-	-	-	-	-	-	-	-
20	280	390	280	-	-	-	16	26	29
21	250	360	400	-	-	-	20	34	38
22	-	-	-	-	-	-	-	-	-
23	240	340	380	-	-	-	17	28	32
24	-	-	-	-	-	-	-	-	-
25	-	-	-	-	-	-	-	-	-
26	-	-	-	-	-	-	-	-	-
27	260	330	380	-	-	-	15	25	30
28	210	270	320	-	-	-	12	19	23
29	-	-	-	-	-	-	-	-	-
30	-	-	-	-	-	-	-	-	-
31	-	-	-	-	-	-	-	-	-
32	-	-	-	-	-	-	-	-	-
33	-	-	-	-	-	-	-	-	-
34	-	-	-	-	-	-	-	-	-
35	-	-	-	-	-	-	-	-	-

NOTE: The following inputs of fertilizer were used:

APPENDIX E (continued)

Cotton: soil management groups 1-5

- a. 20# N, 25# P_2O_5 , 25# K_2O .
- b. 70# N, 35# P_2O_5 , 35# K_2O .
- c. 100# N, 50# P_2O_5 , 50# K_2O .

Cotton: soil management groups 6-35

- a. 20# N, 25# P_2O_5 , 25# K_2O .
- b. 50# N, 35# P_2O_5 , 35# K_2O .
- c. 75# N, 50# P_2O_5 , 50# K_2O .

Corn: soil management groups 1-5

- a. 15# N, 25# P_2O_5 , 25# K_2O .
- b. 70# N, 32# P_2O_5 , 32# K_2O .
- c. 120# N, 40# P_2O_5 , 40# K_2O .

Corn: soil management groups 6-35

- a. 15# N, 25# P_2O_5 , 25# K_2O .
- b. 35# N, 30# P_2O_5 , 30# K_2O .
- c. 60# N, 40# P_2O_5 , 40# K_2O .

Yields were rounded to the nearest units as follows: cotton - 10 lbs. lint; corn - 1 bu.

APPENDIX F

Average weighted yields per acre of soybeans, lespedeza and
oats under several inputs of fertilizer by soil
management group

Soil management group	Soybeans		Lespedeza		Oats		
	a.	b.	a.	b.	a.	b.	c.
	Bushels		Tons Hay		Bushels		
1	22	40	1.3	2.0	-	-	-
2	22	40	1.3	2.0	42	49	58
3	18	38	1.2	1.9	-	-	-
4	18	38	1.2	1.9	39	46	54
5	10	30	-	-	-	-	-
6	18	37	0.9	1.7	38	43	54
7	14	29	1.0	1.5	34	38	48
8	13	26	0.9	1.3	28	31	39
9	14	28	0.6	1.3	26	29	37
10	14	28	0.6	1.3	26	29	37
11	12	26	0.9	1.2	26	30	38
12	14	28	0.9	1.4	27	31	39
13	10	20	0.8	1.2	24	27	34
14	-	-	0.8	1.2	24	27	34
15	11	21	0.6	1.1	23	26	32
16	11	21	0.6	1.1	23	26	32
17	9	19	0.6	1.1	23	26	31
18	9	19	0.6	1.1	23	26	31
19	-	-	-	-	-	-	-
20	10	25	0.9	1.2	23	26	32
21	-	-	0.7	1.0	19	21	27
22	-	-	0.7	1.0	19	21	27
23	10	19	0.5	1.0	22	25	31
24	-	-	0.3	0.6	-	-	-
25	-	-	0.4	0.9	16	18	22
26	-	-	0.4	0.8	14	16	20
27	-	-	0.6	1.0	19	22	27
28	8	18	0.6	1.1	21	25	30
29	-	-	0.6	0.9	17	20	25
30	-	-	0.6	1.0	-	-	-
31	-	-	0.3	0.6	-	-	-
32	-	-	0.4	0.7	-	-	-
33	-	-	0.2	0.4	-	-	-
34	-	-	0.1	0.2	-	-	-
35	-	-	0.1	0.2	-	-	-

NOTE: The following inputs of fertilizer were used:

APPENDIX F (continued)

Soybeans: soil management groups 1-35

a. no fertilizer added.

b. 200 lbs. 0-20-20.

Lespedeza: soil management groups 1-35

a. no fertilizer added.

b. 20 lbs. P_2O_5 ; 20 lbs. K_2O .

Oats: soil management groups 1-35

a. split: 30# N, 30# P_2O_5 , 30# K_2O

b. 30#N, 60# P_2O_5 , 40# K_2O

c. split: 60# N, 60# P_2O_5 , 40# K_2O

The yields were rounded to the nearest units as follows:
soybeans - 1 bu.; lespedeza - 0.1 ton; oats - 1 bu.

APPENDIX G

Average weighted yields per acre of alfalfa and pasture
under several inputs of fertilizer by soil manage-
ment group

Soil management group	Alfalfa		Pasture	
	a.	b.	a.	b.
	Tons Hay		Cow-acre-days	
1	-	-	70	135
2	2.0	3.9	70	135
3	-	-	70	125
4	-	-	70	125
5	-	-	55	130
6	2.7	3.7	70	125
7	-	-	60	105
8	-	-	45	80
9	-	-	45	100
10	2.3	3.3	45	100
11	-	-	40	75
12	-	-	45	90
13	-	-	20	45
14	-	-	20	45
15	-	-	25	55
16	2.3	3.2	25	55
17	-	-	30	70
18	1.7	2.9	30	70
19	-	-	-	-
20	-	-	25	70
21	-	-	20	40
22	-	-	20	40
23	2.1	3.0	25	75
24	-	-	25	75
25	1.6	2.4	25	75
26	-	-	25	75
27	1.7	2.9	25	60
28	1.5	3.0	25	60
29	-	-	25	60
30	-	-	25	60
31	-	-	25	60
32	-	-	20	50
33	-	-	20	50
34	-	-	10	30
35	-	-	20	30

NOTE: The following inputs of fertilizer were used:

APPENDIX G (continued)

Alfalfa: soil management groups 1-35

a. no fertilizer added.

b. establishment: 15#N, 120# P_2O_5 , 120# K_2O .
maintenance: 45# P_2O_5 , 150# K_2O .

Pasture: soil management groups 1-35.

a. no fertilizer added.

b. establishment: 800 lbs. 6-12-12
maintenance: 100 lbs. 6-12-12

Yields were rounded to the nearest units as follows:

Alfalfa - 0.1 ton; pasture - 5 cow-acre-days.

APPENDIX H

Distribution in acres of major crops on soil management groups
in alternate aggregate model A

Soil management group	Crop- land	Row- crop	Cotton	Corn	Soy- beans	Lespe- deza	Oats	Alfal- fa	Past- ure
1	710	710	710	0	0	0	0	0	30
2	7,250	7,250	7,250	0	0	0	0	0	360
3	10,620	10,620	6,350	4,270	0	0	0	0	900
4	17,240	17,240	0	17,240	0	0	0	0	1,460
5	2,200	2,200	0	2,200	0	0	0	0	0
6	5,870	2,940	0	2,940	0	0	2,100	830	890
7	7,580	3,790	0	3,790	0	540	3,250	0	690
8	3,510	1,160	0	1,160	0	2,350	0	0	720
9	30	10	0	0	10	20	0	0	10
10	1,850	610	0	610	0	1,240	0	0	340
11	540	140	0	0	140	400	0	0	30
12	2,500	620	0	0	620	1,880	0	0	0
13	4,680	800	0	790	10	3,880	0	0	760
14	140	20	0	20	0	120	0	0	20
15	30	10	0	0	10	20	0	0	0
16	3,910	660	0	0	660	3,250	0	0	570
17	10	0	0	0	0	10	0	0	0
18	340	60	0	0	60	280	0	0	0
19	0	0	0	0	0	0	0	0	0
20	860	150	0	0	150	710	0	0	580
21	170	0	0	0	0	170	0	0	0
22	270	0	0	0	0	270	0	0	0
23	20	0	0	0	0	20	0	0	10
24	180	0	0	0	0	180	0	0	50
25	120	0	0	0	0	120	0	0	30
26	820	0	0	0	0	820	0	0	240
27	90	0	0	0	0	90	0	0	20
28	30	0	0	0	0	30	0	0	10
29	80	0	0	0	0	80	0	0	20
30	1,230	0	0	0	0	1,230	0	0	260
31	680	0	0	0	0	680	0	0	140
32	980	0	0	0	0	980	0	0	480
33	140	0	0	0	0	140	0	0	70
34	360	0	0	0	0	360	0	0	320
35	30	0	0	0	0	30	0	0	10
Totals	75,070	48,990	14,310	33,020	1,660	19,900	5,350	830	9,020

NOTE: All data are rounded to the nearest 10 acres.

APPENDIX I

Distribution in acres of major crops on soil management groups
in alternate aggregate model B

Soil management group	Crop- land	Row- crop	Cotton	Corn	Soy- beans	Lespe- deza	Oats	Alfal- fa	Past- ure
1	740	740	740	0	0	0	0	0	0
2	7,610	7,610	7,610	0	0	0	0	0	0
3	11,520	11,520	7,190	4,330	0	0	0	0	0
4		18,700	18,700	18,700	0	0	0	0	0
5	2,200	2,200	0	2,200	0	0	0	0	0
6	6,760	3,380	0	3,380	0	0	2,760	620	0
7	8,270	4,140	0	4,140	0	2,840	1,290	0	0
8	4,230	1,400	0	1,400	0	2,830	0	0	0
9	40	10	0	0	10	30	0	0	0
10	2,190	720	0	720	0	1,470	0	0	0
11	570	140	0	0	140	430	0	0	0
12	2,500	620	0	0	620	1,880	0	0	0
13	5,440	920	0	920	0	4,520	0	0	0
14	160	30	0	30	0	130	0	0	0
15	30	10	0	0	10	20	0	0	0
16	4,480	760	0	30	730	860	0	0	2,860
17	10	0	0	0	0	0	0	0	10
18	340	60	0	0	60	0	0	0	280
19	0	0	0	0	0	0	0	0	0
20	1,440	240	0	0	240	0	0	0	1,200
21	170	0	0	0	0	0	0	0	170
22	270	0	0	0	0	0	0	0	270
23	30	0	0	0	0	0	0	0	30
24	230	0	0	0	0	0	0	0	230
25	150	0	0	0	0	0	0	0	150
26	1,060	0	0	0	0	0	0	0	1,060
27	110	0	0	0	0	0	0	0	110
28	40	0	0	0	0	0	0	0	40
29	100	0	0	0	0	0	0	0	100
30	1,490	0	0	0	0	0	0	0	1,490
31	820	0	0	0	0	0	0	0	820
32	1,460	0	0	0	0	0	0	0	1,460
33	210	0	0	0	0	0	0	0	210
34	680	0	0	0	0	0	0	0	680
35	40	0	0	0	0	0	0	0	40
Totals:	84,090	53,200	15,540	35,850	1,810	15,010	4,050	620	11,210

NOTE: Supra. Appendix H.

APPENDIX J

Distribution in acres of major crops on soil management groups in alternate aggregate model C

Soil management group	Crop-land	Row-crop	Cotton	Corn	Soy-beans	Lespe-deza	Oats	Alfal-fa	Past-ure
1	790	790	790	0	0	0	0	0	0
2	8,150	8,150	8,150	0	0	0	0	0	0
3	13,650	13,650	9,060	4,590	0	0	0	0	0
4	22,160	22,160	0	22,160	0	0	0	0	0
5	2,200	2,200	0	2,200	0	0	0	0	0
6	6,950	3,480	0	3,480	0	0	710	2,760	0
7	9,770	4,880	0	4,880	0	0	4,890	0	0
8	6,550	2,180	0	2,180	0	0	4,370	0	0
9	220	70	0	0	70	0	150	0	0
10	13,520	4,510	0	4,510	0	4,400	4,610	0	0
11	570	140	0	140	0	430	0	0	0
12	4,460	1,120	0	80	1,040	0	3,340	0	0
13	7,310	1,220	0	1,220	0	6,090	0	0	0
14	220	40	0	40	0	180	0	0	0
15	80	10	0	0	10	70	0	0	0
16	11,050	1,840	0	1,840	0	9,210	0	0	0
17	180	30	0	0	30	150	0	0	0
18	5,000	830	0	0	830	4,170	0	0	0
19	0	0	0	0	0	0	0	0	0
20	1,930	320	0	0	320	1,610	0	0	0
21	270	0	0	0	0	270	0	0	0
22	430	0	0	0	0	430	0	0	0
23	560	0	0	0	0	560	0	0	0
24	5,210	0	0	0	0	5,210	0	0	0
25	3,460	0	0	0	0	3,460	0	0	0
26	24,260	0	0	0	0	24,260	0	0	0
27	1,260	0	0	0	0	1,260	0	0	0
28	480	0	0	0	0	480	0	0	0
29	1,150	0	0	0	0	1,150	0	0	0
30	17,840	0	0	0	0	3,630	0	0	14,210
31	9,870	0	0	0	0	0	0	0	9,870
32	7,780	0	0	0	0	0	0	0	7,780
33	1,080	0	0	0	0	0	0	0	1,080
34	16,650	0	0	0	0	0	0	0	16,650
35	470	0	0	0	0	0	0	0	470
Totals:	205,530	67,620	18,000	47,320	2,300	67,020	18,070	2,760	50,060

NOTE: Supra. Appendix H.

APPENDIX K

Distribution in acres of major crops on soil management groups
in alternate aggregate model D

Soil management group	Crop- land	Row- crop	Cotton	Corn	Soy- beans	Lespe- deza	Oats	Alfal- fa	Past- ure
1	1,040	1,040	1,040	0	0	0	0	0	0
2	10,770	10,770	10,770	0	0	0	0	0	0
3	16,300	16,300	6,190	10,110	0	0	0	0	0
4	26,460	26,460	0	26,460	0	0	0	0	0
5	2,200	2,200	0	2,200	0	0	0	0	0
6	7,840	3,920	0	3,920	0	0	20	3,900	0
7	10,680	5,340	0	5,340	0	0	5,340	0	0
8	7,170	2,390	0	2,390	0	0	4,780	0	0
9	240	80	0	0	80	0	160	0	0
10	14,850	4,950	0	4,950	0	0	9,900	0	0
11	640	160	0	0	160	0	480	0	0
12	4,460	1,120	0	0	1,120	0	3,340	0	0
13	12,420	2,070	0	2,070	0	8,840	1,510	0	0
14	370	60	0	60	0	310	0	0	0
15	150	20	0	0	20	130	0	0	0
16	19,780	3,300	0	3,250	50	16,480	0	0	0
17	210	40	0	0	40	170	0	0	0
18	5,830	970	0	0	970	4,860	0	0	0
19	0	0	0	0	0	0	0	0	0
20	2,000	330	0	0	330	1,670	0	0	0
21	680	0	0	0	0	680	0	0	0
22	1,070	0	0	0	0	1,070	0	0	0
23	600	0	0	0	0	600	0	0	0
24	5,600	0	0	0	0	5,600	0	0	0
25	3,730	0	0	0	0	3,730	0	0	0
26	26,120	0	0	0	0	26,120	0	0	0
27	1,590	0	0	0	0	1,590	0	0	0
28	610	0	0	0	0	610	0	0	0
29	1,460	0	0	0	0	1,460	0	0	0
30	22,650	0	0	0	0	20,790	0	0	1,860
31	12,550	0	0	0	0	0	0	0	12,550
32	13,520	0	0	0	0	0	0	0	13,520
33	1,880	0	0	0	0	0	0	0	1,880
34	40,330	0	0	0	0	0	0	0	40,330
35	600	0	0	0	0	0	0	0	600
Totals:	276,400	81,520	18,000	60,750	2,770	94,710	25,530	3,900	70,740

NOTE: Supra. Appendix H.

APPENDIX L

Distribution in acres of major crops on soil management groups in alternate aggregate model E

Soil management group	Crop-land	Row-crop	Cotton	Corn	Soy-beans	Lespe-deza	Oats	Alfal-fa	Past-ure	For-est
1	1,040	1,040	1,040	0	0	0	0	0	0	0
2	10,770	10,770	10,770	0	0	0	0	0	0	0
3	16,300	16,300	6,190	10,110	0	0	0	0	0	0
4	26,460	26,460	0	26,460	0	0	0	0	0	0
5	30,960	2,200	0	2,200	0	0	0	0	0	28,760
6	7,840	3,920	0	3,920	0	0	2,680	1,240	0	0
7	10,680	5,340	0	5,340	0	0	5,340	0	0	0
8	7,170	2,390	0	2,390	0	4,690	0	0	0	0
9	240	80	0	0	80	160	0	0	0	0
10	14,850	4,950	0	4,950	0	9,900	0	0	0	0
11	640	160	0	0	160	480	0	0	0	0
12	4,460	1,120	0	0	1,120	3,340	0	0	0	0
13	12,420	2,070	0	2,070	0	10,350	0	0	0	0
14	370	60	0	60	0	310	0	0	0	0
15	150	20	0	0	20	0	0	0	130	0
16	19,780	3,300	0	3,250	50	0	0	0	16,480	0
17	210	40	0	0	40	0	0	0	170	0
18	5,830	970	0	0	970	0	0	0	4,860	0
19	0	0	0	0	0	0	0	0	0	0
20	2,000	330	0	0	330	850	0	0	820	0
21	680	0	0	0	0	0	0	0	0	680
22	1,070	0	0	0	0	0	0	0	0	1,070
23	600	0	0	0	0	0	0	0	0	600
24	5,600	0	0	0	0	0	0	0	0	5,600
25	3,730	0	0	0	0	0	0	0	0	3,730
26	26,120	0	0	0	0	0	0	0	0	26,120
27	1,590	0	0	0	0	0	0	0	0	1,590
28	610	0	0	0	0	0	0	0	0	610
29	1,460	0	0	0	0	0	0	0	0	1,460
30	22,650	0	0	0	0	0	0	0	0	22,650
31	12,550	0	0	0	0	0	0	0	0	12,550
32	13,520	0	0	0	0	0	0	0	0	13,520
33	1,880	0	0	0	0	0	0	0	0	1,880
34	40,330	0	0	0	0	0	0	0	0	40,330
35	600	0	0	0	0	0	0	0	0	600
Totals:	305,160	81,520	18,000	60,750	2,770	30,080	8,110	1,240	22,460	161,750

NOTE: Supra. Appendix H.

APPENDIX M

Land use by inventory grouping in acres of the
soils on representative farm one 1958

Area	Soil management group	Soil mapping unit	Total acres	Crop- land	Pasture	Forest	Other land	Available other land
1	7	153BN	23.5	21.0	0.0	1.0	1.5	0.0
2	13	153CP	9.0	1.4	6.6	0.0	1.0	0.0
3	4	6B	1.0	0.0	0.0	1.6	0.0	0.0
4	4	6B	1.0	0.0	0.0	1.0	0.0	0.0
5	12	62HL	8.0	7.0	0.0	0.0	1.0	0.0
6	34	153(C)T	4.0	0.0	0.0	0.1	3.9	3.0
7	13	153CP	1.5	0.0	0.0	1.5	0.0	0.0
8	4	6B	5.0	0.0	0.0	5.0	0.0	0.0
9	14	153(C)P	5.2	0.0	0.8	4.4	0.0	0.0
Totals:			58.2	29.4	7.4	14.0	7.4	3.0

NOTE: All data are rounded to the nearest 0.1 acres.

APPENDIX N

Land use by inventory grouping in acres of the soils on
representative farm two 1958

Area	Soil management group	Soil mapping unit	Total acres	Crop- land	Pasture	Forest	Other land	Available other land
1	34	55DT	3.0	0.0	3.0	0.0	0.0	0.0
2	16	54CP	13.0	12.0	0.0	0.0	1.0	0.0
3	30	56DL	12.0	0.0	2.5	9.5	0.0	0.0
4	34	56DT	2.5	0.0	0.0	2.5	0.0	0.0
5	30	55DL	2.0	2.0	0.0	0.0	0.0	0.0
6	30	56DL	8.0	0.0	0.0	8.0	0.0	0.0
7	34	56DT	16.0	0.0	16.0	0.0	0.0	0.0
8	10	54CL	0.5	0.5	0.0	0.0	0.0	0.0
9	16	54CP	3.0	3.0	0.0	0.0	0.0	0.0
10	30	56DL	5.0	0.0	0.0	0.0	0.0	0.0
11	2	4B	3.5	2.0	0.0	1.5	0.0	0.0
12	23	54(C)P	15.0	12.5	0.0	0.0	2.5	0.0
13	34	56DT	6.0	0.0	0.0	6.0	0.0	0.0
14	3	6A	9.0	6.0	0.0	0.0	3.0	2.0
15	34	56DT	8.5	0.0	1.5	1.0	6.0	6.0
16	30	56DL	1.0	1.0	0.0	0.0	0.0	0.0
17	30	55DL	1.5	1.5	0.0	0.0	0.0	0.0
18	3	6A	32.0	25.5	0.0	2.5	4.0	2.0
19	6	24EN	4.0	4.0	0.0	0.0	0.0	0.0
20	2	4B	3.5	3.0	0.0	0.0	0.5	0.0
Totals:			149.0	73.0	23.0	36.0	17.0	10.0

NOTE: Supra. Appendix M.

APPENDIX O

Land use by inventory grouping in acres of the soils on
representative farm three 1958

Area	Soil management group	Soil mapping unit	Total acres	Crop- land	Pasture	Forest	Other land	Available other land
1	30	56DL	13.0	0.0	0.0	12.0	1.0	0.0
2	29	56(C)P	4.0	4.0	0.0	0.0	0.0	0.0
3	30	56DP	1.0	0.0	0.0	1.0	0.0	0.0
4	13	153CP	12.0	8.0	0.0	1.0	3.0	2.0
5	30	56DP	11.0	0.0	0.0	11.0	0.0	0.0
6	5	8B	8.0	5.0	0.0	1.0	2.0	1.0
7	30	56DP	3.0	0.0	0.0	3.0	0.0	0.0
8	14	153(C)P	9.0	8.0	0.0	0.0	1.0	0.0
9	34	87	2.0	0.0	2.0	0.0	0.0	0.0
10	14	153(C)P	3.5	3.5	0.0	0.0	0.0	0.0
11	34	60(C)T	12.0	0.0	12.0	0.0	0.0	0.0
12	7	153BN	3.5	3.5	0.0	0.0	0.0	0.0
13	34	153CT	2.0	0.0	0.0	2.0	0.0	0.0
14	34	60DT	1.0	0.0	0.0	1.0	0.0	0.0
15	34	60DT	2.0	0.0	0.0	0.0	2.0	1.0
16	4	6B	18.0	16.0	0.0	0.0	2.0	1.0
17	34	60(C)T	11.0	0.0	2.0	9.0	0.0	0.0
18	8	153CL	1.0	0.0	0.0	1.0	0.0	0.0
19	30	2	2.0	2.0	0.0	0.0	0.0	0.0
Totals:			119.0	50.0	16.0	42.0	11.0	5.0

NOTE: Supra. Appendix M.

APPENDIX P

Land use by inventory grouping in acres of the soils
on representative farm from 1958

Acres	Soil management group	Soil mapping unit	Total Acres	Crop- land	Pasture	Forest	Other land	Available other land
1	5	8A	15.0	0.0	0.0	13.0	2.0	0.0
2	5	8A	24.0	0.0	7.0	7.0	10.0	9.0
3	2	5B	1.0	0.0	1.0	0.0	0.0	0.0
4	16	44CP	4.0	4.0	0.0	0.0	0.0	0.0
5	26	45DP	12.0	10.5	0.0	0.0	1.5	0.0
6	10	44BN	23.5	20.5	0.0	0.0	3.5	0.0
7	26	45DL	20.0	0.0	0.0	20.0	0.0	0.0
8	2	5B	2.0	2.0	0.0	0.0	0.0	0.0
9	4	7B	4.0	4.0	0.0	0.0	0.0	0.0
10	26	45DP	5.0	0.0	0.0	0.0	5.0	5.0
11	34	77	1.0	0.0	0.0	1.0	0.0	0.0
12	24	46DL	4.0	0.0	0.0	4.0	0.0	0.0
13	34	45DT	3.0	0.0	0.0	3.0	0.0	0.0
14	16	44CP	1.0	0.0	0.0	0.0	1.0	1.0
15	34	45DT	1.5	0.0	0.0	1.0	0.5	0.5
Totals:			120.5	41.0	8.0	49.0	22.5	15.5

NOTE: Supra. Appendix M.

APPENDIX Q

Land use by inventory grouping in acres of the soils
on representative farm five 1958

Acres	Soil management group	Soil mapping unit	Total Acres	Crop- land	Pasture	Forest	Other land	Available other land
1	25	45(C)P	1.5	1.5	0.0	0.0	0.0	0.0
2	2	5B	4.0	3.0	0.0	0.0	1.0	0.5
3	13	23CP	2.5	2.0	0.0	0.0	0.5	0.0
4	34	45DT	3.0	0.0	1.0	2.0	0.0	0.0
5	34	44CT	4.0	0.0	2.0	2.0	0.0	0.0
6	34	45DT	7.0	0.0	3.0	4.0	0.0	0.0
7	7	23HN	3.0	3.0	0.0	0.0	0.0	0.0
8	26	45DL	2.5	0.0	0.0	2.5	0.0	0.0
9	3	6A	6.5	4.5	0.0	2.0	0.0	0.0
10	5	8A	42.0	0.0	1.5	38.0	2.5	1.5
11	10	44CL	0.5	0.0	0.5	0.0	0.0	0.0
12	26	45DP	4.0	0.0	2.0	2.0	0.0	0.0
13	25	45(C)P	4.0	3.0	0.0	1.0	0.0	0.0
14	26	45DL	1.5	0.0	0.0	1.5	0.0	0.0
Totals:			86.0	17.0	10.0	55.0	4.0	2.5

NOTE: Supra. Appendix M.

CRANESHOT CREST APPENDIX R

Distribution of major crops in acres on areas in
alternate model A on representative farm two

Area	Crop- land	Row- crop	Cotton	Corn	Soy- beans	Lespedeza	Oats	Pasture	Alfalfa
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0	0.0
2	12.0	2.0	0.0	2.0	0.0	4.0	6.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.5	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	2.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.0	0.0
8	0.5	0.2	0.0	0.2	0.0	0.0	0.3	0.0	0.0
9	3.0	0.5	0.0	0.5	0.0	2.5	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11	2.0	2.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0
12	12.5	0.0	0.0	0.0	0.0	12.5	0.0	0.0	0.0
13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14	6.0	6.0	2.0	1.9	2.1	0.0	0.0	0.0	0.0
15	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5	0.0
16	1.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0
17	1.5	0.0	0.0	0.0	0.0	1.5	0.0	0.0	0.0
18	25.5	25.5	0.0	25.5	0.0	0.0	0.0	0.0	0.0
19	4.0	2.0	0.0	2.0	0.0	0.0	1.2	0.0	0.8
20	3.0	3.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	73.0	41.2	7.0	32.1	2.1	23.5	7.5	23.0	0.8

NOTE: Supra. Appendix M.

APPENDIX S

Distribution of major crops in acres on areas in
alternate model B on representative farm two

Area	Crop- land	Row- crop	Cotton	Corn	Soy- beans	Lespedeza	Oats	Alfalfa	Pasture
1	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0
2	12.0	2.0	0.0	2.0	0.0	7.8	2.2	0.0	0.0
3	2.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.5
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0
6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	16.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.0
8	0.5	0.2	0.0	0.2	0.0	0.3	0.0	0.0	0.0
9	3.0	0.5	0.0	0.5	0.0	1.8	0.0	0.0	0.7
10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11	2.0	2.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0
12	12.5	0.0	0.0	0.0	0.0	2.0	0.0	0.0	10.5
13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14	6.0	6.0	2.0	1.9	2.1	0.0	0.0	0.0	0.0
15	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5
16	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0
17	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5
18	25.5	25.5	0.0	25.5	0.0	0.0	0.0	0.0	0.0
19	4.0	2.0	0.0	2.0	0.0	0.0	1.6	0.4	0.0
20	3.0	3.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	96.0	41.2	7.0	32.1	2.1	11.9	3.8	0.4	38.7

NOTE: Supra. Appendix M.

APPENDIX T

Distribution of major crops in acres on areas in
alternate model C on representative farm two

Area	Crop- land	Row- Crop	Cotton	Corn	Soy- beans	Lespedeza	Oats	Alfalfa	Pasture
1	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0
2	12.0	2.0	0.0	2.0	0.0	5.4	4.6	0.0	0.0
3	12.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.0
4	2.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.5
5	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0
6	8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.0
7	16.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.0
8	0.5	0.2	0.0	0.2	0.0	0.3	0.0	0.0	0.0
9	3.0	0.5	0.0	0.5	0.0	2.5	0.0	0.0	0.0
10	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.0
11	3.5	3.5	3.5	0.0	0.0	0.0	0.0	0.0	0.0
12	12.5	0.0	0.0	0.0	0.0	10.6	0.0	0.0	1.9
13	6.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.0
14	6.0	6.0	1.2	2.5	2.3	0.0	0.0	0.0	0.0
15	2.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.5
16	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0
17	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5
18	28.0	28.0	0.0	28.0	0.0	0.0	0.0	0.0	0.0
19	4.0	2.0	0.0	2.0	0.0	0.0	1.4	0.6	0.0
20	3.0	3.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	132.0	45.2	7.7	35.2	2.3	18.8	6.0	0.6	61.4

NOTE: Supra. Appendix M.

APPENDIX U

Distribution of major crops in acres on areas in
alternate model D on representative farm two

Area	Crop- land	Row- crop	Cotton	Corn	Soy- beans	Lespedeza	Oats	Alfalfa	Pasture
1	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0
2	12.0	2.0	0.0	2.0	0.0	4.9	5.1	0.0	0.0
3	12.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.0
4	2.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.5
5	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0
6	8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.0
7	16.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.0
8	0.5	0.2	0.0	0.2	0.0	0.3	0.0	0.0	0.0
9	3.0	0.5	0.0	0.5	0.0	2.5	0.0	0.0	0.0
10	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.0
11	3.5	3.5	3.5	0.0	0.0	0.0	0.0	0.0	0.0
12	12.5	0.0	0.0	0.0	0.0	12.4	0.0	0.0	0.1
13	6.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.0
14	8.0	8.0	1.9	3.6	2.5	0.0	0.0	0.0	0.0
15	8.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.5
16	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0
17	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5
18	30.0	30.0	0.0	30.0	0.0	0.0	0.0	0.0	0.0
19	4.0	2.0	0.0	2.0	0.0	0.0	1.3	0.7	0.0
20	3.0	3.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	142.0	49.2	8.4	38.3	2.5	20.1	6.4	0.7	65.6

NOTE: Supra. Appendix M.

APPENDIX V

Distribution of major crops in acres on areas in alternate
model E on representative farm two

Area	Crop- land	Row- crop	Cotton	Corn	Soy- beans	Lespe- deza	Oats	Alfal- fa	Pasture	Forest
1	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0
2	12.0	2.0	0.0	2.0	0.0	0.0	0.0	0.0	10.0	0.0
3	12.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.0
4	2.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.5
5	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0
6	8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.0
7	16.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.0
8	0.5	0.2	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0
9	3.0	0.5	0.0	0.5	0.0	2.0	0.0	0.0	0.5	0.0
10	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.0
11	3.5	3.5	3.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12	12.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.5
13	6.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.0
14	8.0	8.0	1.9	3.6	2.5	0.0	0.0	0.0	0.0	0.0
15	8.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.5
16	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0
17	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5
18	30.0	30.0	0.0	30.0	0.0	0.0	0.0	0.0	0.0	0.0
19	4.0	2.0	0.0	2.0	0.0	1.0	1.0	0.0	0.0	0.0
20	3.0	3.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	142.0	49.2	8.4	38.3	2.5	3.3	1.0	0.0	10.5	78.0

NOTE: Supra. Appendix M.



APPENDIX W

Calculated distribution in acres of cotton and corn on bottom and upland soils in alternate aggregate models

Model	Cotton		Corn	
	Bottomland	Upland	Bottomland	Upland
A	5,000	9,310	23,320	9,700
B	5,430	10,110	25,320	10,530
C	6,000	12,000	33,080	14,240
D	6,300	11,700	40,820	19,930
E	6,300	11,700	40,820	19,930

NOTE: All data are rounded to the nearest 10 acres.

APPENDIX X

Total production of major crops at several inputs of fertilizer in alternate aggregate models

(in thousands of units)

Model	Cotton											
	No flooding			Flooding			Corn			Soybeans		
	a.	b.	c.	a.	b.	c.	a.	b.	c.	a.	b.	
	Lbs. Lint						Bushels			Bushels		
A	6,844.9	9,540.3	10,398.9	5,088.1	7,028.0	7,600.0	1,329.0	2,142.5	2,508.0	20,040	40,500	
B	7,470.8	10,351.5	11,283.9	5,522.5	7,626.2	8,247.8	1,436.4	2,317.0	2,710.9	21,500	42,800	
C	8,638.8	11,968.2	13,048.2	6,389.4	8,818.8	9,538.8	1,792.4	2,896.3	3,380.7	26,670	55,700	
D	8,696.2	12,054.3	13,134.3	6,418.1	8,876.2	9,596.2	2,321.5	3,746.6	4,378.5	31,900	66,600	
E	8,696.2	12,054.3	13,134.3	6,418.1	8,876.2	9,596.2	2,321.5	3,746.6	4,378.5	31,900	66,600	

APPENDIX X (continued)

Model	Lespedeza		Oats		Alfalfa		Pasture	
	a.	b.	a.	b.	a.	b.	a.	b.
	Tons Hay		Bushels		Tons Hay		Cow-acre-days	
A	13,763	22,170	190.3	213.8	2.24	3.1	442.5	821.4
B	12,620	19,610	148.8	167.7	1.67	2.29	260.8	648.0
C	34,980	64,020	529.7	593.4	7.45	10.21	955.1	2,401.4
D	51,630	91,120	716.7	802.4	10.53	14.43	1,083.6	2,862.5
E	22,990	38,250	285.9	320.9	3.35	4.59	586.6	1,323.1

NOTE: Supra. Appendices E, F, and G.

APPENDIX Y

Total production of major crops at several inputs of fertilizer in alternate models on representative farm two

Model	Cotton						Soy-			Lespe-		Oats		Alfalfa		Pasture	
	No flooding			Flooding			beans			deza		b.		a. b.		a. b.	
	a.	b.	c.	a.	b.	c.	a.	b.	c.	a.	b.	a.	b.	a.	b.	a.	b.
A	3,390	4,700	5,120	2,500	3,460	3,740	1,360	2,183	2,566	38	80	12.8	24.2	191	216	268	2.2 3.0 298 765
B	3,390	4,700	5,120	2,500	3,460	3,740	1,360	2,183	2,566	38	80	6.9	13.0	111	126	157	1.1 1.5 660 1,861
C	3,749	5,200	5,662	2,760	3,826	4,134	1,499	2,406	2,830	41	87	10.2	19.7	159	180	223	1.6 2.2 1,085 2,812
D	4,078	5,655	6,139	3,005	4,162	4,498	1,639	2,629	3,093	45	95	10.8	20.9	167	188	233	1.9 2.6 1,100 2,898
E	4,078	5,655	6,139	3,005	4,162	4,498	1,639	2,629	3,093	45	95	2.3	4.3	38	43	54	0.0 0.0 262 578

NOTE: Supra. Appendices E, F, and G.

APPENDIX Z

Forestry Information - Henderson County, Tennessee

General:

Henderson County contains, according to 1954 data, 90,833 acres in woodlands. The woodlands are typical of West Tennessee, varying in size from small isolated tracts to several hundred acres. An estimated 21.11% are found on bottomland soils, and 78.89% on terrace and upland soils.

There is evidence that it will take time and sound management to bring these woodlands back into potential production. ^{4/} Past treatment has left these woodlands understocked, and damaged by fire and grazing have left their mark. The best trees have been cut, gradually leaving the stands depleted and resulting in low quality in the remaining stands. Approximately 17 to 20% of the stands have cull trees, and comparing grazing damage to that found on the Beech River Watershed - about 17% have grazing damage.

A wide range of species are found, in Henderson County woodlands; the hardwoods are comprised of White oak, Red oak, Post oak, Scarlet oak, Black oak, Yellow poplar, Red gum, Red maple, Beech, Hickory, Elm, Dogwood, Persimmon, and a number of other deciduous trees. A few native pine are found south of Lexington, and Shortleaf, Loblolly Pine, and Virginia have been planted. ^{3/}

Five forest types are found; namely,

- (1) Oak-beech-gum-poplar dominate on Ina-Beechy-Hyman soil association.
- (2) Oak-hickory-poplar dominate on Ruston-Lexington and Lexington-Ruston associations.
- (3) White oak-hickory-beech type on Shubuta-Cuthbert association.
- (4) Gum-oak-beech type on Dulac-Tippah-Cuthbert association.
- (5) Scrub oak-hickory-beech on the Ruston-Shubuta-Silerton association.

In general, the existing tree stocking ranges from fair, to poor, to good. Protection from fire has been greatly improved by the protection given the County through cooperation with the State Division of Forestry fire protection system. Grazing protection will be necessary to getting the existing stands and new plantings of trees into potential production. Permanent vegetation will aid in control and reducing of erosion losses.

Sound management by landowners with the help of conservation leaders, foresters, and others can put the county's woodlands into production which the land use indicates is possible. It is estimated that an annual growth of the following is possible with good stocking using proper woodland management principles: 1/

Bottomland sites -- 300 board feet per acre per year.
 Upland hardwoods -- 200 to 300 board feet per acre per year.
 Upland pines -- 150 to 300 board feet per acre per year.

Forestry practices such as selective cutting, marking (by forester) of merchantable trees to cut; weeding of damaged, undesirable, low quality, cull trees; interplanting to strengthen understocked stands; underplanting to desirable species; planting of pine where suitable and needed following up by doing release work -- these practices will put idle, unprofitable land to work again, or continue the good work already underway. Example of this work can be seen on numerous farms in the county, and on the Natchez State Park near Lexington.

Forest Soils in Henderson County. 2/

1. Bottomland soils:

<u>Soil series and type</u>	<u>Est. Acreage</u>	<u>Growth Evaluation *</u>	<u>Comments</u>
Beechy silt loam	16,626	A	Ash, Willow, Beech, Oak, Misc.
Beechy fine sandy loam	2,250	A	Bottomland species - Oaks, Gums.
Ina fine sandy loam	300	R	Cutover hardwoods.

2. Upland soils:

Cuthbert-Silerton soils, sloping phase.	562	S	Oak, Hickory, Beech.
steep phase.	9,000	A	Cutover hardwoods - oak, hickory, beech, dogwood, and persimmon. Low quality due to past treatment. Pine do well on this soil.
Dulac silt loam sloping, deep phase	140	A	In cutover hardwoods. Oak, hickory Tree growth-moderate rate.
Dulac-Cuthbert soils, moderately steep phase	1,376	A	Ridge slopes. Hardwoods-oak hickory, gum, sourwood, and beech. Have been overcut.
Dulac-Tippah silt loam, gently sloping phase	75	A	Upland oak type. Understocked. Found in isolated areas and small acreage tracts.
sloping phase	75	A	In cutover hardwoods. When cleared subject to erosion.

APPENDIX Z (continued)

<u>Soil series and type</u>	<u>Est. Acreage</u>	<u>Growth Evaluation *</u>	<u>Comments</u>
strongly sloping phase	500	R	Oak, hickory, dogwood, beech.
Moderately to severe gullied land, Cuthbert- Silerton material	2,000	S	Abandoned or in wild pasture. Suited to pines.
Moderately to severe gullied land, Lexington-Ruston	3,700	A	Suitable for pines. Protection from grazing and fire important.
Lexington silt loam, sloping, and strongly sloping phases	1,442	A	Well-drained; plant to pines; found in small inaccessible areas.
Lexington-Ruston soils, sloping phase, and strongly sloping phase	4,000	A to R	Upland oak type, depleted.
moderately, steep phase	27,200	A	Cutover hdws. Oak, poplar, hickory.
Providence silt loam, eroded, gently sloping phase	300	A	One-third in forest or idle land. Slow growth due to lack or pro- tection. Suited to pines.
sloping and strongly sloping phases	400	A	Narrow ridgetops. Cutover one or more times. Upland oak type. Should remain in trees.
Ruston fine sandy loam sloping and strongly sloping phases	2,000	A	Now in hickory-oak of low quality. Occurs in small tracts. If cleared is highly erodible.
moderately steep phase and steep phase	2,000	R	In cutover hardwoods, oak, poplar. On moderately steep phase.
Ruston sandy, clay loam, severely eroded phase	-----	R	Plant to pines. Erosion hazard.
Shubuta-Cuthbert loams, moderately steep to steep phases	5,000	A to R	Droughy, low fertility, Oak, beech, poplar. Percent slopes - 12 to 25.

APPENDIX Z (continued)

<u>Soil series and type</u>	<u>Est. Acreage</u>	<u>Growth Evaluation *</u>	<u>Comments</u>
Shubuta-Cuthbert sandy clays, severely eroded	2,349	A	Oak, hickory, beech.
Shubuta-Cuthbert-Silerton sloping and moderately phases	4,200	A	Found on ridge slopes. Cutover hardwoods of low quality. Underplant and release.
Shubuta-Ruston-Silerton sloping (mod. steep)	2,000	A to R	Oak, hickory, beech. Low quality. On narrow ridgetops.
Silerton silt loam sloping and strongly phases	2,700	A	Found on narrow ridgetops. 95% in woodland. Oak-beech-hickory.
Tippah silt loam, gently sloping shallow phase	90	A	In Upland oak type. 50% wooded.
Almo silt loam	518	S to A	One-fourth in cutover hardwoods.
Calloway silt loam	130	A	Fifty percent in woodlands.

* Estimated growth evaluation by soil series and types. Production possibilities may fall into following ranges:

S - slow. 100 to 150 board feet per acre/yr.
A - average. 150 to 250 board feet per acre/yr.
R - rapid. 250 to 300 plus board feet per acre/yr.

Sources of Assistance and Information:

- 2/ "Soil Survey Report, Henderson County". In process for printing.
- 1/ "Natchez Trace State Park". June 1950. Tenn. Dept. of Conservation*, Forestry Division and T.V.A. Division of Forestry Relations.
- 3/ "Forest Inventory Statistics for Beech River Watershed". Forestry Bulletin No. 64. TVA Div. of Forestry Relations.
- 4/ "Data for Planning Woodland Opportunities". (On West Tennessee Farms). Solon L. Barraclough and Alfred Pleasonton. Univ. of Tennessee in cooperation with Southern Forest Experiment Station, U.S.F.A. of USDA.

APPENDIX Z (continued)

"Financial Maturity: a guide to
profitable timber growing".

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