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To the Graduate Council:

I am submitting herewith a thesis written by David Mayo Pearson, Jr. entitled "Variations in Leasing Arrangements and Optimum Farm Organizations for Part-Time and Part-Retired Farmers in West Tennessee." 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 Agricultural Economics.

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VARIATIONS IN LEASING ARRANGEMENTS AND OPTIMUM FARM  
ORGANIZATIONS FOR PART-TIME AND PART-RETIRED  
FARMERS IN WEST TENNESSEE

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A Thesis  
Presented to  
the Graduate Council of  
The University of Tennessee

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

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by  
David Mayo Pearson, Jr.

June 1966



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## CHAPTER I

### NATURE OF THE STUDY

#### I. INTRODUCTION

The problems of farm managers, operators, and rural land owners have intensified because of rapid technological, economical, and sociological changes over the last twenty years. These changes have caused new risks and uncertainties and have placed a high premium on competent farm managers. Increased land values and large investments in machinery have placed a greater burden upon the small operator and hindered the entrance of young men into farming. The addition of many new industries to Tennessee has resulted in more part-time farming, increased absentee land ownership, and a shortage of labor for farm use. The industrial jobs and other more rewarding opportunities outside of agriculture have caused many young farm people to leave the farm. Thus there are many old people with farms and no one to operate them.

There are many small inefficient farms in Tennessee which result from an improper relationship between land owners, farm operators, and farm laborers. While many farmers need more land and young people are wanting to enter farming, part-time farmers are in need of labor, machines, and management; retired or semi-retired farmers need someone to operate



their farms; and absentee land owners need managers and/or laborers.

Many farmers have found it advantageous to sell or rent their farms and to engage in off-farm work. The overall objective of this study will be to determine the most profitable combination of resources and enterprises which will maximize net profit for owners of six representative farm situations in West Tennessee under various rental arrangements and two different labor supplies.

## II. STATEMENT OF THE PROBLEM

Farm operators in Tennessee have a choice between farming, not farming, or some combination of these two possibilities. Should the farmer sell out completely and work at a nonfarm job full time, or should he devote full time to farming and try to expand his farm operation? The land owner might buy, sell, rent in, and/or rent out land.

The first problem in this study is one of determining whether farmers with various resources and restrictions would benefit by working at off-farm jobs. The next problem consists of determining the most profitable combination of farm resources and enterprises. Also related to this second problem is the decision that must be made concerning the various types of rental arrangements and the various price levels that are possible in the acquisition and/or disposition of land.

By using average or representative farm situations in the two areas of West Tennessee that are to be considered, this study attempts



to outline the optimum farm operations for three different sizes of farms. In addition to varying the size of farms, labor restrictions and types of rental arrangements will be varied.

The increasing percentage of part-time farmers, as compared with the total number of farmers, and the relatively large number of older farmers in Tennessee indicate the need for some practical method of aiding this large segment of farmers in deciding what to do with their land, buildings, and equipment.

### III. OBJECTIVES

The objectives of this study were as follows:

1. To determine if commercial farmers in the Brown Soil and Hill Areas of West Tennessee could benefit by working at off-farm jobs.
2. To determine the optimum farm organizations for part-time and part-retired farm operators in the study areas including the possibility of expanding or contracting the farm operation by buying, selling, and/or renting land.
3. To determine the effect upon net farm income of a cash rental arrangement of crops as compared with one-fourth, one-third, and one-half crop share rents.



#### IV. PROCEDURE

The primary source of the basic data for this study was the S-42 Regional Project, Revised.<sup>1</sup> The data used were those pertaining to the Brown Soil Area and the Hill Area of West Tennessee. These data included the input requirements of resources and output levels of selected enterprises. Enterprise budgets, soil patterns, and cotton allotments, assumed prices, and other factors affecting cost and returns on representative farms in three size categories were given for the study areas. Two previous theses which organized much of the S-42 data for the West Tennessee areas were done by Cowan and Luan.<sup>2</sup> These studies were referred to in setting up representative farms in the study areas.

A second source of data was a survey of Production Credit Association (PCA) county managers in ten selected counties in West Tennessee. The counties selected were Carroll, Crockett, Dyer, Fayette, Gibson, Hardeman, Hardin, Haywood, Henderson, and Tipton. From this survey, present rental arrangements, price of land, cost of labor, and other data relating to the study were obtained. A copy of the survey questionnaire is presented in Appendix A.

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<sup>1</sup>"An Economic Appraisal of Farming Adjustment Opportunities in the Southern Region to Meet Changing Condition." (Unpublished, The University of Tennessee, Knoxville, 1963).

<sup>2</sup>William B. Cowan, Jr., "Variations in Land-Labor Resources and Optimum Enterprise Organizations of Farms in the Brown Soil Area of West Tennessee" (unpublished Master's Thesis, The University of Tennessee, Knoxville, 1964); Chau Tam Luan, "The Effect of Price Variability on the Optimum Enterprise Organization of a Representative Farm in the Hill Area of West Tennessee" (unpublished Master's Thesis, The University of Tennessee, Knoxville, 1962).

In addition to the above mentioned sources of basic data for the farm situations which were programmed, Census data for 1954 and 1959 were studied. The Census data were used to provide information on what the farm tenure situation was in West Tennessee and to give some indication of changes that have been taking place. Also, these data were used to determine the importance of part-time and part-retired farmers in the study areas.

From the basic data, three farm situations which represented three different farm sizes were developed for each area. Modifications were made in the basic data in order to bring the data up to date and to consider the conditions encountered by part-time and part-retired farmers. The only labor that was permitted to be acquired in the linear programming model was a hired operator who was paid \$3,600 annually. This operator was assumed to be hired only for the medium- and large-size farms. Although the small farms, which were programmed, more nearly represented the part-time farm situations in the study areas, the medium- and large-size farms were programmed in order to determine if these farm operators could benefit by farming part-time. While the study was primarily concerned with part-time and part-retired farmers, the optimum farm organizations for full-time farm situations were presented since these solutions resulted when the net incomes from the part-time and full-time operations were compared.

Linear programming techniques were used to determine the optimum combination of resources and enterprises in order to maximize net farm



income. Each farm was programmed using cash, one-fourth, one-third, and one-half crop rental arrangements. Each farm was programmed first with 2,865 hours of labor available (excluding the operator that could be hired) which was the amount assumed to be supplied by one full-time operator. The optimum farming system was then determined for a situation with only 600 hours of labor available (plus the operator that could be hired) which was the amount of farm labor assumed to be available for a part-time farm operator.

After all the representative farm situations (six) were programmed under the various conditions, the optimum farm organizations for each farm were compared. Also, a comparison was made between cash rent and crop share rental systems.

## V. PREVIOUS RESEARCH

Numerous studies have been conducted in various states with respect to part-time farming, farm retirement, leasing arrangements, and optimum farm organizations. This study attempted to integrate some of the most important findings from these previous studies and to apply the results while studying the West Tennessee Area.

Two recent studies dealt directly with the Hill Area and the Brown Soil Area of West Tennessee. The first of these was a study of the effect of price variability on optimum enterprise organization.<sup>3</sup>

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<sup>3</sup>Luan, op. cit.



In this study one representative farm of 219.5 acres of land was programmed under several sets of assumed conditions. Land was generally the most limiting resource on this farm. The results indicated that one man was sufficient to operate the representative farm and a second man would be considerably under-employed. Variability in cotton prices was found to have profound effect on the farm plan and the farm income. Thus the present study attempts to apply the cotton regulations of the 1965 Food and Agriculture Act.

A second study was entitled "Variations in Land-Labor Resources and Optimum Enterprise Organizations of Farms in the Brown Soil Area of West Tennessee."<sup>4</sup> This research also used the linear programming farm planning technique. Land-labor combinations were varied along with reservation prices for labor. The results indicated that land-labor combinations do have effects on enterprise organization and net returns. Net returns increased as each land-labor ratio was increased by adding additional land. The returns, however, generally increased proportionately less than the increases in land. The study further indicated that "there is too little land in combination with the available labor supply for the most profitable operation on many of the farms in the area."<sup>5</sup> While the model for that research considered

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<sup>4</sup>Cowan, op. cit.

<sup>5</sup>Ibid., 85-86.



the possibility of buying land, the program did not include an activity for renting or leasing land.

E. O. Heady and others made a study which attempted to relate the efficiencies of alternative leasing arrangements.<sup>6</sup> In their study two specific farm resource situations were used as models. Linear programming was used to obtain optimum farm operations. Heady stated that "an efficient lease can be recognized as one under which the same farm plan is optimum for both the landlord and tenant and for the farm as a whole."<sup>7</sup>

Three basic principles, that should be followed in determining the share of rent to use, were sent forth in a publication by Harris and Hurlburt.<sup>8</sup> The principles were:

Land, labor, capital, and management resources should be combined to yield, in the long run, the maximum net income for the farm.

Needed resources, including land, not owned by either landlord or tenant should be obtained if reasonably possible.

All long-lasting resources should be used so that over a period of time they will be fully developed, sufficiently maintained, and adequately conserved.<sup>9</sup>

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<sup>6</sup>Earl O. Heady, et al., "Analysis of the Efficiencies of Alternative Farm Leasing Arrangements" (Ames, Iowa: Agricultural Experiment Station, Iowa State College), Bulletin 445, November, 1956.

<sup>7</sup>Ibid., p. 935.

<sup>8</sup>Marshall Harris and Virgil Hurlburt, "Your Farm Rent Determination Problem" (Washington, D. C.: U. S. Department of Agriculture), Farmers' Bulletin No. 2162, June, 1961.

<sup>9</sup>Ibid., p. 6.

A general principle in determining farm rental rates states that the farm income should be shared on the basis of the relative contributions of each party. Hurlburt went into somewhat more detail and listed three incentive conditions that must be met to keep from adversely affecting the use of resources. First, he stated that each variable expense must be shared in the same proportion as the revenue is shared. Second, income from each enterprise must be shared in the same proportion. The third incentive condition which must be met is that each resource owner must have the opportunity to receive a fair return on his investment, even though the return may come in a later production period.

#### VI. ORDER OF PRESENTATION

The following chapter presents a description of the study area, a discussion of the various types of tenure, and an analysis of the importance of part-time and part-retirement farming. Resource situations and the various enterprises considered are given in Chapter III. In addition, an explanation of the transaction activities that involve land is presented in Chapter III. Chapter IV gives a description of the linear programming model and presents the results of the programming analysis for both the Brown Soil and Hill Areas. The final chapter contains a summary of the study and a discussion of some implications and limitations of the results.



## CHAPTER II

### LAND OWNERSHIP PATTERNS

#### I. AREA OF STUDY

The two areas studied were the Brown Soil and Hill Areas of West Tennessee as shown in Figure 1. As defined in the Southern Regional Project S-42, the Brown Soil Area included Crockett, Fayette, Gibson, Haywood, Madison, and portions of Dyer, Lauderdale, Shelby, and Tipton counties. The Delta portions of Dyer, Lauderdale, Tipton, and Shelby counties were excluded from the study area. Counties included in the Hill Area were Chester, Henderson, McNairy, and portions of Benton, Carroll, Decatur, Hardeman, and Hardin.

The study areas formed the Plateau Slope of West Tennessee, the second largest of eight physiographic divisions in the State. The Brown Soil Area corresponded to the "type of farming area" described as the Southern Plateau Slope.<sup>1</sup> Elevation in this area ranges from 600 feet along the eastern border to 250 feet at Memphis. Topography varies from almost level to rolling with very little rough land. The principal soil associations of the Southern Plateau Slope are the Memphis-Loring and Grenada-Loring-Memphis series. The growing season ranges from about

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<sup>1</sup>Joe A. Martin and B. H. Luebke, "Types of Farming in Tennessee" (Knoxville: The University of Tennessee Agricultural Experiment Station), Bulletin 311, March, 1960, pp. 65-68.

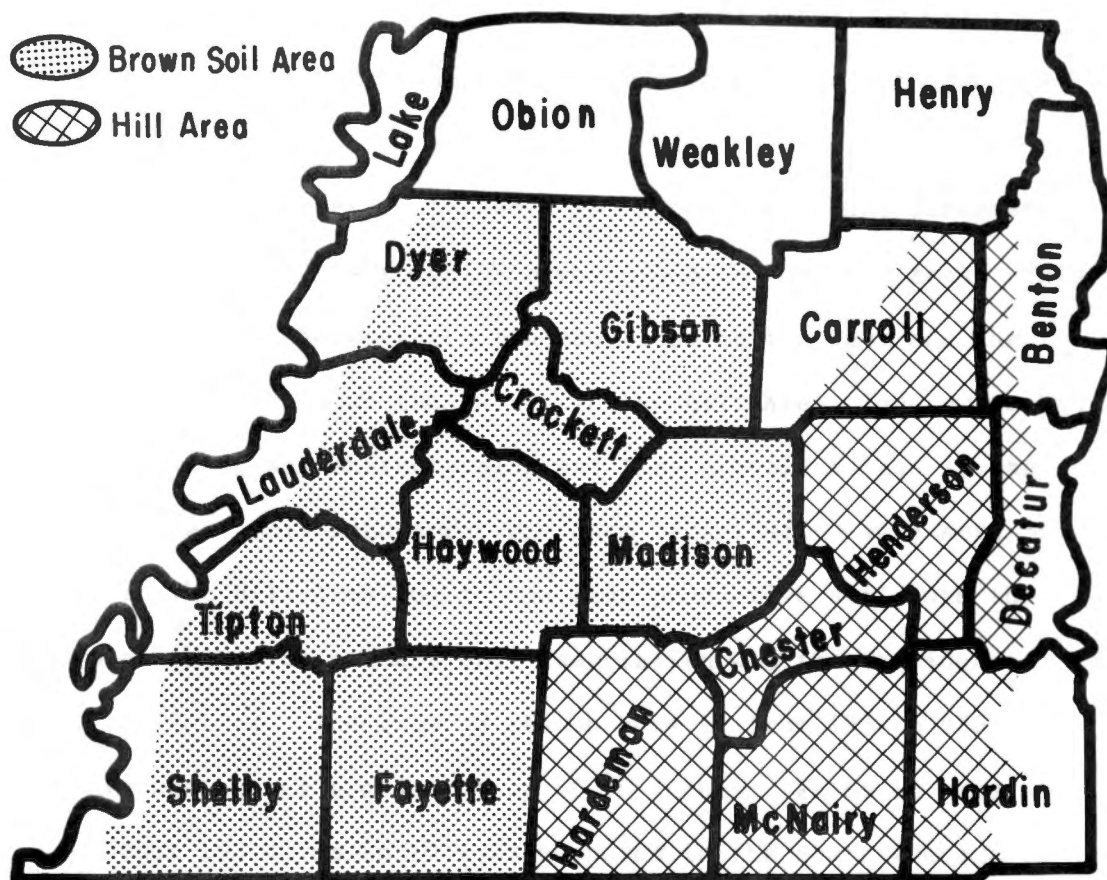


Figure 1. Location of study areas in West Tennessee.



200 to 226 days with an average annual precipitation of 48 inches. The bulk of Tennessee's cotton has been produced in this area along with production of corn, hay, small fruits and vegetables, and increasing acreages of soybeans. For many years, livestock production was low in this area but has been increasing since 1925 as the sharecropper system declines in importance.<sup>2</sup>

In the study referred to above on "Types of Farming Tennessee," the Eastern Plateau Slope roughly corresponded to the Hill Area. This area is bordered by the Southern Plateau Slope on the West and the Tennessee River Bottoms on the East. In the Hill Area, land ownership units were smaller and sharecropping was less prevalent than in the Brown Soil Area. Soil management and farm organization were more of a problem in the Hill Area due to the less productive soils and the hilly topography. The primary Soil Association was the Providence-Dulac-Ruston series. The growing season here is from 195 to 205 days with an average annual precipitation of 50 inches. Farms in this area averaged about 103 acres in 1959 as compared to the State average of 87 acres, but investments in buildings and machinery were relatively low and about 43 per cent of the farm land was in timber. Corn and hay were relatively more important in this area than in the Brown Soil Area. Numbers of beef cattle, hogs, and chickens on farms have been increasing in the Hill Area since 1940.<sup>3</sup>

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<sup>2</sup>Ibid.

<sup>3</sup>Ibid., p. 68-70.



## II. TYPES OF TENURE

Farms were divided into several categories according to tenure of the operator in the 1959 Census of Agriculture.<sup>4</sup> The four broad categories listed in the Census included full owners, part owners, managers, and tenants. This study, however, was concerned primarily with full owners and part owners. Full owners operated only land which they owned and thus did not rent additional land. Part owners operated land which they owned and also rented land from others. The manager category included those farmers who operated land for others and received a wage or salary for their services. Hired laborers were not included in this category. The type of tenure designated as tenants was subdivided into six divisions. Taken as a whole, tenants were those who rented from others or worked on shares for others all the land which they operated. Cash tenants paid cash rent entirely while share-cash tenants paid part of their rent in cash and part as a share of crops and/or livestock and livestock products. Crop-share and livestock-share were two additional types of tenants. While the crop-share tenant paid a share of the crops, the livestock-share paid only a share of the livestock or livestock products. Landlords furnished all the equipment for croppers, and the croppers usually worked under the close supervision

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<sup>4</sup>United States Bureau of the Census, United States Census of Agriculture: 1959. Tennessee, Vol. I, Part 31 (Washington: Government Printing Office, 1951), p. XXIII.



of the farm operator. The sixth type of tenure included miscellaneous types and unspecified rental arrangements.

Full owners accounted for the largest number of farm operators in Tennessee in 1959. Of the 157,688 farm operators in Tennessee in 1959, 61.2 per cent were full owners; 20.5 per cent were tenants; 18 per cent were part owners; and only .3 per cent were managers (Table I). These figures were somewhat different, however, for the counties in West Tennessee. In seven counties, all of which were in the Brown Soil Area, tenants made up the majority of total operators. The Brown Soil Area had a large percentage of tenants (48.8 per cent) while full owners made up the major tenure group in the Hill Area (52.6 per cent). The percentages of the various types of tenure, as given in Table I, also show that in 11 of the 17 counties in the study areas, the proportion of part owners as compared to the total number of operators was equal to or greater than the State figure of 18 per cent.

While the percentage of managers was not too important in any of the counties, there was wide variation between counties in the percentages of full owners, part owners, and tenants. Generally, the counties with the smaller number of total operators had the greatest percentage of full owners.

In the five years between 1954 and 1959, drastic changes took place in farm tenure status. The total number of farm operators dropped from 203,149 to 157,688--a decrease of over 22 per cent.<sup>5</sup> (Approximately

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<sup>5</sup>Ibid., p. 160.



TABLE I

TYPES OF TENURE OF FARMER OPERATORS AND PERCENTAGE OF EACH  
TYPE IN SELECTED WEST TENNESSEE COUNTIES, 1959

| County          | All<br>operators<br>Number | Types of Tenure |                   |           |           |
|-----------------|----------------------------|-----------------|-------------------|-----------|-----------|
|                 |                            | Full<br>owners  | Part<br>owners    | Managers  | Tenants   |
|                 |                            | - - - - -       | Per cent of farms | - - - - - | - - - - - |
| Crockett        | 2,024                      | 31.7            | 18.0              | --a       | 50.3      |
| Dyer            | 1,874                      | 32.1            | 20.0              | .1        | 47.8      |
| Fayette         | 3,451                      | 19.9            | 11.7              | .1        | 68.3      |
| Gibson          | 3,974                      | 42.4            | 23.7              | --        | 33.9      |
| Haywood         | 3,210                      | 22.1            | 10.6              | --        | 67.3      |
| Lauderdale      | 2,456                      | 21.5            | 17.2              | --        | 61.3      |
| Madison         | 2,700                      | 40.5            | 14.8              | --        | 44.7      |
| Shelby          | 3,020                      | 42.5            | 15.8              | 1.4       | 39.3      |
| Tipton          | 2,762                      | 27.5            | 20.7              | --        | 51.8      |
| Brown Soil Area | 25,471                     | 32.9            | 17.1              | 1.2       | 48.8      |
| Benton          | 766                        | 68.5            | 22.1              | --        | 9.4       |
| Carroll         | 2,424                      | 59.2            | 22.4              | --        | 18.4      |
| Chester         | 1,047                      | 46.0            | 25.1              | --        | 28.9      |
| Decatur         | 906                        | 62.4            | 23.6              | --        | 14.0      |
| Hardeman        | 1,886                      | 43.6            | 13.9              | --        | 42.5      |
| Hardin          | 1,321                      | 48.2            | 28.6              | --        | 23.2      |
| Henderson       | 1,797                      | 50.0            | 25.9              | --        | 24.1      |
| McNairy         | 1,866                      | 48.8            | 23.9              | --        | 27.3      |
| Hill Area       | 12,013                     | 52.6            | 22.6              | .6        | 24.2      |
| State           | 157,688                    | 61.2            | 18.0              | .3        | 20.5      |

<sup>a</sup>Less than .1 of 1 per cent.

Source: United States Bureau of the Census, United States Census of Agriculture: 1959. Tennessee, Vol. I, Part 31 (Washington: Government Printing Office, 1961), pp. 160-167.



5 per cent of the change in number of farm operators may be attributed to the change in the Census definition of a farm which took place between 1954 and 1959). From Table II, one can readily see that the greatest decrease in any tenure group occurred in the tenant category. The number of tenants decreased nearly 41 per cent in the five-year span. While both full owners and part owners decreased in number, the percentage decrease for part owners was much less than it was for full owners. This indicated that the farmers who were remaining in farming were expanding their operations by renting additional land. This probably came about due to the higher prices of land, the increased mechanization on farms, and a decrease in the availability of farm labor.

The PCA survey, referred to previously, indicated that the changes which took place between 1954 and 1959 are continuing. The PCA managers indicated that in their counties tenants were very difficult to obtain, but part owners who would rent land to tend were readily available. In fact, lack of land for expansion was a common problem in the Brown Soil Area. These part owners generally had their own equipment and rented only the cash crops, primarily on a share basis. Hired seasonal labor was also difficult to obtain. Very little hiring of managers or farm operators was done in the West Tennessee study area in 1965.



TABLE II

CHANGES IN TYPES OF TENURE OF FARMERS IN BROWN SOIL AND  
HILL AREAS OF WEST TENNESSEE, 1954 AND 1959

| Type of tenure <sup>a</sup> | 1954                 | 1959   | Change   |
|-----------------------------|----------------------|--------|----------|
|                             | - - - -Number- - - - |        | Per cent |
| Brown Soil Area             |                      |        |          |
| Full owners                 | 10,618               | 8,378  | -21.1    |
| Part owners                 | 4,415                | 4,345  | - 1.6    |
| All tenants                 | 19,530               | 12,433 | -36.3    |
| Cash                        | 695                  | 404    | -41.9    |
| Share-cash                  | 250                  | 273    | + 9.2    |
| Crop-share                  | 7,315                | 3,988  | -45.5    |
| Livestock-share             | 260                  | 256    | - 1.5    |
| Croppers                    | 9,753                | 6,437  | -34.0    |
| Other                       | 1,257                | 1,075  | -14.5    |
| Total for three types       | 34,563               | 25,156 | -27.2    |
| Hill Area                   |                      |        |          |
| Full owners                 | 8,146                | 6,319  | -22.4    |
| Part owners                 | 3,112                | 2,712  | -12.8    |
| All tenants                 | 5,147                | 2,905  | -43.6    |
| Cash                        | 233                  | 86     | -63.1    |
| Share-cash                  | 71                   | 125    | +76.0    |
| Crop-share                  | 2,514                | 1,292  | -48.6    |
| Livestock-share             | 69                   | 90     | +30.4    |
| Croppers                    | 1,820                | 960    | -47.3    |
| Other                       | 440                  | 352    | -20.0    |
| Total for three types       | 16,405               | 11,936 | -27.2    |

<sup>a</sup>Managers not included.

Source: United States Bureau of the Census, United States Census of Agriculture: 1959. Tennessee, Vol. I, Part 31 (Washington: Government Printing Office, 1961), p. 176-183.



### III. PART-TIME FARMING

As Tennessee joins with the rest of the nation in making the change from rural to urban living and industrialization, part-time farming has become an important means of aiding the transition. Farming has often been referred to as a way of life and for many farmers the move away from the farm is a difficult one indeed. Many farmers in Tennessee are engaging in off-farm work either permanently or temporarily while they are caught in the cost-price squeeze affecting agriculture. Many of the farmers who have not yet taken an off-farm job are considering this possibility.

In 1959, 52 per cent of Tennessee's population was classified as urban. Urban, according to the Population Census definition, included those persons living in towns of 2,500 or more inhabitants.<sup>6</sup> As Table III indicates, only 16.4 per cent of the State's population was classified as rural while 31.3 per cent was classified as rural nonfarm in 1959. This latter term refers to persons not included in the urban or rural farm categories. The rural nonfarm population does not meet the rural farm classification because of the small amounts of agricultural products sold. Only Madison and Shelby counties had a greater percentage of urban population than the State as a whole. Thus most of the study area was more rural than the State as a whole.

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<sup>6</sup>United States Bureau of the Census, County and City Data Book: 1962, A Statistical Abstract Supplement (Washington: Government Printing Office, 1962), p. XIX.

TABLE III

PERCENTAGE OF URBAN, RURAL FARM, AND RURAL NONFARM POPULATION  
IN SELECTED WEST TENNESSEE COUNTIES, 1959

| County                                   | Urban           | Rural farm | Rural nonfarm |
|------------------------------------------|-----------------|------------|---------------|
| - - - - -Per cent of Population- - - - - |                 |            |               |
| Brown Soil Area                          |                 |            |               |
| Crockett                                 | -- <sup>a</sup> | 56.5       | 43.5          |
| Dyer                                     | 42.3            | 28.5       | 29.2          |
| Fayette                                  | --              | 66.8       | 33.2          |
| Gibson                                   | 40.1            | 33.8       | 26.1          |
| Haywood                                  | 23.2            | 65.4       | 11.4          |
| Lauderdale                               | 17.3            | 46.9       | 35.8          |
| Madison                                  | 61.0            | 19.5       | 19.5          |
| Shelby                                   | 87.8            | 2.2        | 10.0          |
| Tipton                                   | 18.5            | 46.0       | 35.5          |
| Hill Area                                |                 |            |               |
| Benton                                   | 26.0            | 21.4       | 52.6          |
| Carroll                                  | 15.4            | 36.7       | 47.9          |
| Chester                                  | 28.1            | 40.9       | 31.0          |
| Decatur                                  | --              | 34.6       | 65.4          |
| Hardeman                                 | 15.5            | 38.5       | 46.0          |
| Hardin                                   | 24.8            | 26.1       | 49.1          |
| Henderson                                | 24.5            | 41.3       | 34.2          |
| McNairy                                  | --              | 40.9       | 59.1          |
| State                                    | 52.3            | 16.4       | 31.3          |

<sup>a</sup>Less than .1 of 1 per cent.

Source: United States Bureau of the Census, County and City Data Book: 1962, A Statistical Abstract Supplement (Washington: Government Printing Office, 1962), pp. 332-333, 342-343.



Part-time farms were defined by the 1959 Census of Agriculture as those farms with a value of farm sales of from \$50 to \$2,499 "if the operator was under 65 years of age and he either worked off the farm 100 or more days or the income he and members of his household received from nonfarm sources was greater than the total value of farm products sold."<sup>7</sup> Thus, as long as a man had farm sales of \$2,500 or more he was not classified as a part-time farmer by the Census definition.

As stated previously, part-time and part-retired farmers account for a large part of the total farm population in Tennessee. The numbers of commercial, part-time, and part-retired farmers are given in Table IV. In Benton and Decatur counties part-time farms outnumbered commercial farms. For the state as a whole, the sum of part-time and part-retired farmers closely approximated the number of commercial farmers. In the study area, the total number of part-time and part-retired farmers was only 47 per cent as large as the number of commercial farms. Thus the study area had a much smaller percentage of part-time and part-retired farmers than did Tennessee. This study was done for the West Tennessee area in order to determine whether or not farmers in the area would benefit by engaging in off-farm work as many farmers in the other divisions of the State have done.

Increases in industrial jobs have offered new opportunities for farmers who wish to engage in additional work off the farm. The number

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<sup>7</sup>Census of Agriculture, op. cit., p. XXIV.

TABLE IV

NUMBER OF COMMERCIAL, PART-TIME, AND PART-RETIRED FARMERS  
IN SELECTED WEST TENNESSEE COUNTIES, 1959

| County          | (1)<br>Commer-<br>cial | (2)<br>Part-<br>time | (3)<br>Part-<br>retired | Total of<br>(2) & (3) | % Total<br>is of<br>Comm. |
|-----------------|------------------------|----------------------|-------------------------|-----------------------|---------------------------|
| Crockett        | 1,604                  | 386                  | 200                     | 586                   | 36.5                      |
| Dyer            | 1,508                  | 340                  | 175                     | 515                   | 34.2                      |
| Fayette         | 2,617                  | 390                  | 366                     | 756                   | 28.9                      |
| Gibson          | 2,871                  | 695                  | 425                     | 1,120                 | 39.0                      |
| Haywood         | 2,623                  | 245                  | 313                     | 558                   | 21.3                      |
| Lauderdale      | 1,961                  | 230                  | 205                     | 435                   | 22.2                      |
| Madison         | 1,935                  | 576                  | 256                     | 832                   | 43.0                      |
| Shelby          | 1,673                  | 866                  | 446                     | 1,312                 | 78.4                      |
| Tipton          | 2,068                  | 410                  | 225                     | 635                   | 30.7                      |
| Brown Soil Area | 18,860                 | 4,138                | 2,611                   | 6,749                 | 35.8                      |
| Benton          | 328                    | 341                  | 121                     | 462                   | 140.8                     |
| Carroll         | 1,379                  | 700                  | 345                     | 1,045                 | 75.8                      |
| Chester         | 690                    | 300                  | 210                     | 510                   | 73.9                      |
| Decatur         | 417                    | 512                  | 351                     | 863                   | 206.9                     |
| Hardeman        | 1,275                  | 394                  | 226                     | 620                   | 48.6                      |
| Hardin          | 695                    | 451                  | 175                     | 626                   | 90.1                      |
| Henderson       | 1,147                  | 366                  | 220                     | 586                   | 51.1                      |
| McNairy         | 1,138                  | 438                  | 281                     | 719                   | 63.2                      |
| Hill Area       | 7,069                  | 3,502                | 1,929                   | 5,431                 | 76.8                      |
| State           | 82,639                 | 50,630               | 24,380                  | 75,010                | 90.7                      |

Source: United States Bureau of the Census, United States Census of Agriculture: 1959. Tennessee, Vol. I, Part 31 (Washington: Government Printing Office, 1961), pp. 176-183.



of persons employed in seven major industrial classifications increased by 28,056 persons in Tennessee between 1960 and 1963 (Table V). For West Tennessee the increase was 8,762 persons or 31.3 per cent of the State increase. Increases in total wages over the same time period were up by \$67,440,000 in West Tennessee alone.

Changes that occurred in the seven major industrial classifications in Tennessee are shown in Figure 2 for the period from 1960 to 1963. As can be seen, only employment in lumber and machinery decreased while the other classes increased by relatively large amounts for the three-year period. Changes in total wages increased in all seven industrial categories.

Tennessee, with its abundance of small farms, excess labor, water and power resources, and other factors favorable for industrial development, has experienced and is experiencing a rapid increase in part-time farming. In 1949 approximately 23 per cent of all farm operators worked off the farm 100 or more days contrasted with 28.7 per cent in 1954 and 32 per cent in 1959. Twelve per cent of all commercial farmers worked off their farms 100 or more days in 1959.<sup>8</sup>

#### IV. PART-RETIREMENT FARMING

As the number of farmers in Tennessee declines, the percentage of farmers over 45 years of age increases. The older farmers generally

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<sup>8</sup>Census of Agriculture, op. cit., p. 176.

TABLE V  
CHANGES IN EMPLOYMENT AND TOTAL WAGES IN EAST,  
MIDDLE, AND WEST TENNESSEE, 1960-1963

| Division<br>of State | Gain in<br>employment<br>Number | Per cent of<br>State gain<br>Per cent | Increases in<br>total wages<br>\$1,000 | Per cent of<br>State increase<br>Per cent |
|----------------------|---------------------------------|---------------------------------------|----------------------------------------|-------------------------------------------|
| East                 | 6,685                           | 23.8                                  | 97,070                                 | 38.5                                      |
| Middle               | 12,609                          | 44.9                                  | 87,370                                 | 34.7                                      |
| West                 | 8,762                           | 31.3                                  | 67,440                                 | 26.8                                      |
| Tennessee            | 28,056                          | 100.0                                 | 251,880                                | 100.0                                     |

Source: Tennessee Survey of Business, Volume 1, No.1, September, 1965, The Bureau of Business and Economic Research, Allen H. Keally, p. 5.



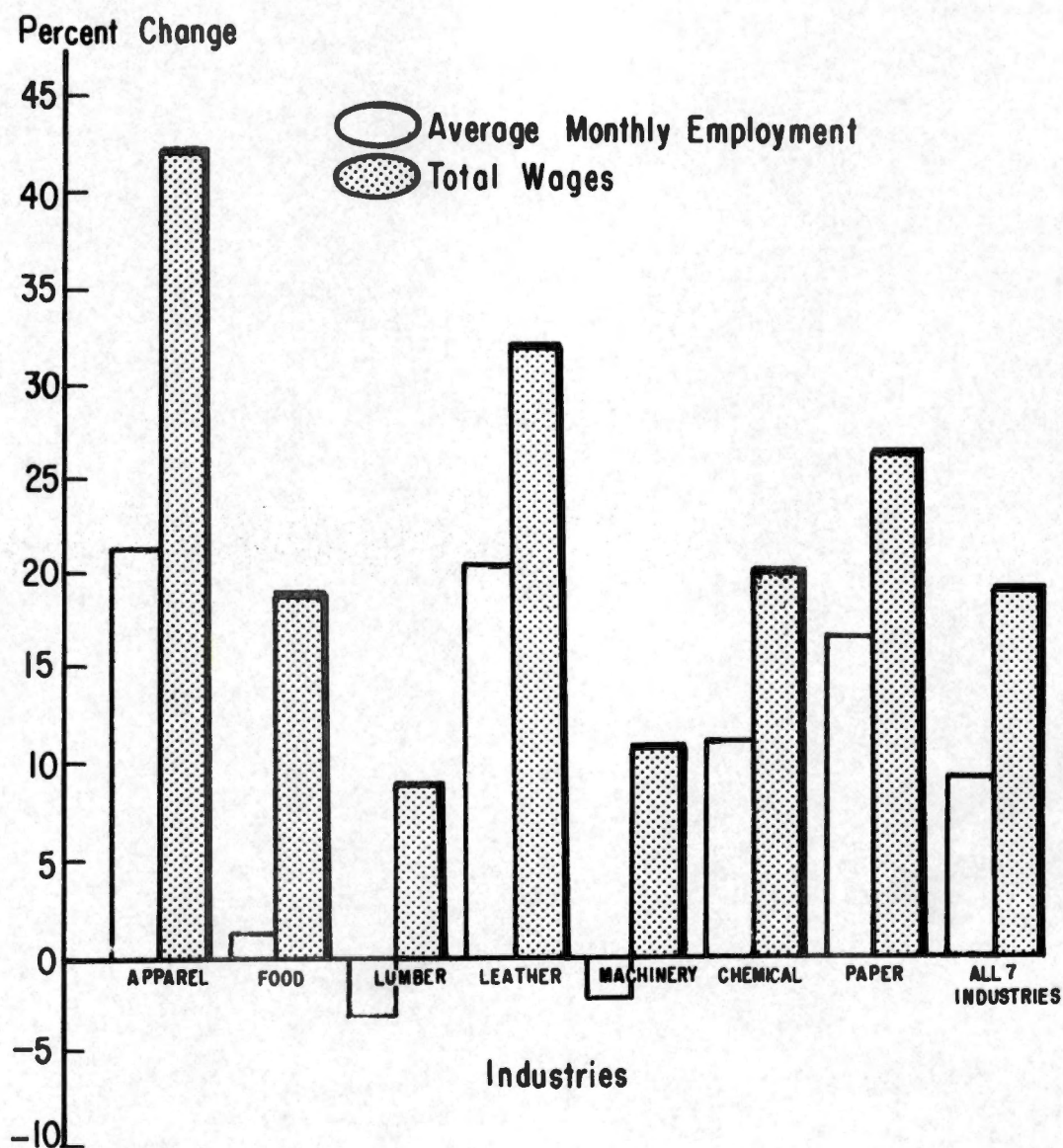


Figure 2. Percentage changes in average monthly employment and total wages for seven industrial classifications, West Tennessee, 1960-1963.

Source: See Table V, page 23.

have no alternative other than remaining in farming while the younger men have more rewarding opportunities outside of agriculture. Farms with sales of farm products of from \$50 to \$2,499 were classified as part-retirement farms if the farm operator was 65 years old or older.<sup>9</sup> This study, in determining optimum farm arrangements for part-retired farmers, did not restrict farm sales for part-retired farmers to less than \$2,500. This study, however, was also concerned with those farmers who own a farm of any size, and because of their age, they must decide what to do with their land and equipment.

While the number of farmers in all age categories decreased in the years between 1954 and 1959 (Figure 3), the change in the number of farmers, age 45 years and older, decreased only about one-half as much as the number of farmers under 45 years of age. Data on age of farmers in West Tennessee in 1954 were not available, however, the data for 1959 showed that the percentage of farmers in various age groups was approximately the same as the State figures for 1959. The number of farmers in the age group 55 to 64 years showed the least change over the five-year period, only 11.8 per cent decrease. Referring back to Table IV, page 31, one can see that in Tennessee the number of part-retired farmers in 1959 was about one-half the number of part-time farmers in 1959.

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<sup>9</sup>Ibid., p. XXIV.



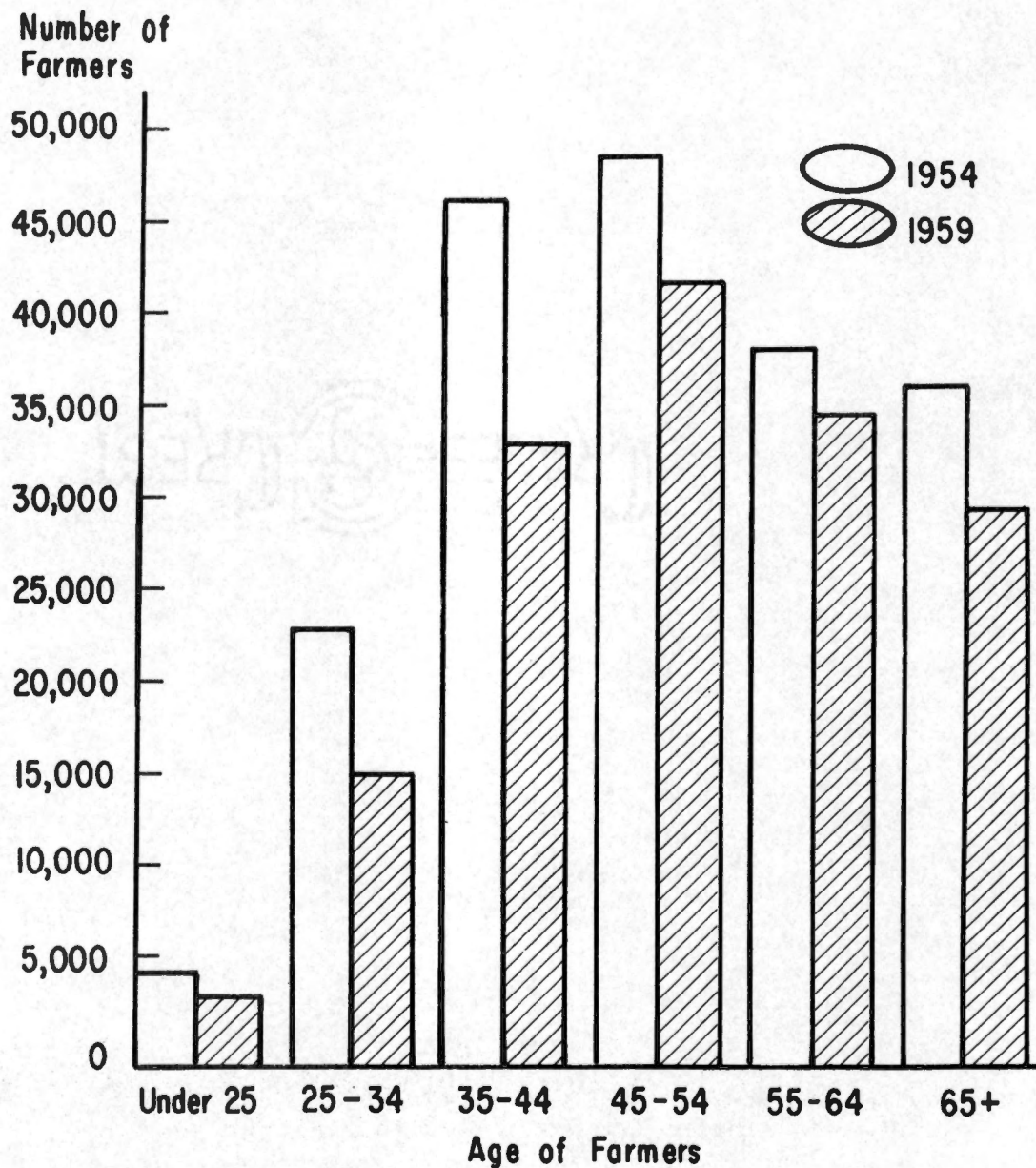


Figure 3. Number of Tennessee farmers in selected age groups, 1954 and 1959.

Source: United States Bureau of the Census, United States Census of Agriculture: 1959. Tennessee, Vol. I, Part 31 (Washington: Government Printing Office, 1961), pp. 176-183.

## V. ECONOMIC IMPORTANCE

In order to evaluate the significance of part-time and part-retired farmers, several factors relating to these two groups need to be compared with similar factors concerning Economic Class IV and V farms. These two classes included those farms which had sales of farm products of from \$2,500 to \$9,999. In 1959, 28.5 per cent of the farms in Tennessee were in Classes IV and V, while 32.1 per cent were classified as part-time farms and 15.5 per cent were classified as part-retirement farms.<sup>10</sup>

Although part-time and part-retirement farms were important numerically, they were not nearly as important economically as the commercial farms (Table VI). In value of all farm products sold in 1959, Class IV and V farms totaled over \$203 million as compared with approximately \$41 million for part-time farms and over \$20 million for part-retirement farms. These last two classes of farmers had over four million acres of land that might be combined for more efficient use by other farm operators. As an indication of efficiency, acres of cropland harvested and idle land may be compared for the three types of farms. Percentage wise, approximately one-half as much cropland was harvested on the part-time and part-retirement farms as compared to Class IV and V farms. Also, nearly twice as much land was idle or had crop failure on the part-time and part-retirement farms as on Class IV and V farms.

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<sup>10</sup>Ibid., p. 176.



TABLE VI

## COMPARISON OF SELECTED ITEMS CONCERNING THREE FARM CATEGORIES IN TENNESSEE, 1959

| Item                          | Unit   | Class IV and<br>V farms | Per cent<br>of land | Part-time<br>farms | Per cent<br>of land | Part-retirement<br>farms | Per cent<br>of land |
|-------------------------------|--------|-------------------------|---------------------|--------------------|---------------------|--------------------------|---------------------|
| Number of farms               | Number | 44,914                  |                     | 50,630             |                     | 24,375                   |                     |
| Land in farms                 | Acre   | 6,329,143               | 100.0               | 2,831,005          | 100.0               | 1,745,026                | 100.0               |
| Average size of<br>farms      | Acre   | 140.9                   |                     | 55.9               |                     | 71.6                     |                     |
| Cropland harvested            | Acre   | 1,871,032               | 29.6                | 454,748            | 16.0                | 248,035                  | 14.2                |
| Cropland for pasture          | Acre   | 1,328,914               | 21.0                | 574,970            | 20.3                | 357,496                  | 20.5                |
| Soil development <sup>a</sup> | Acre   | 168,144                 | 2.9                 | 92,709             | 3.3                 | 49,769                   | 2.9                 |
| Idle land                     | Acre   | 217,800                 | 3.4                 | 179,396            | 6.3                 | 109,971                  | 6.3                 |
| Woodland pastured             | Acre   | 690,956                 | 10.9                | 318,313            | 11.2                | 213,587                  | 12.2                |
| Woodland not pastured         | Acre   | 1,148,598               | 18.1                | 777,522            | 27.5                | 484,698                  | 27.8                |
| Other pasture                 | Acre   | 566,306                 | 8.9                 | 248,303            | 8.8                 | 166,100                  | 9.5                 |
| Other land                    | Acre   | 337,393                 | 5.3                 | 185,044            | 6.5                 | 115,370                  | 6.6                 |

<sup>a</sup>Grasses and legumes used for soil improvement.

Source: United States Bureau of the Census, United States Census of Agriculture: 1959. Tennessee, Vol. I, Part 31 (Washington: Government Printing Office, 1961), p. 33.

This study attempted to determine whether or not the part-time and part-retired farmers could improve their economic well-being and, if so, what action they might take. The effect of changes made by these farmers on the aggregate agricultural operations in the area was examined only to a limited extent.



## CHAPTER III

### RESOURCE SITUATIONS AND ENTERPRISES

#### I. LAND RESOURCES

##### Brown Soil Area

As stated previously most of the basic data were obtained from the S-42 project which derived representative farms and resource situations for the Brown Soil and Hill Areas of West Tennessee. The main deviations of the model in this study from the S-42 project dealt with land rental activities; buying and selling of land, corn, and hay; price of cotton; and labor supplies. Three sizes of farms were used in each area representing three size ranges. Farms with less than 30 acres of land were not considered on the assumption that adjustment potentials were severely limited for this group. A 54.3 acre farm represented the small farm group which included farms with from 30 to 99 total acres. Farms of from 100 to 179 acres were represented by the medium-size farm of 130.3 acres. The representative large farm had 213.8 acres and represented those farms with from 180 to 259 acres. The extra large farms of over 259 acres were not considered in this study since owners of such farms can generally earn a substantial income from the farm.

Percentage wise, the soil pattern, woodland acreage, and waste acreage were assumed to be the same on all three farm sizes. Woodland accounted for approximately 18 per cent of the total land on each of

the farm sizes, while waste land made up slightly over 10 per cent of the land. In the Brown Soil Area, 23 soil capability groups were regrouped into six management groups as shown in Table VII. Data used in this study pertained to farms which were predominately upland since approximately 70 per cent of the crop and pasture land in the Brown Soil Area was in this category.

In addition to soil group restrictions on land; row crop restrictions, alfalfa restrictions, and cotton allotments were considered. These land resources and crop allotments on the three representative farms are shown in Table VIII. The percentages of acreages for soil types, row crops, allotments, and restrictions were based on the existing conditions in the Brown Soil Area and were applied to each farm size.

The yield levels of the crops considered on the various soil groups were obtained with the aid of production specialists and were based on weighted averages of estimated yields for specific soils in the management groups. Table IX presents the estimated yields of representative crop enterprises considered for the various soil groups. It was assumed that some of the crops could not be grown on certain soil groups since production would be uneconomic. As indicated in Table IX, Soil Group I contained the most productive soils and had the widest range of uses.

#### Hill Area

Representative farms in the Hill Area had total areas of 109.8, 219.5, and 424.2 acres. These farms were somewhat larger than the



TABLE VII

SUMMARY OF CROPLAND AND PASTURE ACREAGE BY SOIL GROUPS,  
BROWN SOIL AREA OF WEST TENNESSEE, 1963

| Soil group | Capability groups <sup>a</sup> | Major series                         |
|------------|--------------------------------|--------------------------------------|
| I          | I-1, I-2                       | Memphis, Loring,<br>Shannon          |
|            | IIe-1                          | Memphis, Loring<br>(B slope)         |
|            | IIw-1                          | Collins                              |
|            | IIIw-2                         | Falaya                               |
|            | IIe-3                          | Shannon                              |
| II         | IIe-2                          | Grenada (B slope)                    |
|            | IIs-1                          | Grenada (A slope)                    |
| III        | IIIe-1                         | Memphis, Loring<br>(C slope)         |
| IV         | IIIe-2                         | Grenada                              |
|            | IIIe-4                         | Calloway (C slope)                   |
|            | IIIw-1                         | Calloway (B slope)                   |
| V          | IVe-1                          | Memphis, Loring<br>(D slope)         |
|            | IVe-2                          | Grenada (C & D slope)                |
|            | IVe-3                          | Lexington (D slope)                  |
|            | IVs-1                          | Bruno, Ina                           |
|            | IVw-1                          | Henry                                |
|            | IVw-2                          | Waverly                              |
|            |                                |                                      |
| VI         | VIe-1                          | Memphis, Loring<br>(E slope)         |
|            | VIe-2                          | Grenada (C, D & E slopes)            |
|            | VIe-3                          | Lexington, Ruston<br>(D & E slopes)  |
|            | VIIe-1                         | Memphis, Lexington<br>(E & F slopes) |
|            | VIIIs-1                        | Overwash                             |

<sup>a</sup>Groups were established by Soil Conservation Service as a system of classification used to show the relative suitability of soils for crops, grazing, forestry, and wildlife.

Source: William B. Cowan, Jr., "Variations in Land-Labor Resources and Optimum Enterprise Organizations of Farms in the Brown Soil Area of West Tennessee" (unpublished Master's thesis, The University of Tennessee, Knoxville, 1964).

TABLE VIII

LAND RESTRICTIONS ON THREE REPRESENTATIVE FARMS IN  
BROWN SOIL AREA OF WEST TENNESSEE, 1966

| Resource            | Per cent of<br>total acres<br>Per cent | Farm size        |                   |                   |
|---------------------|----------------------------------------|------------------|-------------------|-------------------|
|                     |                                        | 54 Ac.           | 130 Ac.           | 214 Ac.           |
|                     |                                        | - - - - -        | Acres - - - - -   |                   |
| Soil I              | 30.8                                   | 16.8             | 40.2              | 65.9              |
| Row Crop I          | 24.1                                   | 13.1             | 31.3              | 51.4              |
| Alfalfa restriction | 15.2                                   | 8.3              | 19.9              | 32.6              |
| Soil II             | 9.1                                    | 4.9              | 11.9              | 19.5              |
| Row Crop II         | 2.9                                    | 1.6              | 4.0               | 6.5               |
| Soil III            | 8.1                                    | 4.4              | 10.6              | 17.4              |
| Row Crop III        | 2.0                                    | 1.1              | 2.7               | 4.4               |
| Soil IV             | 8.1                                    | 4.4              | 10.6              | 17.4              |
| Soil V              | 10.2                                   | 5.5              | 13.3              | 21.8              |
| Soil VI             | 5.2                                    | 2.8              | 6.6               | 10.8              |
| Rent in Land        | --                                     | 38.8             | 93.2              | 100.0             |
| Cotton allotment    | 17.5                                   | 6.2 <sup>a</sup> | 14.9 <sup>a</sup> | 24.4 <sup>a</sup> |
| Cotton land rental  | 11.4                                   | 6.2              | 14.9              | 24.4              |
| Total open acres    | --                                     | 38.8             | 93.2              | 152.8             |
| Total row crop      | --                                     | 16.8             | 40.3              | 66.1              |

<sup>a</sup>Refers to acres of domestic allotment (65 per cent of original allotment).

Source: William B. Cowan, Jr., "Variations in Land-Labor Resources and Optimum Enterprise Organizations of Farms in the Brown Soil Area of West Tennessee" (unpublished Master's thesis, The University of Tennessee, Knoxville, 1964).



TABLE IX  
ESTIMATED YIELDS OF REPRESENTATIVE CROP ENTERPRISES  
ACCORDING TO SOIL GROUPS, BROWN SOIL AREA  
OF WEST TENNESSEE, 1963

| Crop                                 | Unit             | Soil Group |     |     |     |     |    |
|--------------------------------------|------------------|------------|-----|-----|-----|-----|----|
|                                      |                  | I          | II  | III | IV  | V   | VI |
| Cotton                               | Lb. lint         | 700        | 650 | 575 | 600 | a   | a  |
| Corn                                 | Bu.              | 80         | 65  | 65  | 46  | a   | a  |
| Soybeans                             | Bu.              | 33         | 28  | 28  | 25  | a   | a  |
| Alfalfa                              | Ton              | 2.9        | 2.0 | 2.8 | a   | a   | a  |
| Orchard grass-ladino pasture         | CAD <sup>b</sup> | 156        | 138 | 129 | 111 | 92  | 64 |
| Orchard grass-ladino pasture and hay | CAD <sup>c</sup> | 78         | 68  | 64  | 55  | 46  | 32 |
| Bermuda-ladino pasture               | CAD              | 190        | 170 | 160 | 135 | 110 | a  |
| Lespedeza hay                        | Ton              | 1.7        | 1.6 | 1.6 | 1.2 | 1.2 | a  |
| Oats                                 | Bu.              | 58         | 52  | 52  | 40  | a   | a  |
| Lespedeza pasture                    | CAD              | 120        | 105 | 100 | 85  | 70  | a  |
| Red clover hay                       | Ton              | 2.2        | 1.5 | 2.2 | a   | a   | a  |

<sup>a</sup>It was assumed uneconomical to grow this specific crop on this soil group.

<sup>b</sup>Cow acre day = 25 lbs. hay equivalent and refers to the amount of forage available for one cow per day per acre of pasture.

<sup>c</sup>The pasture furnishes approximately one-half as many CAD's as when a hay crop is harvested.

Source: William B. Cowan, Jr., "Variations in Land-Labor Resources and Optimum Enterprise Organizations of Farms in the Brown Soil Area of West Tennessee" (unpublished Master's thesis, The University of Tennessee, Knoxville, 1964).

corresponding farms in the Brown Soil Area; however, the amount of open land was only slightly larger due to the large amount of woodland in the Hill Area. The farms programmed represented farms in a mixed soil group rather than the upland soils used in the Brown Soil Area since most of the soils were in this group. Eighteen soil capability units in the Hill Area were regrouped into four major soil groups. The first two groups could be used to produce row crops as well as other crops while Soil Groups III and IV could be used only for pasture, hay, and small grain. The soil classifications and expected yields for the Hill Area are given in Table X. The land resources and crop allotments for the three representative farms are presented in Table XI.

## II. LABOR RESOURCES

Labor resources were assumed to be the same for both the Brown Soil and Hill Areas. Each farm was programmed first with a one-man labor supply (2,865 hours). The farm was then reprogrammed with only 600 hours of labor available initially, the amount assumed to be available from a part-time farmer. The part-time labor supply was estimated after allowing for eight hours of nonfarm work, weather conditions, and travel time to and from work. A comparison of the two solutions was used to determine the effect of part-time farming upon net farm income and to determine what income the farmer would have to earn off the farm in order to justify part-time farming.



TABLE X

## SOIL CLASSIFICATION AND EXPECTED YIELDS, HILL AREA OF WEST TENNESSEE, 1963

| Group | Capability group <sup>b</sup> | Major Soil        | Estimated yields   |            |                |              |            |                |                            |
|-------|-------------------------------|-------------------|--------------------|------------|----------------|--------------|------------|----------------|----------------------------|
|       |                               |                   | Cotton (lbs. lint) | Corn (bu.) | Soybeans (bu.) | Lesp. (tons) | Oats (bu.) | Alfalfa (tons) | Pasture (CAD) <sup>c</sup> |
| I     | IIe-1                         | Lexington, Dexter |                    |            |                |              |            |                |                            |
|       | IIe-2                         | Dulac, Freeland   | 575                | 60         | 28             | 1.5          | 48         | 3.5            | 120                        |
|       | IIIe-2                        | Dulac, Freeland   |                    |            |                |              |            |                |                            |
| II    | IIw-1                         | Hymon, Shannon    |                    |            |                |              |            |                |                            |
|       | IIIw-2                        | Ina               |                    |            |                |              |            |                |                            |
|       | IIIw-1                        | Calloway, Hatcher | 700                | 88         | 33             | 1.9          | 58         | 3.5            | 175                        |
|       | IIIw-3                        | Lexington, Dexter |                    |            |                |              |            |                |                            |
| III   | IVe-1                         | Dulac, Freeland   |                    |            |                |              |            |                |                            |
|       | IVe-2                         | Dulac             | a                  | a          | a              | 1.2          | 34         | a              | 96                         |
|       | IVe-3                         | Ruston            |                    |            |                |              |            |                |                            |
| IV    | IVw-1                         | Almo              |                    |            |                |              |            |                |                            |
|       | IVw-2                         | Beechy            |                    |            |                |              |            |                |                            |
|       | VIe-2                         | Dulac             | a                  | a          | a              | a            | a          | a              | 80                         |
|       | VIe-3                         | Ruston            |                    |            |                |              |            |                |                            |
|       | VIIe-1                        | Lexington, Ruston |                    |            |                |              |            |                |                            |

<sup>a</sup>It was assumed uneconomical to grow this specific group on this soil group.

<sup>b</sup>Defined in Table VII, page 32.

<sup>c</sup>Cow Acre Day is defined in Table IX, page 34.

Source: A Guide to Procedures in Southern Research Project S-42, Revised, "An Economic Appraisal of Farming Adjustment Opportunities in the Southern Region to Meet Changing Conditions," (Unpublished, The University of Tennessee, Knoxville, 1963).

TABLE XI  
LAND RESTRICTIONS ON THREE REPRESENTATIVE FARMS  
IN HILL AREA OF WEST TENNESSEE, 1966

| Resource                      | Farm size         |           |           |
|-------------------------------|-------------------|-----------|-----------|
|                               | 109.8 Ac.         | 219.5 Ac. | 424.2 Ac. |
|                               | ----- Acres ----- |           |           |
| Soil I                        | 16.5              | 45.4      | 68.7      |
| Row crop I                    | 8.3               | 22.7      | 34.4      |
| Alfalfa restriction I         | 5.5               | 15.1      | 22.9      |
| Soil II                       | 17.2              | 36.4      | 82.5      |
| Row crop II                   | 17.2              | 36.4      | 82.5      |
| Alfalfa restriction II        | 8.6               | 18.2      | 41.3      |
| Soil III                      | 16.3              | 29.8      | 50.4      |
| Soil IV                       | 3.7               | 10.1      | 47.3      |
| Rent in land                  | 53.7              | 100.0     | 100.0     |
| Cotton allotment <sup>a</sup> | 5.1               | 11.7      | 23.9      |
| Cotton land rental            | 5.1               | 11.7      | 23.9      |
| Total open land               | 53.7              | 121.7     | 248.9     |
| Total row crop                | 25.5              | 59.1      | 116.9     |

<sup>a</sup>Domestic allotment (65 per cent of original allotment).

Source: A guide to procedures in Southern Research Project S-42, Revised, "An Economic Appraisal of Farming Adjustment Opportunities in the Southern Region to Meet Changing Conditions," (Unpublished, The University of Tennessee, Knoxville, 1963).



Each labor supply was divided into six labor periods as shown in Table XII. In addition to the part-time and full-time labor supply, one full-time man could be hired on the medium- and large-size farms. This hired operator was assumed to be able to either operate the farm as the farm owner would or to work full time along with the owner. The cost of the hired operator was assumed to be \$3,600 annually which is somewhat above the minimum wage for most factory workers in the area. Due to the problem of hiring other types of labor, this study assumed that no day labor could be hired. Part of the objective of this study was to avoid the labor shortage by renting land and mechanizing. The salary of the hired operator was set relatively high in order to assure that the salary would be competitive with factory wages in the area.

### III. CAPITAL SITUATION

Capital was divided into two types: annual capital and investment capital. Both types were assumed to be unlimited with an interest charge of six per cent annually. The annual requirement of operating capital was estimated for each enterprise considered. If the operating capital was required for a period less than 12 months, the annual operating capital charge was adjusted accordingly. The investment capital applied to such items as buildings, machines, long-life pastures, and land. Although it was recognized that capital limitations are important on many farms, this problem was not treated in the present study. In this analysis, capital became limiting only when the return

TABLE XII

ASSUMED AVAILABILITY OF ANNUAL LABOR BY PERIODS,  
WEST TENNESSEE, 1966

| Period                | Size of labor force |                  |
|-----------------------|---------------------|------------------|
|                       | Part-time worker    | Full-time worker |
|                       | Hours               | Hours            |
| I. Dec. 1 - Feb. 28   | 129                 | 616              |
| II. Mar. 1 - Apr. 14  | 73                  | 351              |
| III. Apr. 15 - May 31 | 82                  | 390              |
| IV. June 1 - Aug. 15  | 136                 | 650              |
| V. Aug. 16 - Sept. 30 | 82                  | 390              |
| VI. Oct. 1 - Nov. 30  | 98                  | 468              |
| Total hours annually  | 600                 | 2865             |



from an additional dollar was less than the cost (\$.06) of the additional unit.

#### IV. MACHINERY RESOURCES

In both study areas, a set of farm machinery was assumed for each farm size. The farms in the Hill Area were assumed to have the same machinery resources as farms of corresponding size, based on number of open acres, in the Brown Soil Area. If the estimated amount of use of a particular machine did not justify owning the machine, custom work was assumed to be available at a designated price. The assumed custom rates are included in Appendix B.

The costs associated with the machinery were divided into two classes: fixed and variable. Storage, insurance, depreciation, and interest costs were included in fixed costs, while the variable costs included fuel, oil, and repairs. The cost per hour, of course, decreased as the fixed costs were spread over more hours of use. The machines and their expected hours of use on each size farm are shown in Table XIII.

#### V. ENTERPRISES CONSIDERED

##### Cotton

As noted earlier the soil types in the two areas studied were of different quality. In the Brown Soil Area cotton could be grown on Soil Groups I-IV, but in the Hill Area cotton was grown only on Soil

TABLE XIII

MACHINES AVAILABLE AND ASSUMED HOURS OF USE FOR THREE  
REPRESENTATIVE FARM SIZES IN WEST TENNESSEE, 1966

| Machine                         | Description         | Farm size                     |        |       |
|---------------------------------|---------------------|-------------------------------|--------|-------|
|                                 |                     | Small                         | Medium | Large |
|                                 |                     | - - Hours of use annually - - |        |       |
| Tractor                         | 25 DBH <sup>a</sup> | 250                           |        | 400   |
|                                 | 35 DBH <sup>a</sup> |                               | 570    |       |
|                                 | 45 DBH <sup>a</sup> |                               |        | 500   |
| Plow                            | 1-2 bottom          | 40                            |        |       |
|                                 | 2 bottom            |                               | 90     | 100   |
| Disk                            | 7 foot              | 40                            |        |       |
|                                 | 8 foot              |                               | 90     | 150   |
| Section harrow                  | 2 section           | 20                            | 45     | 75    |
| Planter fertilizer              | 2 row               | 15                            | 35     | 50    |
| Cultivator                      | 2 row               | 20                            | 45     | 65    |
| Fertilizer spreader<br>(w/seed) | 8 foot              | 25                            | 55     |       |
|                                 | 12 foot             |                               |        | 80    |
| Sprayer                         | 6 row               |                               |        | 55    |
| Mower                           | 6 foot              | 30                            | 65     |       |
|                                 | 7 foot              |                               |        | 50    |
| Rotary mower                    | 6 foot              |                               |        | 50    |

<sup>a</sup>Drawbar Horsepower.

Source: A guide to procedures in Southern Research Project S-42, Revised, "An Economic Appraisal of Farming Adjustment Opportunities in the Southern Region to Meet Changing Conditions," (Unpublished, The University of Tennessee, Knoxville, 1963).



Groups I and II. Cotton allotment and price were applied to the representative farms according to the Food and Agriculture Act of 1965. From budgets worked out under various provisions of the Act, it was determined that most farmers would benefit most by taking the 35 per cent reduction in allotment. Thus on each of the representative farms, the original cotton allotment was reduced by 35 per cent and this amount of land was taken out of production as specified in the Act. Gross revenue from an acre of cotton was then figured by summing the following amounts:

1. the actual yield in pounds of lint per acre times 21 cents per pound,
  2. the projected yield per acre times 9.42 cents per pound, and
  3. the projected yield per acre, times 10.5 cents per pound,
- times the number of acres diverted, divided by the domestic allotment. The 21 cents represented the price-support loan value of cotton in 1966 while the 9.42 cents was the government price-support and the 10.5 cents was the diversion payment.

### Corn

It was assumed that corn could be grown on the same soil groups as cotton. Corn was permitted to be used either for feed or sold as cash grain. The assumed selling price of corn was \$1.10 per bushel while the purchase price was \$1.20 per bushel. The assumed prices used for the various products were based on the S-42 Project and on long-run

price projections from 1963. The projections reflect the long-term levels that might reasonably be expected in the study area.

#### Soybeans

Soybeans were assumed to be a cash crop only and could be grown on the same soil types as corn and cotton. There was no restriction on soybean acreage except available rowcrop land. For soybeans grown on land rented in, it was assumed that the land could be planted to soybeans only one year in three. This assumption prevented soil depletion and disease build-up and also limited the amount of soybean land available for renting. The assumed selling price for soybeans was \$2.40 per bushel.

#### Oats

Oats were used to represent small grains that might be grown in the area. In the Brown Soil Area, oats were double cropped with lespedeza pasture or hay. The budgets were developed on the assumption that lespedeza had an annual life. An oats-lespedeza activity was added to the farm enterprises in the Hill Area with lespedeza having a two-year life. Oats were converted to corn equivalents in the model in the ratio of 2.1 bushels of oats to one bushel of corn and were assumed to be used as grain for feed or sold in terms of corn equivalents.



### Forage

Hay equivalents and pasture were the two divisions of forage used. Five forage periods were used in order to insure a sufficient amount of forage for livestock throughout the season. A "forage transfer activity" was used in order to allow transfer of forage from one period to another with some reduction in feed value. Included in Table XIV are the assumed percentage distributions of forage growth by periods.

Orchard grass-ladino clover, bermuda-ladino, and lespedeza were possible pasture sources in the Brown Soil Area while bermuda-ladino was replaced by fescue-ladino in the Hill Area. Possible hay activities were alfalfa, orchard grass-ladino, lespedeza, and red clover hay in the Brown Soil Area and alfalfa, orchard grass-ladino, lespedeza, and fescue-ladino in the Hill Area. Hay could be purchased for \$30 per ton or sold for \$25 per ton.

### Dairy

Since Grade A milk production possibilities were rather restricted in the areas of study because of market limitations, ungraded or manufactured milk production was the only dairy alternative included in the model. A unit of this enterprise was composed of 10 cows. Each cow was assumed to produce 7,500 pounds of milk with 4.0 per cent butterfat content. Since this enterprise required large amounts of labor, its entrance into the optimum solutions was expected to be limited.

TABLE XIV

PERCENTAGE DISTRIBUTION OF DIFFERENT FORAGES BY PERIODS, WEST TENNESSEE, 1966<sup>a</sup>

| Period                | Orchard grass-<br>ladino clover | Lespedeza<br>following<br>oats | Lespedeza<br>alone | Bermuda<br>ladino | Fescue-<br>ladino |
|-----------------------|---------------------------------|--------------------------------|--------------------|-------------------|-------------------|
| I. Nov. 16 - Mar. 15  | 11                              | 0                              | 0                  | 3                 | 22                |
| II. Mar. 16 - May 31  | 41                              | 0                              | 3                  | 25                | 50                |
| III. June 1 - July 31 | 26                              | 47                             | 47                 | 36                | 15                |
| IV. Aug. 1 - Sept. 30 | 13                              | 42                             | 42                 | 28                | 3                 |
| V. Oct. 1 - Nov. 15   | 9                               | 11                             | 8                  | 8                 | 10                |

<sup>a</sup>The figures represent the per cent of cow acre days in each forage period for each of the particular enterprises.

Source: A Guide to Procedures in Southern Research Project S-42, Revised, "An Economic Appraisal of Farming Adjustment Opportunities in the Southern Region to Meet Changing Conditions," (Unpublished, The University of Tennessee, Knoxville, 1963).



### Swine

Two swine enterprises, referred to as Swine I and Swine II, were considered in this study. In both operations the costs and feed requirements were based on units of twelve sows each. Swine I consisted of farrowing pigs and feeding them out to a weight of approximately 210 pounds each. The assumed selling price of slaughter hogs was \$14.50 per hundredweight.

Swine II involved farrowing pigs and selling them as feeders at weaning time. The assumed price of feeder pigs was \$10.50 each for 40 pound pigs. In each operation the assumption was made that on the average two litters were farrowed by each sow with a total of sixteen pigs saved per sow per year. Sow death loss was assumed to be 2 per cent per year. Five gilts for replacements to the twelve-sow unit were also assumed along with a death loss of 3 per cent between weaning and marketing of hogs.

### Beef Cattle

Three types of beef enterprises were considered in this study. All three variations had a basic unit of 25 brood cows. Calves were assumed to be born in late January and February and pastured with the cows during the summer. Under Beef I the calves were sold in the fall at a weaning weight of approximately 500 pounds and a price of \$22.50 per hundredweight.

Under Beef II the steers and heifers were carried through the winter on a ration of ground corn and cob, cottonseed meal, and hay. This ration was assumed to be maintained for 150 days with an average daily gain of 1.4 pounds. After this period of time, the animals would be placed on a finishing ration similar to the wintering ration but in increased amounts. The heifers were on this ration for 50 days and gained an estimated 2.5 pounds daily. The steers were also assumed to gain 2.5 pounds daily but were kept on the ration 116 days and sold when they weighed approximately 1,000 pounds. Heifers were sold at about 800 pounds. Both steers and heifers were assumed to sell at \$23.50 per hundredweight.

With Beef III the calves were wintered the same as in Beef I, but the heifers were then fed for 50 days on a finishing ration and sold. The steers were pastured for 91 days following the wintering ration with an estimated daily gain of 1.1 pounds. Following this period the steers were placed on a finishing ration for 75 days and gained an assumed 2.5 pounds daily. Again both heifers and steers were assumed to sell at \$23.50 per hundredweight.

A ten per cent death loss was assumed on the calf crop under each beef activity. Of the 22 calves thus raised, four were kept to replace the culled cows and the remaining 18 calves were sold. Three per cent of the gross value of sales was allowed for shrinkage and a charge of \$2.50 per head was made for hauling and selling.



## VI. TRANSACTION ACTIVITIES

### Selling Land

Other activities, in addition to the farm production enterprises, included selling land, buying land, and renting land. These activities were added in order to give the part-time and part-retired farmer situations a wider choice of possible solutions to land problems. The activity of selling land was included to determine if the farmer might improve his position by selling his farm completely, and also to determine whether it would be better to sell or to rent out land.

The selling price for land in the Brown Soil Area was assumed to be \$350 per acre. This price was determined from the PCA survey and was assumed to include both land and farm buildings, but not equipment and/or the homestead. In the Hill Area the selling price was assumed to be \$125 per acre. When an acre of land was sold, it included percentages of all the various types of land that constituted the farm. Thus the less productive land could not be sold without selling some of all the other land from a particular farm.

### Buying Land

The buying land activity would enable the farmer to expand his soil types in the same ratio as his original holdings. Thus one was not permitted to buy only open land. It was assumed, in the programming model, that quantities of land could be purchased up to the amount of the farmer's initial farm size. The purchase prices were \$350 in the Brown Soil Area and \$125 in the Hill Area.

### Renting Land

Land was permitted to be either rented in or rented out. Renting of land could be done only for cotton, corn, soybeans, and/or pasture. An activity of renting the entire farm for a cash amount was not included in the model, but this possibility is considered in Chapter IV. Pasture could be rented on a cash basis only. From the PCA survey it was determined that unimproved pasture land could be rented annually for \$10 per acre. In this study the assumption was made that the pasture land was rented on a long enough term so that the renter would be secure in making any improvements he wished.

The row crop rental activities (cotton, corn, and soybeans) could be rented on either a cash or share basis. Each farm situation was first programmed with all renting on a cash basis, then on a one-fourth basis, one-third basis, and finally on a one-half basis. A mixture of these arrangements was not considered since previous research indicates that the optimum arrangement exists when the income from each enterprise is shared in the same proportion.<sup>1</sup>

The cash rental rates for the various crops, as determined from the PCA survey, were as follows:

| <u>Crop</u> | <u>Annual rental rate per acre</u> |
|-------------|------------------------------------|
| Cotton      | \$50                               |
| Corn        | \$20                               |
| Soybeans    | \$17                               |

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<sup>1</sup>Marshall Harris and Virgil Hurlburt, "Your Farm Rent Determination Problem" (Washington, D. C.: U. S. Department of Agriculture), Farmers' Bulletin No. 2162, June, 1961.



Thus the profit per acre of cotton rented in would be the net profit per acre for an owner, assuming no charge for land, minus a rental charge of \$50. Cotton rented out on a cash basis was assumed to yield a profit of \$50 per acre plus a government payment of approximately \$36.66 per acre of domestic allotment for retiring 35 per cent of the cotton acreage. The amount of cotton land which could be rented in was restricted to the amount of cotton allotment already on the farm. Thus cotton acreage on a given farm could be doubled.

The one-fourth and one-third share rents were determined through the use of the budgets for the representative farms. For the one-fourth arrangements, the renter received three-fourths of the receipts from the crops sold and furnished the resources as shown in Table XV. The landowner furnished the remaining share of resources and received one-fourth of the gross receipts. The one-third rental arrangements were determined similarly.

Since many part-time and part-retired farmers already have their equipment, a one-half rental arrangement was programmed whereby the landowner received one-half of the gross receipts and furnished the equipment along with his share of the expenses as shown in Table XV. In all cases the person furnishing the equipment paid all of the fixed expenses since most of the fixed expenses were assumed to be connected with the equipment. The total amount of land that could be rented in was restricted to the number of acres of open land already on the farm up to 100 acres. This would permit the small- and medium-size farms to

TABLE XV

SHARES OF SELECTED EXPENSES ASSUMED TO BE FURNISHED BY THE  
RENTER OF ROW CROPS UNDER VARIOUS SHARES OF REVENUE

| Share of revenue                                  | Cotton |     |      | Corn |     |      | Soybeans |      |      |
|---------------------------------------------------|--------|-----|------|------|-----|------|----------|------|------|
|                                                   | 3/4    | 2/3 | 1/2  | 3/4  | 2/3 | 1/2  | 3/4      | 2/3  | 1/2  |
| - - - Share of expenses furnished by renter - - - |        |     |      |      |     |      |          |      |      |
| <u>Expense</u>                                    |        |     |      |      |     |      |          |      |      |
| Labor                                             | All    | All | All  | All  | All | All  | All      | All  | All  |
| Seed                                              | 3/4    | 2/3 | 1/2  | 3/4  | 2/3 | All  | 3/4      | 2/3  | 1/2  |
| Fertilizer                                        | 3/4    | 2/3 | 1/2  | 3/4  | 2/3 | All  | 3/4      | 2/3  | 1/2  |
| Insecticide                                       | 3/4    | 2/3 | 1/2  | a    | a   | a    | a        | a    | a    |
| Defoliant                                         | 3/4    | 2/3 | 1/2  | a    | a   | a    | a        | a    | a    |
| Ginning                                           | 3/4    | 2/3 | 1/2  | a    | a   | a    | a        | a    | a    |
| Harvesting                                        | All    | All | All  | All  | All | All  | All      | All  | 1/2  |
| Poison                                            | 3/4    | 2/3 | 1/2  | a    | a   | a    | a        | a    | a    |
| Tractor                                           | All    | All | None | All  | All | None | None     | None | None |
| Other equip.                                      | All    | All | None | All  | All | None | None     | None | None |

<sup>a</sup>Does not apply to this crop.



double their open acreage. This restriction was placed in the model because of the lack of available land to rent within a close proximity of the representative farm.

## CHAPTER IV

### RESULTS OF THE PROGRAMMING ANALYSIS

#### I. LINEAR PROGRAMMING

Linear programming was used in this study to obtain optimum organizations for specified representative farm resource situations. The optimum solutions that were sought were those combinations of farm activities which would maximize net farm income within the resource constraints.

A linear programming problem has the following quantitative components: (1) an objective, (2) alternative methods for attaining the objective, and (3) resource restrictions. In addition, there are four assumptions which are the basis for linear programming. First, the assumption of linearity assumes that resource inputs combine in fixed proportions for all levels of output. The second assumption, divisibility, indicates that resources can be used and products can be produced in fractional quantities. Additivity, the third assumption, means that the total amount of resources used by enterprises must equal the sum of those used by the individual enterprises. The fourth basic assumption, finiteness, implies that a limit exists as to the number of alternatives that can be considered.<sup>1</sup>

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<sup>1</sup>Earl O. Heady and Wilfred Candler, Linear Programming Methods (Ames, Iowa: Iowa State University Press, 1963), pp. 17-18.



An analysis of the results of the programming, using these basic assumptions and the resources and activities specified previously, is presented in this chapter. The results of the programming for the Brown Soil Area will be considered first, followed by a discussion of solutions for the Hill Area. The solutions for the small, medium and large farms are presented separately. On each farm size, the effect of the various types of rental arrangements upon net profit and types of enterprises are discussed, followed by an analysis of the effect of different labor supplies upon net profit and types of enterprises. Finally, the profitability of renting or selling the entire farm is compared.

Three key terms used in the analysis of the programs were "enterprise," "activity," and "operation." "Enterprise," as used in this thesis, refers to the various crops grown and types of livestock raised. "Activity" includes the various farm enterprises but also refers to the other alternatives used in the model such as the renting of land. "Operation" refers to the entire farm program under a particular rental arrangement and either the part-time or full-time labor system.

## II. BROWN SOIL AREA

### Small Farm

The small farm consisted of 54.3 acres. Of this total, 38.8 acres were in open land with an effective cotton allotment of 9.5 acres. Since this study applied the latest cotton legislation, the domestic cotton allotment was 6.2 acres which was 65 per cent of the effective allotment.

Very little effect on net income was found to result from the various rental arrangements programmed for the small farm. This was true under both the part-time and full-time labor supplies. The mean deviation of the net incomes from the cash, one-fourth, one-third, and one-half rental arrangements was only \$.75 with the part-time labor supply. The mean deviation is an indication of the "scatteration" of individual values around the average or central value of a group of values.<sup>2</sup> Under the full-time labor supply, the mean deviation was \$71, indicating that the type of rental method used had a small effect on net profit. This small effect of the type of rental arrangement used on net farm income indicates that both the part-time and full-time operator of a small farm could be indifferent to using either cash, one-fourth, one-third, or one-half rental arrangements. Although the optimal solution for the small farm did not include much land renting, the land rental activity did enter the solutions. The small farm operator, thus, would maximize net farm income by renting some land under either type of rental arrangement programmed.

The principal activities which entered in the optimum solution under the two different labor supplies and the various rental arrangements are shown in Table XVI. Instead of presenting the fractional units given in the basic programming solutions, the unit values are rounded to the nearest whole number or the nearest tenth. The types and amounts

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<sup>2</sup>Mordecai Ezekiel and Karl A. Fox, Methods of Correlation and Regression Analysis (New York: John Wiley & Sons, Inc., 1959), pp. 7-8.



TABLE XVI

OPTIMUM ENTERPRISE ORGANIZATIONS AND NET PROFITS UNDER VARIOUS RENTAL  
ARRANGEMENTS AND DIFFERENT LABOR SUPPLIES FOR SMALL FARM IN THE  
BROWN SOIL AREA OF WEST TENNESSEE, 1966

| Activity                     | Unit | Part-time Labor Supply |        |       |       | Full-time Labor Supply |        |        |        |
|------------------------------|------|------------------------|--------|-------|-------|------------------------|--------|--------|--------|
|                              |      | Rental Arrangements    |        |       |       | Rental Arrangements    |        |        |        |
|                              |      | Cash                   | Fourth | Third | Half  | Cash                   | Fourth | Third  | Half   |
| Net profit                   | \$   | 1,796                  | 1,794  | 1,795 | 1,795 | 3,953                  | 4,096  | 3,947  | 4,089  |
| Open land                    |      |                        |        |       |       |                        |        |        |        |
| Cotton                       | Acre | 4.1                    | 4.2    | 4.1   | 4.1   | 12.4                   | 12.4   | 12.4   | 12.4   |
| Cotton rented in             | Acre |                        |        |       |       | (6.2)                  | (6.2)  | (6.2)  | (6.2)  |
| Corn                         | Acre | 8.8                    | 9.0    | 8.8   | 8.8   | 20.6                   | 24.9   | 16.6   | 38.0   |
| Corn rented in               | Acre |                        |        |       |       | (10.2)                 | (15.3) | (6.7)  | (32.6) |
| Soybeans                     | Acre | 1.0                    | 1.7    | 1.0   | 1.0   |                        |        |        | 5.3    |
| Pasture                      | Acre | 6.3                    | 5.6    | 6.3   | 6.3   | 31.6                   | 28.4   | 35.1   | 17.2   |
| Pasture rented in            | Acre |                        |        |       |       | (22.4)                 | (17.3) | (25.9) |        |
| O. Grass-Lad. hay            |      |                        |        |       |       |                        |        |        |        |
| and pasture                  | Acre | 2.7                    | 2.5    | 2.7   | 2.7   | 11.7                   | 10.2   | 11.4   | 6.1    |
| Alfalfa hay                  | Acre |                        |        |       |       |                        | 1.1    |        | 1.1    |
| Total open land <sup>a</sup> | Acre | 22.9                   | 23.0   | 22.9  | 22.9  | 76.3                   | 77.0   | 75.5   | 80.1   |
| Land rented out              |      |                        |        |       |       |                        |        |        |        |
| Cotton                       | Acre | 2.1                    | 2.0    | 2.1   | 2.1   |                        |        |        |        |
| Pasture                      | Acre | 8.2                    | 11.1   | 8.2   | 8.2   |                        |        |        |        |
| Total                        | Acre | 10.3                   | 13.1   | 10.3  | 10.3  |                        |        |        |        |



TABLE XVI (continued)

| Activity           | Unit | Part-time Labor Supply |        |       |       | Full-time Labor Supply |        |        |        |
|--------------------|------|------------------------|--------|-------|-------|------------------------|--------|--------|--------|
|                    |      | Rental Arrangements    |        |       |       | Rental Arrangements    |        |        |        |
|                    |      | Cash                   | Fourth | Third | Half  | Cash                   | Fourth | Third  | Half   |
| Land purchased     | Acre |                        |        |       |       | 2.8                    | 4.2    | 1.9    | 8.2    |
| Land sold          | Acre | 1.4                    | 1.1    | 1.5   | 1.5   |                        |        |        |        |
| Idle land          | Acre | 1.4                    | 1.0    | 1.4   | 1.4   |                        |        |        |        |
| Corn purchased     | Bu.  | 53.8                   |        | 54.9  | 55.5  | 39.8                   |        | 482.0  |        |
| Hay sold           | Ton  |                        |        |       |       |                        | 3.7    |        | 4.2    |
| Livestock          |      |                        |        |       |       |                        |        |        |        |
| Market hogs        | Sow  | 4.0                    | 4.0    | 4.0   | 4.0   |                        |        |        |        |
| Feeder pigs        | Sow  |                        |        |       |       | 28.0                   | 29.0   | 28.0   | 32.0   |
| Beef cattle        | Cow  | 3.0                    | 3.0    | 3.0   | 3.0   |                        |        |        |        |
| Dairy cattle       | Cow  |                        |        |       |       | 12.0                   | 12.0   | 12.0   | 6.0    |
| Annual capital     | \$   | 490                    | 385    | 525   | 525   | 1,302                  | 1,155  | 1,749  | 1,110  |
| Investment capital | \$   | 2,690                  | 2,638  | 2,690 | 2,795 | 11,242                 | 11,687 | 10,953 | 10,166 |
| Labor              |      |                        |        |       |       |                        |        |        |        |
| Available          | Hour | 600                    | 600    | 600   | 600   | 2,865                  | 2,865  | 2,865  | 2,865  |
| Used               | Hour | 445                    | 440    | 445   | 445   | 2,497                  | 2,452  | 2,540  | 2,265  |

<sup>a</sup>Does not include 3.3 acres of cotton acreage diverted.



of activities used under the various rental methods were very similar. The types of enterprises engaged in, however, were very different between the part-time and full-time labor supplies.

Due to the limited amount of labor available on the part-time operation (600 hours), one-third of the cotton and some pasture land were rented out. Since the one-fourth rental arrangement was not as favorable for the landowner who rents out, one-tenth acre less of cotton was rented out on fourths which caused a slight change in the levels of other activities. Three beef brood cows entered the solution with 600 hours of labor available in order to make use of pasture that was not rented out and to utilize labor in slack periods. All beef activities which entered the optimum solution under any arrangement and on any size farm were of the Beef III type. Beef III was the cow-calf enterprise where the heifers were on a finishing ration for 50 days, and the steers were on pasture for 91 days and then were assumed to be put on the finishing ration for 75 days. In no instance was beef cattle a major enterprise. The only dairy enterprise included in the representative farm solutions for the Brown Soil Area was on the small farm with the full-time labor supply.

Since one of the assumptions of this study was that part-time or seasonal labor was difficult to hire, the small farm was not permitted to hire additional labor. Other enterprises which differed with the two alternative labor supplies other than beef and dairy included swine, cotton land rental, corn land rental, and land purchase (Table XVI,

page 56). Under the part-time labor situations, market hogs were raised, some cotton land was rented out, no corn land was rented, and approximately one and one-half acres of land were sold. With the full-time labor systems, feeder pigs were raised, cotton land was rented in, corn land was rented in, and up to 8.2 acres of land were purchased. More operating capital was needed under the full-time labor systems and over \$10,000 of investment capital was also needed. Thus, the labor supply had a major effect on the types of enterprises entering the optimal solutions.

While the effect of the various rental arrangements on net income was not too important, the difference between the part-time and full-time labor supplies was appreciable. The average net income under the full-time labor system was \$4,021 while the average income under the part-time labor supply was \$1,795. Thus, the operator of the small farm would need to earn slightly over \$2,400 off the farm to justify his non-farm job since he could only increase his farm income by this amount if he farmed full-time. This analysis does not consider personal preferences of the operators and unusual circumstances. Also, the net income figures are the result of the resource restrictions and assumptions set forth in previous chapters.

If the owner of a small farm such as the 54 acre farm which was programmed did not wish to farm at all, he could rent or sell his land. The part-time farmer on the small farm which was programmed would have to rent his open land for at least \$46 per acre in order to exceed the



net income he could expect to earn by farming part-time. The full-time farmer, on the other hand, would need to rent his open land for at least \$104 per acre. Assuming that the owner of this 54 acre farm could sell the farm for \$350 per acre and could receive 5 per cent interest on the money, his return the first year would be less than \$900. Thus, the owner would benefit most by either farming part-time and earning over \$2,200 at an off-farm job or by working at the off-farm job and renting the open acreage for at least \$46 per acre.

#### Medium Farm

The medium-size farm for the Brown Soil Area consisted of 130.3 acres of land. There were 93.2 acres of open land with a domestic cotton allotment of 14.9 acres. The medium- and large-size farms were programmed as commercial farms with the amount of labor that could be hired restricted so that only a one-man unit could be hired. The cost of a unit of labor (2,865 hours) was assumed to be \$3,600 annually. These two farm sizes were programmed in order to determine whether or not the operators would benefit by farming part-time and to determine what farm operation would be most profitable for a part-retired operator.

With renting done on either fourths, thirds, or on a cash basis, the same enterprises were optimum although the size of a particular enterprise varied from one rental arrangement to another. Under the one-half rental arrangement and the part-time labor supply, the types of enterprises which were optimum were not the same as the enterprises with the other rental arrangements. The main differences were that

cotton land was rented out, capital requirements were less, and less labor was required with the one-half share arrangement. While there was little cotton land rented, 17 acres of soybeans and up to 46 acres of corn were rented in under various arrangements (Table XVII). The rental of this amount of land accounted for the mean deviation of \$95.63 among the net incomes from the part-time operations and a mean deviation of \$117.62 among the net incomes from the full-time operations. These differences were probably not significant enough to be critical in deciding which rental arrangement to use. Other factors, however, such as the risks associated with a cash rent as compared to a crop share rent should be considered. While the present study did not attempt to study the advantages and disadvantages of cash rent and share rents from the standpoint of management and risk problems, the effect upon net profit and types of enterprises of the various rental arrangements were studied.

The primary production enterprises entering in the optimum solutions for the medium-size farm, for both labor supplies, were cotton, corn, and market hogs. Table XVII shows the principal activities in the optimum solutions and the resulting net profits. The labor supplies were very close to the same amount for the part-time and full-time operations since additional labor was hired under the part-time operation. The 130 and 214 acre farms were programmed first whereby a fractional unit of a hired operator could enter the solution. Those operations which required between one-half and one full unit of hired



TABLE XVII

OPTIMUM ENTERPRISE ORGANIZATIONS AND NET PROFITS UNDER VARIOUS RENTAL  
ARRANGEMENTS AND DIFFERENT LABOR SUPPLIES FOR MEDIUM-SIZE  
FARM IN THE BROWN SOIL AREA OF WEST TENNESSEE, 1966

| Activity                         | Unit | Part-time Labor Supply |        |        |        | Full-time Labor Supply |        |        |        |
|----------------------------------|------|------------------------|--------|--------|--------|------------------------|--------|--------|--------|
|                                  |      | Rental Arrangements    |        |        |        | Rental Arrangements    |        |        |        |
|                                  |      | Cash                   | Fourth | Third  | Half   | Cash                   | Fourth | Third  | Half   |
| Net profit                       | \$   | 3,507                  | 3,743  | 3,449  | 3,508  | 6,521                  | 6,755  | 6,484  | 6,322  |
| Open land                        |      |                        |        |        |        |                        |        |        |        |
| Cotton                           | Acre | 17.5                   | 19.9   | 17.9   | 6.2    | 14.9                   | 16.1   | 14.9   | 14.9   |
| Cotton rented in                 | Acre | (2.6)                  | (5.4)  | (3.0)  |        |                        | (1.2)  |        |        |
| Corn                             | Acre | 67.6                   | 65.1   | 67.3   | 17.5   | 64.7                   | 63.0   | 63.4   | 39.9   |
| Corn rented in                   | Acre | (45.3)                 | (43.9) | (45.1) |        | (46.6)                 | (45.7) | (46.2) | (21.1) |
| Soybeans                         | Acre |                        |        |        | 18.8   | 2.5                    | 2.5    | 2.5    | 17.0   |
| Soybeans rented in               | Acre |                        |        |        | (17.0) |                        |        |        | (17.0) |
| Pasture                          | Acre | 30.6                   | 29.3   | 30.5   | 22.4   | 21.1                   | 28.2   | 25.9   | 26.8   |
| Alfalfa                          | Acre |                        | 1.4    | 8.8    |        |                        |        |        |        |
| O. Grass-Lad. hay<br>and pasture | Acre | 6.5                    | 9.2    | 6.4    | 4.9    | 2.5                    | 5.9    | 5.1    | 5.7    |
| Oats-Lesp. hay                   | Acre | 8.7                    |        |        |        | 4.8                    |        |        |        |
| Red clover hay                   | Acre |                        |        |        | 10.8   | 8.6                    | 8.4    | 8.4    | 8.4    |
| Total open land <sup>a</sup>     | Acre | 130.9                  | 124.9  | 130.9  | 80.6   | 119.1                  | 124.1  | 120.2  | 112.7  |
| Cotton rented out                | Acre |                        |        |        | 8.6    |                        |        |        |        |
| Land sold                        | Acre |                        |        |        |        |                        |        |        |        |
| Idle land                        | Acre | 2.7                    | 6.8    | 3.2    | 14.9   | 8.5                    | 11.6   | 11.9   | 14.8   |
|                                  |      |                        |        |        |        | 6.3                    |        |        |        |

TABLE XVII (continued)

| Activity           | Unit | Part-time Labor Supply |        |        |       | Full-time Labor Supply |        |        |       |
|--------------------|------|------------------------|--------|--------|-------|------------------------|--------|--------|-------|
|                    |      | Rental Arrangements    |        |        |       | Rental Arrangements    |        |        |       |
|                    |      | Cash                   | Fourth | Third  | Half  | Cash                   | Fourth | Third  | Half  |
| Corn purchased     | Bu.  | 572                    | 1,581  | 1,862  | 2,648 | 487                    | 1,409  | 1,580  | 2,749 |
| Hay sold           | Ton  | 5.7                    |        | 22.2   | 20.5  | 19.9                   | 14.3   | 16.3   | 14.3  |
| Livestock          |      |                        |        |        |       |                        |        |        |       |
| Market hogs        | Sow  | 30.0                   | 29.0   | 30.0   | 21.0  | 28.0                   | 27.0   | 27.0   | 26.0  |
| Beef cattle        | Cow  | 6.0                    | 9.0    | 6.0    | 5.0   | 2.0                    | 6.0    | 5.0    | 5.0   |
| Annual capital     | \$   | 5,997                  | 6,388  | 6,468  | 5,455 | 3,215                  | 4,228  | 4,262  | 5,348 |
| Investment capital | \$   | 11,352                 | 11,795 | 11,315 | 7,302 | 9,702                  | 10,431 | 10,197 | 8,864 |
| Labor              |      |                        |        |        |       |                        |        |        |       |
| Operator hired     | Man  | 1.0                    | 1.0    | 1.0    | .4    |                        |        |        |       |
| Available          | Hour | 3,465                  | 3,465  | 3,465  | 1,746 | 2,865                  | 2,865  | 2,865  | 2,865 |
| Used               | Hour | 2,714                  | 2,678  | 2,706  | 1,746 | 2,471                  | 2,462  | 2,446  | 2,264 |

<sup>a</sup>Does not include 8 acres of cotton acreage diverted.



operator labor supply were then programmed with one full-time man hired. On the medium-size farm the net profit decreased by approximately \$100 when the full unit was forced into the model under the cash, one-fourth, and one-third share rents. Since the optimum solution for the one-half share arrangement and the part-time labor supply included only .42 of a hired operator, a full-time man was not hired. From an economic point-of-view, the part-time farmer on this size farm would not operate on the one-half share basis unless he could be assured of the 1200 hours of hired labor ( $.42 \times 2865$  hours of labor) and someone to rent the cotton land and manage the hog enterprise. If no labor were forced into the model, the one-half share rental would be much less profitable than the other types of rental arrangements.

Where one full-time man was hired, only a small amount of land was sold. The amount of investment capital was approximately \$4,000 lower with the one-half arrangement and the part-time labor supply since no corn land was rented in and the swine operation was smaller. With both types of labor supplies, the one-fourth rental systems required the greatest investment capital and rented in the most cotton acreage. The primary difference between the part-time and full-time operations, with respect to type of activities, was that less land was sold when one man was hired under the part-time situation.

The net incomes or profits (Table XVII) with the part-time labor supply varied from \$3,507 for the cash arrangement to \$3,743 with renting on fourths. With the full-time labor supply, net profits ranged

from \$6,322 on one-half rentals to \$6,755 with the one-fourth rental arrangements. The average net income for the part-time operator was \$3,552 while the average net income for the full-time operator was \$6,520. Thus, the farm owner would need to earn approximately \$3,000 off the farm for his total income to equal the net farm income if he farmed full-time. The owner of this medium-size farm would probably prefer to operate the farm himself as long as he could not earn at least as much off the farm as the hired operator would have to be paid. Considering the average net incomes from the various rental arrangements, the part-time farmer would have to rent his open land to some other farmer for \$38 per acre to exceed his part-time farm income. If the full 130 acres were sold at \$350 per acre, the entire amount invested at 5 per cent interest would yield less than \$2,300 annually. If it is assumed that a part-retired farmer has no labor of his own available and he hires an operator for \$3,600 annually, the optimum farm organization would be the same as that for the full-time operator. Net profit, however, would be reduced by \$3,600 thus providing about \$2,900 return to land and capital. If the part-retired farmer could rent his open land for about \$31 per acre, his income would exceed the \$2,900 farm income.

### Large Farm

The large farm for the Brown Soil Area consisted of 213.8 acres with 153 acres of open land. The domestic cotton allotment was 24.4



acres. The one man labor supply was sufficient for this size operation except for about 286 hours needed in critical labor periods. With the part-time labor supply, an additional 2,000 hours of labor (.7 of a man) were hired at a cost of \$2,500 in order to obtain maximum net profit. Under the assumptions of the study, however, a fractional unit of operator labor could not be hired. Thus, one full-time man was hired on the part-time operations. By forcing this into the solution net profit was reduced by only \$35.

A noticeable difference between the large farm and the small- and medium-size farms was the fact that on the large farm the maximum amount of cotton was grown and the maximum amount of cotton land was rented in under all of the various rental arrangements (Table XVIII). While most of the corn was grown on the operator's own farm, soybean land was rented in altogether. Due to the large hog enterprise and the need for corn on this size farm, corn was grown on the operator's farm rather than the operator renting in corn land and paying part of the corn yield as rent. In the case of cash renting, corn could be grown on the owned land more economically than it could be rented at \$20 per acre. The large amounts of cotton, corn, soybeans, and hogs in the optimal organization indicate the size of enterprises than can be operated with a one-man labor supply.

Since the types and amounts of enterprises engaged in by the part-time and full-time operators were so similar, the mean deviations of the net incomes from the various rental arrangements were approxi-

TABLE XVIII

OPTIMUM ENTERPRISE ORGANIZATIONS AND NET PROFITS UNDER VARIOUS RENTAL  
ARRANGEMENTS AND DIFFERENT LABOR SUPPLIES FOR THE LARGE FARM  
IN THE BROWN SOIL AREA OF WEST TENNESSEE, 1966

| Activity                     | Unit | Part-time Labor Supply |        |        |        | Full-time Labor Supply |        |        |        |
|------------------------------|------|------------------------|--------|--------|--------|------------------------|--------|--------|--------|
|                              |      | Rental Arrangements    |        |        |        | Rental Arrangements    |        |        |        |
|                              |      | Cash                   | Fourth | Third  | Half   | Cash                   | Fourth | Third  | Half   |
| Net profit                   | \$   | 6,518                  | 6,900  | 6,453  | 6,099  | 9,449                  | 9,832  | 9,384  | 9,030  |
| Open land                    |      |                        |        |        |        |                        |        |        |        |
| Cotton                       | Acre | 48.8                   | 48.8   | 48.8   | 48.8   | 48.8                   | 48.8   | 48.8   | 48.8   |
| Cotton rented in             | Acre | (24.4)                 | (24.4) | (24.4) | (24.4) | (24.4)                 | (24.4) | (24.4) | (24.4) |
| Corn                         | Acre | 25.7                   | 25.8   | 25.8   | 31.6   | 32.6                   | 36.1   | 32.7   | 32.8   |
| Corn rented in               | Acre |                        |        |        |        |                        | (4.8)  |        |        |
| Soybeans                     | Acre | 25.2                   | 25.2   | 25.2   | 25.2   | 25.2                   | 22.0   | 25.2   | 25.2   |
| Soybeans rented in           | Acre | (25.2)                 | (25.2) | (25.2) | (25.2) | (25.2)                 | (22.0) | (25.2) | (25.2) |
| Pasture                      | Acre | 23.9                   | 23.9   | 23.9   | 23.9   | 16.6                   | 16.6   | 16.6   | 16.6   |
| Oats-Lesp. hay               | Acre | 11.3                   | 11.3   | 11.3   | 11.3   | 12.3                   | 12.3   | 12.3   | 12.3   |
| Red clover hay               | Acre | 17.1                   | 17.1   | 17.1   | 17.1   | 16.8                   | 17.5   | 15.8   | 15.8   |
| Total open land <sup>a</sup> | Acre | 152.0                  | 152.1  | 152.1  | 157.9  | 152.3                  | 153.3  | 151.4  | 151.5  |
| Pasture rented out           | Acre | 4.3                    | 4.4    | 4.5    | 4.6    | 21.2                   | 22.0   | 21.4   | 21.5   |
| Land sold                    | Acre | 28.9                   | 28.9   | 28.4   | 28.0   | 12.6                   | 11.1   | 12.1   | 11.6   |
| Idle land                    | Acre | 11.7                   | 11.7   | 11.7   | 11.7   | 8.0                    | 7.8    | 8.0    | 8.0    |
| Market hogs                  | Sow  | 37.0                   | 37.0   | 37.0   | 37.0   | 25.0                   | 25.0   | 25.0   | 25.0   |



TABLE XVIII (continued)

| Activity           | Unit | Part-time Labor Supply |        |        |        | Full-time Labor Supply |        |       |       |
|--------------------|------|------------------------|--------|--------|--------|------------------------|--------|-------|-------|
|                    |      | Rental Arrangements    |        |        |        | Rental Arrangements    |        |       |       |
|                    |      | Cash                   | Fourth | Third  | Half   | Cash                   | Fourth | Third | Half  |
| Corn purchased     | Bu.  | 4,632                  | 4,619  | 4,614  | 4,597  | 1,810                  | 1,553  | 1,791 | 1,773 |
| Hay sold           | Ton  | 41.3                   | 41.4   | 41.4   | 41.5   | 40.1                   | 43.6   | 40.2  | 40.3  |
| Annual capital     | \$   | 10,610                 | 10,506 | 10,436 | 10,297 | 4,890                  | 4,408  | 4,717 | 4,543 |
| Investment capital | \$   | 11,889                 | 11,888 | 11,887 | 11,041 | 9,498                  | 9,482  | 9,496 | 8,649 |
| Labor              |      |                        |        |        |        |                        |        |       |       |
| Operator hired     | Man  | 1.0                    | 1.0    | 1.0    | 1.0    |                        |        |       |       |
| Available          | Hour | 3,465                  | 3,465  | 3,465  | 3,465  | 2,865                  | 2,865  | 2,865 | 2,865 |
| Used               | Hour | 2,835                  | 2,835  | 2,835  | 2,835  | 2,305                  | 2,304  | 2,305 | 2,304 |

<sup>a</sup>Does not include 13.1 acres of cotton acreage diverted.

mately equal. The mean deviation under the part-time operation was \$216.50 while the mean deviation with the full-time operation was \$216.78. Only the one-half rental arrangements differed from the other arrangements with respect to size of activities entering the solutions and these differences were reflected primarily in the capital requirements which were necessary. Since the types and sizes of enterprises which were optimum were practically the same for the various situations programmed, the one-fourth rental arrangement would seem to be somewhat more profitable where this amount of land was rented in. There was no practical method of determining the level of significance of the differences among the various profit levels, but for the farm which was programmed, the one-fourth rental system was the most profitable under both labor supplies.

The net profits of over \$9,000 from the full-time operations of the large farm indicates what can be accomplished with a one-man labor supply and the renting of land. Approximately 24 acres of cotton and 25 acres of corn were rented in while about 20 acres of pasture land were rented out. On the large farm a rather large amount of hay was sold which is not a common practice of many farmers in the Brown Soil Area. The 40 tons of alfalfa equivalent which were sold yielded a gross income of \$1,000. Although no labor was hired on the full-time operations, this study did not rule out the possibility of farmers exchanging labor during such times as hay harvesting.



The average net income under the full-time labor system was \$9,424 while the average under the part-time labor supply was \$6,492. Thus, the operator of the large farm would need to earn slightly over \$2,900 at an off-farm job in order for his total income to equal the expected net farm income if he farmed full-time. Since the full-time farmer could earn approximately \$9,000 net farm income, he would be in a better position to forego an off-farm job than would be the operators of the small- and medium-size farms. If the part-retired farm owner could hire an operator for \$3,600 a year, his net profit would be approximately \$5,800 with the same farm organization shown in Table XVIII, page 67, under the full-time labor supply.

The owner of the large farm would need to rent his open land for slightly over \$42 per acre to exceed the income from the part-time operation. The part-retired operator, on the other hand, would need to rent his open acreage for approximately \$38 per acre to exceed the expected net farm income level. If the entire 214 acres were sold at \$350 per acre and invested at 5 per cent interest, the interest would amount to \$3,741 per year.

### Summary

The principal enterprises which entered the optimum solutions under the two different labor supplies and the various rental arrangements in the Brown Soil Area were cotton, corn, and market hogs. Since only a small amount of land was rented on the small farm, the type of

rental arrangement was not too important. The small farm operator, however, would maximize net farm income by renting some land under either type of rental arrangement programmed since some land rental entered each optimal solution. On the medium- and large-size farms where land was rented in, except pasture land, the one-fourth rental arrangement yielded the most profit. Since pasture land was rented only on a cash basis, the type of rental arrangement had no effect on rental of pasture. The renting of pasture land and the selling of hay were activities which entered the optimal solutions but are not important in the Brown Soil Area at the present time. As stated previously, hay was assumed to sell for \$25 a ton and pasture land was rented out at \$10 per acre.

The activities engaged in on the small farm with only 600 hours of labor available indicate what could be expected on the medium and large farms if only this amount of labor were available. The only change in net income would come from the additional land which was either rented out or sold.

The average net profits from the various rental arrangements, under the different labor supplies, are given below for each of the farms:

| <u>Farm Size</u> | <u>Part-Time Operation</u> | <u>Full-Time Operation</u> |
|------------------|----------------------------|----------------------------|
| Small            | \$1,795.16                 | \$4,021.42                 |
| Medium           | 3,551.75                   | 6,520.36                   |
| Large            | 6,492.50                   | 9,424.17                   |

The difference between the part-time and full-time labor systems on the small farm was approximately \$2,200 while this difference for the



medium and large farms was somewhat over \$2,900. The full-time operators of the latter two farm sizes could earn net incomes of over \$6,000 without hiring additional labor or working off the farm. The linear programming results also indicated that the part-retired farmer could afford to hire a farm operator for \$3,600 annually to operate the medium- and large-size farms. This would be true only if the retired farmer had the equipment which this study assumed to be available.

### III. HILL AREA

#### Small Farm

The small farm for the Hill Area consisted of 109.8 acres of land. There were 53.7 acres of open land with a domestic cotton allotment of 5.1 acres. Since alfalfa can be grown economically on only certain soil types, a restriction was included in the programs which limited the amount of alfalfa which could be grown. This restriction for the small farm was 5.5 acres for Soil I. The maximum amount of alfalfa on Soil I permitted in the model could be grown profitably on practically all of the farm operations in the Hill Area. This enterprise was important since alfalfa yield on Soil I was relatively high compared with the yields from other crops. On the small- and medium-size farms, hay was assumed to be custom raked and baled, thus reducing the labor requirements. The alfalfa was sold at \$25 per ton and was not fed on the farm. Assuming that a market is available, these hay production and selling activities would be profitable enterprises in the Hill Area.

Since there was little renting done on the small farm, the effect of the various rental arrangements on net profit was not great. Net profit varied from \$1,795 with renting on halves to \$1,861 with cash rents for the part-time operations (Table XIX). The mean deviation among the net profits for the part-time operations was \$20.20. The higher net profit under the cash rental system indicated that renting out cotton land at \$50 per acre and corn land at \$20 per acre was more advantageous than the share of crops received as rent. Likewise, on the full-time operations, cotton land rented in on a cash basis was not as profitable as renting in cotton acreage and paying a share of the crop. After analyzing the optimum solutions, it seemed that the cash rental costs which were assumed for the Hill Area were somewhat higher than they needed to be for the cash rent to compete with the share rents. For the full-time operations, the mean deviation of the net incomes was \$25.25. The incomes ranged from \$4,642 with the cash arrangement to \$4,729 with renting on fourths.

The principal activities which entered in the optimum solutions under the two different labor supplies and the various rental arrangements are shown in Table XIX. Approximately one-half of the cotton allotment was rented out with the part-time labor supply while the maximum amount of cotton land was rented in with the full-time labor supply except under the cash arrangement. The only corn land rented was the small amounts rented out under the cash and one-third rental arrangements on the part-time operations. With the full-time labor



TABLE XIX

OPTIMUM ENTERPRISE ORGANIZATIONS AND NET PROFITS UNDER VARIOUS RENTAL  
ARRANGEMENTS AND DIFFERENT LABOR SUPPLIES FOR SMALL FARM IN THE  
HILL AREA OF WEST TENNESSEE, 1966

| Activity                       | Unit | Part-time Labor Supply |        |       |       | Full-time Labor Supply |        |       |       |
|--------------------------------|------|------------------------|--------|-------|-------|------------------------|--------|-------|-------|
|                                |      | Rental Arrangements    |        |       |       | Rental Arrangements    |        |       |       |
|                                |      | Cash                   | Fourth | Third | Half  | Cash                   | Fourth | Third | Half  |
| Net profit                     | \$   | 1,861                  | 1,795  | 1,829 | 1,814 | 4,642                  | 4,729  | 4,671 | 4,685 |
| Open land                      |      |                        |        |       |       |                        |        |       |       |
| Cotton                         | Acre | 2.3                    | 3.0    | 2.2   | 3.0   | 5.1                    | 10.2   | 10.2  | 10.2  |
| Cotton rented in               | Acre |                        |        |       |       |                        | (5.1)  | (5.1) | (5.1) |
| Corn                           | Acre | 10.2                   | 8.5    | 9.3   | 8.5   | 8.0                    | 8.7    | 8.7   | 8.7   |
| Soybeans                       | Acre | 2.6                    | 7.5    | 5.5   | 7.5   |                        |        |       |       |
| Pasture                        | Acre | 2.5                    | 2.0    | 2.0   | 2.0   | 24.8                   | 23.5   | 23.5  | 23.5  |
| Alfalfa hay                    | Acre | 4.7                    | 3.4    | 5.4   | 3.4   | 5.5                    | 5.5    | 5.5   | 5.5   |
| Fescue-Lad. hay<br>and pasture | Acre |                        |        |       |       | 5.2                    | 5.5    | 5.5   | 5.5   |
| Total open land <sup>a</sup>   | Acre | 22.3                   | 24.4   | 24.4  | 24.4  | 48.6                   | 53.4   | 53.4  | 53.4  |
| Land rented out                |      |                        |        |       |       |                        |        |       |       |
| Cotton                         | Acre | 2.8                    | 2.1    | 2.9   | 2.1   |                        |        |       |       |
| Corn                           | Acre | 7.4                    |        | 5.4   |       |                        |        |       |       |
| Pasture                        | Acre | 2.8                    | 11.3   | 2.1   | 11.3  |                        |        |       |       |
| Total                          | Acre | 13.0                   | 13.4   | 10.4  | 13.4  |                        |        |       |       |
| Land sold                      | Acre |                        | 1.4    |       | 1.5   |                        |        |       |       |
| Idle land                      | Acre | 16.0                   | 13.0   | 16.3  | 11.1  | 3.3                    | 3.3    | 3.3   | 2.6   |

TABLE XIX (continued)

| Activity           | Unit | Part-time Labor Supply |        |       |       | Full-time Labor Supply |        |        |        |
|--------------------|------|------------------------|--------|-------|-------|------------------------|--------|--------|--------|
|                    |      | Rental Arrangements    |        |       |       | Rental Arrangements    |        |        |        |
|                    |      | Cash                   | Fourth | Third | Half  | Cash                   | Fourth | Third  | Half   |
| Corn purchased     | Bu.  |                        |        |       |       | 7,713                  | 7,232  | 7,232  | 7,232  |
| Hay sold           | Ton  | 16.5                   | 11.8   | 18.7  | 11.8  | 22.6                   | 22.8   | 22.8   | 22.8   |
| Market hogs        | Sow  | 5.0                    | 4.0    | 4.0   | 4.0   | 46.0                   | 43.2   | 43.2   | 43.2   |
| Annual capital     | \$   | 198                    | 317    | 224   | 329   | 11,710                 | 11,082 | 11,075 | 11,062 |
| Investment capital | \$   | 2,257                  | 2,219  | 2,296 | 2,359 | 10,683                 | 10,647 | 10,647 | 10,315 |
| Labor              |      |                        |        |       |       |                        |        |        |        |
| Available          | Hour | 600                    | 600    | 600   | 600   | 2,865                  | 2,865  | 2,865  | 2,865  |
| Used               | Hour | 463                    | 442    | 525   | 442   | 2,411                  | 2,432  | 2,432  | 2,432  |

<sup>a</sup>Does not include 2.8 acres of cotton acreage diverted.



supply, practically all of the corn needed for the hog enterprise was purchased at \$1.20 per bushel. Because of the difference in yields (Table X, page 36), cotton was grown on Soil II while the alfalfa was grown on Soil I. The corn could be purchased more economically than it could be grown since the soil with the high corn yields was limited and no labor was required when corn was purchased.

While the effect of the various rental arrangements on net income for the small farm was not significant, the difference between the net incomes which resulted from the part-time and full-time labor supplies was approximately \$2,900. Thus, the operator of the small farm would need to earn over \$2,900 at an off-farm job to increase his total net farm income. The average net income of \$4,682 from the full-time labor situations was not a profitable return to land, labor, and capital--especially with the large amount of capital required. By farming part-time, however, the owner of the small farm could add approximately \$1,800 to his off-farm income.

The owner of this representative small farm would need to rent his open land for at least \$34 per acre to exceed the income from the part-time operation. Assuming that the part-retired farmer had no labor of his own available, he would benefit most by either renting out his open land or by selling the farm since it would not be profitable to hire an operator on this size farm. The rent of \$34 per acre for the part-time operation compared with \$46 per acre in the Brown Soil Area. Thus, the farm in the Brown Soil Area yielded more net income per acre

than the small farm in the Hill Area. This was true for the medium- and large-size farms also. The net incomes were somewhat larger for the farms in the Hill Area since the farms which were programmed in the Hill Area had a larger number of acres than the farms in the Brown Soil Area. Assuming that the owner of this 110 acre farm could sell the farm for \$125 per acre and invest the money at 5 per cent interest, the return the first year would be less than \$700.

#### Medium Farm

The medium-size farm for the Hill Area consisted of 219.5 acres. There were 121.7 acres of open land with a domestic cotton allotment of 11.7 acres. The restriction for alfalfa on Soil I was 15.1 acres. This maximum amount of alfalfa permitted was grown on all but one of the operations. With the cash, one-fourth, and one-third rental arrangements and the part-time labor supply, one operator was hired. With the other arrangements, less than a half unit of hired operator labor supply was optimum; therefore, the data were reprogrammed with no labor hiring permitted. The net profits for the full-time operations where no labor could be hired were about \$50 less than where a fractional unit of operator labor supply was hired.

The solutions for the medium-size farm showed wide variation in the types and amounts of activities which were optimum (Table XX). This variation was a result of the effects of the various rental arrangements and the different labor supplies. The activities under the one-fourth and one-third rental systems were much alike. The cash rental rates were



TABLE XX

OPTIMUM ENTERPRISE ORGANIZATIONS AND NET PROFITS UNDER VARIOUS RENTAL  
ARRANGEMENTS AND DIFFERENT LABOR SUPPLIES FOR MEDIUM-SIZE FARM  
IN THE HILL AREA OF WEST TENNESSEE, 1966

| Activity                     | Unit | Part-time Labor Supply |        |        |       | Full-time Labor Supply |        |        |        |
|------------------------------|------|------------------------|--------|--------|-------|------------------------|--------|--------|--------|
|                              |      | Rental Arrangements    |        |        | Cash  | Rental Arrangements    |        |        | Cash   |
|                              |      | Fourth                 | Third  | Half   |       | Fourth                 | Third  | Half   |        |
| Net profit                   | \$   | 3,961                  | 4,229  | 3,943  | 3,335 | 6,851                  | 7,018  | 6,820  | 6,738  |
| Open land                    |      |                        |        |        |       |                        |        |        |        |
| Cotton                       | Acre | 13.8                   | 14.4   | 14.5   | 1.1   | 10.9                   | 11.5   | 11.2   | 10.5   |
| Cotton rented in             | Acre | (2.1)                  | (2.7)  | (2.8)  |       |                        |        |        |        |
| Corn                         | Acre | 66.7                   | 75.7   | 78.2   | 9.8   | 47.8                   | 56.4   | 61.8   | 31.9   |
| Corn rented in               | Acre | (35.0)                 | (48.6) | (46.2) |       | (15.3)                 | (35.9) | (29.4) |        |
| Soybeans                     | Acre | 20.3                   | 15.9   | 11.0   | 7.1   | 34.6                   | 31.4   | 11.3   | 45.0   |
| Soybeans rented in           | Acre | (9.3)                  |        |        |       | (23.1)                 | (9.4)  |        | (33.3) |
| Pasture                      | Acre | 20.8                   | 21.2   | 21.6   | 2.5   | 13.8                   | 10.6   | 17.4   | 15.7   |
| Alfalfa hay                  | Acre | 15.1                   | 15.1   | 15.1   | 5.5   | 15.1                   | 15.1   | 15.1   | 15.1   |
| Oats-Iesp. hay               | Acre | 2.9                    |        |        | 3.2   | 3.9                    |        |        |        |
| Fescue-Lad. hay              |      |                        |        |        |       |                        |        |        |        |
| and pasture                  | Acre | 18.1                   | 14.4   | 15.0   |       | 11.3                   | 6.5    | 8.2    | 10.9   |
| O. Grass-Lad. hay            |      |                        |        |        |       |                        |        |        |        |
| and pasture                  | Acre | 3.2                    | 3.2    | 3.2    |       |                        | 3.6    | 3.7    |        |
| Total open land <sup>a</sup> | Acre | 157.7                  | 159.9  | 143.6  | 29.2  | 137.4                  | 135.1  | 128.7  | 129.1  |
| Land rented out              |      |                        |        |        |       |                        |        |        |        |
| Cotton                       | Acre |                        |        |        |       | .8                     | .2     | .5     | 1.2    |
| Corn                         | Acre |                        |        |        |       |                        |        |        |        |
| Pasture                      | Acre |                        |        |        |       |                        |        |        |        |
| Total                        | Acre |                        |        |        |       | .8                     | .2     | .5     | 1.2    |

TABLE XX (continued)

| Activity           | Unit | Part-time Labor Supply |                     |        |       | Full-time Labor Supply |                     |       |       |
|--------------------|------|------------------------|---------------------|--------|-------|------------------------|---------------------|-------|-------|
|                    |      | Cash                   | Rental Arrangements |        |       | Cash                   | Rental Arrangements |       |       |
|                    |      |                        | Fourth              | Third  | Half  |                        | Fourth              | Third | Half  |
| Land sold          | Acre |                        |                     |        | 1.9   |                        |                     |       |       |
| Idle land          | Acre | 4.0                    | 6.6                 | 5.6    | 24.4  | 17.9                   | 17.0                | 15.3  | 15.0  |
| Livestock          |      |                        |                     |        |       |                        |                     |       |       |
| Market hogs        | Sow  | 28.0                   | 26.0                | 26.0   | 5.0   | 21.0                   | 19.0                | 22.0  | 24.0  |
| Beef cattle        | Cow  | 3.0                    | 3.0                 | 4.0    |       | 2.0                    | 3.0                 | 3.0   | 2.0   |
| Annual capital     | \$   | 3,640                  | 3,500               | 3,470  | 507   | 1,589                  | 1,491               | 1,621 | 3,536 |
| Investment capital | \$   | 10,783                 | 10,838              | 10,859 | 3,266 | 8,611                  | 8,705               | 9,015 | 7,883 |
| Corn purchased     | Bu.  |                        |                     |        |       |                        |                     |       | 1,604 |
| Hay sold           | Ton  | 67.4                   | 63.6                | 64.0   | 22.5  | 64.1                   | 58.7                | 59.9  | 63.4  |
| Labor              |      |                        |                     |        |       |                        |                     |       |       |
| Operator hired     | Man  | 1.0                    | 1.0                 | 1.0    |       |                        |                     |       |       |
| Available          | Hour | 3,465                  | 3,465               | 3,465  | 600   | 2,865                  | 2,865               | 2,865 | 2,865 |
| Used               | Hour | 2,773                  | 2,450               | 2,752  | 487   | 2,255                  | 2,237               | 2,283 | 2,282 |

<sup>a</sup>Does not include 6.3 acres of cotton acreage diverted.



high relative to crop yields, and therefore the cash arrangement was not as profitable where land was rented in as the one-fourth and one-third arrangements. The mean deviation of the net profits from the part-time operations was \$265.80. When the one-half rental operation was not included in figuring the mean deviation, the mean deviation of the cash, one-fourth, and one-third rental systems was \$123.53. Thus the differences between the cash, fourth, and third rents were not very great. While the net profit from the part-time labor supply and the one-half rental operation was \$530 below the mean of the net incomes from the part-time systems, investment capital was approximately \$7,500 less, annual capital about \$3,000 less, and no labor was hired. By hiring an operator to manage the swine, cotton, and hay enterprises, the part-time farmer could add \$4,200 from the farm to his off-farm income.

With the full-time labor supply and no labor hired, the one-fourth rental system yielded the highest net profit. The mean deviation of the net profits from the various rental arrangements and the full-time labor supply, however, was only \$80.84. The major differences among the net incomes from the various rental arrangements under the full-time labor supply were reflected primarily with the one-half rental arrangement. Unlike the other farms with the full-time labor supply, the operator of the medium-size farm in the Hill Area did not grow the full cotton allotment or rent in any cotton acreage. Swine, cotton, and hay production were the major activities (Table XX). The full-time

labor supply with renting on fourths yielded a net income of slightly over \$7,000. With this arrangement, it was optimal to rent in approximately 36 acres of corn and 9 acres of soybeans along with the swine and hay enterprises.

The average net income for the part-time operator was \$3,867 while the average net income for the full-time operator was \$6,857. Thus, the farm owner would need to earn approximately \$3,000 off the farm for his total income to equal the net income from the farm operation. Considering the average net incomes from the various rental arrangements, the part-time farmer would have to rent his open land for \$32 per acre to exceed his part-time farm income. The part-retired farmer, on the other hand, would need to rent his open land for \$27 per acre to equal the net income he could expect to earn if he hired an operator. If the full 220 acres were sold at \$125 per acre, the entire amount invested at 5 per cent interest would yield less than \$1,400 annually.

### Large Farm

The large farm for the Hill Area consisted of 424.2 acres of which 249 acres were in open land. The domestic cotton allotment was 23.9 acres and alfalfa acreage was limited to 23 acres. On this large farm the maximum amount of alfalfa was not grown, but oats-lespedeza hay were grown on Soil III. All of the hay was sold while the oats were used for sow and boar maintenance.



The mean deviation of the net profits was \$192.81 for both the part-time and full-time operations. This was a result of the similarity of the labor supplies since one man was hired on each of the part-time operations (Table XXI). The net profits from the part-time operations ranged from \$7,486 with renting on halves to \$8,148 with renting on fourths. The types and amounts of activities in the optimum solutions were very similar under the various rental arrangements, and the differences among the net profits were a result of the large amounts of cotton and soybean land rented. As was true on the other farms where land was rented in, the one-fourth rental system yielded the highest net profit. The variation, however, among the net profits from the other rental systems was not significant enough to be the deciding factor in determining which rental arrangement to use. The one-half rental arrangement provided the smallest net profit, but this arrangement required the least amount of capital.

On the large farm in the Hill Area, the level of the swine enterprise was not as large as on most of the other farms. The maximum amount of cotton permitted by the model was grown and from 70 to 80 acres of soybeans were optimum. The production and selling of hay were major enterprises with the part-time operations where over 96 tons of hay were sold. The \$25 price per ton of hay used in this study was a conservative value since the lowest average monthly price received by farmers in Tennessee for alfalfa hay since 1963 was \$29.50 per ton

TABLE XXI

OPTIMUM ENTERPRISE ORGANIZATIONS AND NET PROFITS UNDER VARIOUS RENTAL  
ARRANGEMENTS AND DIFFERENT LABOR SUPPLIES FOR THE LARGE FARM IN  
THE HILL AREA OF WEST TENNESSEE, 1966

| Activity                     | Unit | Part-time Labor Supply |        |        |        | Full-time Labor Supply |        |        |        |
|------------------------------|------|------------------------|--------|--------|--------|------------------------|--------|--------|--------|
|                              |      | Rental Arrangements    |        |        |        | Rental Arrangements    |        |        |        |
|                              |      | Cash                   | Fourth | Third  | Half   | Cash                   | Fourth | Third  | Half   |
| Net profit                   | \$   | 7,678                  | 8,148  | 7,737  | 7,486  | 10,376                 | 10,845 | 10,454 | 10,183 |
| Open land                    |      |                        |        |        |        |                        |        |        |        |
| Cotton                       | Acre | 47.8                   | 47.8   | 47.8   | 47.8   | 47.8                   | 47.8   | 47.8   | 47.6   |
| Cotton rented in             | Acre | (23.9)                 | (23.9) | (23.9) | (23.9) | (23.9)                 | (23.9) | (23.9) | (23.7) |
| Corn                         | Acre | 44.6                   | 44.6   | 44.6   | 44.6   | 30.4                   | 30.5   | 30.6   | 30.3   |
| Soybeans                     | Acre | 69.9                   | 70.0   | 70.0   | 70.0   | 82.1                   | 82.3   | 82.3   | 82.6   |
| Soybeans rented in           | Acre | (25.4)                 | (25.4) | (25.4) | (25.4) | (25.4)                 | (25.4) | (25.4) | (25.4) |
| Pasture                      | Acre | 11.5                   | 11.5   | 11.5   | 11.5   | 7.5                    | 7.5    | 7.5    | 7.5    |
| Alfalfa hay                  | Acre | 19.0                   | 19.0   | 19.0   | 19.0   | 11.1                   | 11.1   | 11.1   | 11.1   |
| Oats-Lesp. hay               | Acre | 32.7                   | 32.7   | 32.7   | 32.7   | 19.7                   | 19.8   | 19.8   | 19.8   |
| Total open land <sup>a</sup> | Acre | 225.5                  | 225.6  | 225.6  | 225.6  | 198.6                  | 199.0  | 199.1  | 198.9  |
| Land sold                    | Acre |                        |        |        |        |                        |        |        |        |
| Idle land                    | Acre | 60.0                   | 60.0   | 60.0   | 60.0   | 11.8                   | 10.9   | 10.5   | 10.2   |
|                              |      |                        |        |        |        | 79.6                   | 79.9   | 80.0   | 80.0   |
| Corn sold                    | Bu.  |                        |        |        |        |                        |        |        |        |
| Hay sold                     | Ton  | 96.6                   | 96.6   | 96.6   | 96.6   | 57.2                   | 59.2   | 59.2   | 59.2   |



TABLE XXI (continued)

| Activity           | Unit | Part-time Labor Supply |        |        |       | Full-time Labor Supply |        |       |       |
|--------------------|------|------------------------|--------|--------|-------|------------------------|--------|-------|-------|
|                    |      | Rental Arrangements    |        |        |       | Rental Arrangements    |        |       |       |
|                    |      | Cash                   | Fourth | Third  | Half  | Cash                   | Fourth | Third | Half  |
| Market hogs        | Sow  | 23.0                   | 23.0   | 23.0   | 23.0  | 15.0                   | 15.0   | 15.0  | 15.0  |
| Annual capital     | \$   | 3,959                  | 3,849  | 3,811  | 3,737 | 2,177                  | 1,972  | 2,022 | 1,985 |
| Investment capital | \$   | 11,137                 | 11,137 | 11,137 | 9,654 | 8,859                  | 8,855  | 8,854 | 7,383 |
| Labor              |      |                        |        |        |       |                        |        |       |       |
| Operator hired     | Man  | 1.0                    | 1.0    | 1.0    | 1.0   |                        |        |       |       |
| Available          | Hour | 3,465                  | 3,465  | 3,465  | 3,465 | 2,865                  | 2,865  | 2,865 | 2,865 |
| Used               | Hour | 2,740                  | 2,740  | 2,740  | 2,740 | 2,189                  | 2,189  | 2,189 | 2,180 |

<sup>a</sup>Does not include 12.9 acres of cotton acreage diverted.

in June of 1964.<sup>3</sup> Thus, a market should be available for good quality hay at the assumed price. The low price was used since no storage or transportation costs were assumed for hay which was sold.

With the full-time labor supply, .35 of a hired operator or about 1000 additional hours of labor were needed. On the assumption that this fractional unit of operator could not be hired, the net profit was decreased by approximately \$350 when no labor was permitted to be hired. With the full-time operations, the 600 hours of labor from the part-time operator was not available and this reduced the size of the swine enterprise by eight sows. In addition, about ten acres of land were sold in the optimum solutions for the full-time operations along with a small amount of corn. Since the swine enterprise was small, the amount of investment capital needed was not great.

The average net income under the full-time labor system was \$10,459 while the average under the part-time labor supply was \$7,673. Thus, the operator of the large farm would need to earn approximately \$2,700 at an off-farm job for his total income to equal what he could expect to earn by farming full-time. The farm owner, however, could probably make more efficient use of his resources by farming full-time rather than hiring an operator, particularly if the hired operator was paid more than the farm owner earned at an off-farm job. Since

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<sup>3</sup>"Agricultural Prices," June 1964. Statistical Reporting Service, U. S. Department of Agriculture. Washington: Government Printing Office, 1964.



the full-time farmer could earn over \$10,000 net farm income, he would be in a better position to decide not to work off the farm than would be the operators of the small- and medium-size farms. The owner of this large farm would need to rent his open land for \$31 per acre to exceed the income from the part-time operation. The part-retired farmer, on the other hand, would need to rent his open acreage for \$28 per acre to exceed the income he could earn by hiring an operator for the farm at \$3,600 annually. If the entire 424 acres were sold at \$125 per acre and invested at 5 per cent interest, the interest would amount to \$2,651 the first year.

#### Summary

The principal activities which entered the optimum solutions under the two different labor supplies and the various rental arrangements in the Hill Area were cotton, corn, soybeans, market hogs, and hay production. There was less pasture land rented out and less land sold on each representative farm in the Hill Area than in the Brown Soil Area. The price of land in the Hill Area was assumed to be only \$125 per acre since much of the land was in timber (43 per cent) and the soils were not as productive as soils in the Brown Soil Area. Cotton and corn were grown on the most productive soil (Soil II) while alfalfa hay and soybeans were grown on Soil I. The oats-lespedeza hay and fescue-ladino hay were grown on Soil III.

Since only a small amount of land was rented on the small farm, the type of rental arrangement was not too important. On the two larger

farms where cropland was rented in, the one-fourth rental system gave the most profit. Where crops were rented out, the cash rent yielded the greatest profit since the cash rents were greater than the return from a share of the crop.

The average net profits from the various rental arrangements under the different labor supplies are given below for each of the farms:

| <u>Farm Size</u> | <u>Part-Time Operation</u> | <u>Full-Time Operation</u> |
|------------------|----------------------------|----------------------------|
| Small            | \$1,824.81                 | \$4,681.75                 |
| Medium           | 3,867.17                   | 6,856.76                   |
| Large            | 7,762.58                   | 10,459.44                  |

The difference between the part-time and full-time operations on the small farm was approximately \$2,900 while this difference for the medium-size farm was nearly \$3,000, and for the large farm, the difference was \$2,700. The full-time operators of the medium- and large-size farms could earn a net income of over \$6,500 without hiring additional labor or working off the farm. The results of the programs also indicated that the part-retired farmer could afford to hire an operator for \$3,600 annually to operate the medium- and large-size farms if the retired farmer had the necessary equipment.



## CHAPTER V

### SUMMARY, CONCLUSIONS, AND IMPLICATIONS

#### I. SUMMARY AND CONCLUSIONS

The objectives of the study were (1) to determine if commercial farm operators in the Brown Soil and Hill Areas of West Tennessee could benefit by working at off-farm jobs; (2) to determine the optimum farm organizations for part-time and part-retired farm operators in the study areas; and (3) to determine the effect upon net farm income of a cash rental arrangement of crops as compared with one-fourth, one-third, and one-half crop share rents. The analysis of rental arrangements was based on the assumption that land was rented by farmers who already owned some land rather than rented by tenants. In order to attain the objectives, the linear programming method for farm planning was used to determine the optimum farm organizations for three farm sizes in each of the two areas of study and under specified rental arrangements and different labor supplies. Each farm was programmed first with 600 hours of labor assumed to be furnished by a part-time farm operator and then with 2,865 hours of labor assumed to be furnished by a full-time operator. On the medium- and large-size farms, an additional quantity of labor equal to one operator labor supply (2,865 hours) was permitted to be hired for \$3,600 annually. The net incomes from the farm operations under the two different labor supplies were then compared to determine

whether or not the farm owner would benefit by working at an off-farm job. For each farm size and each labor supply, the program was first run with all renting on a cash basis. Each farm situation was then programmed with all renting under the one-fourth share arrangement, then under the one-third share arrangement, and finally with all renting done on the one-half basis.

The present study was directed primarily at providing information that could be used in aiding part-time and part-retired farmers in West Tennessee. The optimum farm organizations under the assumed conditions for full-time farm operators were also presented since these data resulted when the profitability of part-time farming was studied. Agricultural statistics for Tennessee for the years 1954 and 1959 indicated that changes were taking place in the types of farm tenure, and indications are that these changes are continuing at the present time. In 1959, full owners accounted for 61 per cent of the farm operators in Tennessee. Tenants accounted for 21 per cent of the total operators, while part owners made up 18 per cent of the farm operators in Tennessee in 1959. From 1954 to 1959 the number of farm operators in Tennessee decreased by 22 per cent. The tenant class showed the greatest decrease with a drop of 41 per cent. Part owners, those farm operators who own and rent land, decreased by only 5 per cent between 1954 and 1959. Thus, many farmers were realizing the advantages of renting land. The results of this study also showed the profitability of renting land under the assumed conditions.



The conclusions of this study are based on the assumptions stated in previous chapters. They can serve only as general guides to aid in farm adjustments. The principal enterprises included in the optimum farm organizations for the Brown Soil Area were cotton, corn, and market hogs. Corn land was rented in on all farm sizes while cotton and soybean acreages were rented in primarily on the large farms. The principal enterprises in the optimal solutions for the Hill Area were cotton, corn, alfalfa hay, and market hogs. An extra unit of labor would be profitable to acquire for all the part-time operations on the medium- and large-size farms except when renting under the one-half crop share rental arrangement. With renting on halves, it was assumed that the landowner furnished the equipment for crops rented out. For the part-time farm operators, where no labor was hired, net profit was maximized by renting out cotton and corn lands and using the part-time labor supply for growing and finishing market hogs. Where an operator's labor supply was hired, cotton, corn, and soybean acreages were rented in. For each of the various farm situations programmed, very little land was purchased or sold in the optimum solutions. Thus, as long as land could be rented, the selling or buying of land would not be profitable. The market hog enterprise would be very profitable in the study areas where corn land could be rented in and corn could be purchased. The beef enterprises and the manufactured milk enterprise would not be as profitable as the swine enterprises. The study indicated that the production and selling of hay, particularly alfalfa hay, would be profitable enter-

prises in the Hill Area. The amount of corn and soybean land rented was dependent upon the type of rental arrangement and the labor supply. All of the corn to be raised or purchased would be most profitably used for the market hog enterprise.

In the Brown Soil Area, net profits on representative farms ranged from \$1,794 for the small part-time farm to \$9,832 on the large full-time operations. For the above named farms, the net profits for the representative farms in the Hill Area ranged from \$1,795 to \$10,845. While the average value of farm products sold per farm in the Brown Soil Area in 1959 was \$4,894 according to the Census of Agriculture,<sup>1</sup> the gross sales from the optimum organization for the part-time operator of the medium-size farm, with a hired operator, were approximately \$17,000. The average value of farm products sold per farm in the Hill Area was \$2,800 in 1959.<sup>2</sup> For Tennessee as a whole, the average gross farm sales in 1959 were only \$819 on part-time farms and \$849 for the part-retired farmers.<sup>3</sup> Thus the net incomes which resulted from the optimum solutions of this study were larger than the gross sales from farms in the study area in 1959. This study indicates that farmers in the study areas in 1959 were operating their farms under much less than the optimum farm organizations.

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<sup>1</sup>United States Bureau of the Census, United States Census of Agriculture: 1959. Tennessee, Vol. I, Part 31 (Washington: Government Printing Office), pp. 176-183.

<sup>2</sup>Ibid., p. 39.

<sup>3</sup>Ibid., p. 39.



On the small farms where additional labor was assumed not to be available, the maximum net income that could be expected from the full-time operations was approximately \$4,700. The maximum net income that could be expected from the part-time operations was \$1,800. The owner of a small farm (40 open acres), such as the one programmed, would thus maximize his net income by working off the farm if he could earn over \$2,900 at a non-farm job. The part-retired farmer, on the other hand, would benefit most by either renting or selling his land at the going rates. The large amount of land which was rented in under the optimum solutions for the medium- and large-size farms would seem to indicate that part-retired farmers in the study area would have a land rental market if they desired to rent out their land. If an operator were hired on the medium-size farm, the net profit would be less than \$4,000 for the part-retired farmer. The part-retired farmer, operating the medium-size farm, would exceed the \$4,000 net income if he could rent his open acreage to other farmers for approximately \$35 per acre. On the large farm, the part-retired farmer could afford to hire an operator for as much as \$3,600 annually if it is assumed that the part-retired farmer had the necessary equipment and that a competent operator could be hired at the assumed salary.

The linear programming results indicated that the renting of cropland would be a profitable activity on all the farms that were programmed. The amount of cropland rented in under the optimum solutions varied from about 5 acres for the small farm in the Hill Area to

approximately 50 acres for the large farm in the Brown Soil Area. The type of rental arrangement used for the small farms did not have a significant effect upon the types of enterprises which were optimum or the amount of net profit. For the medium- and large-size farms, the same enterprises were generally optimum with each of the various rental arrangements. The net profits varied somewhat among rental arrangements but the variation was probably not significant enough to determine if a particular rental arrangement were optimum. Each farmer has his own distinguishing conditions and restrictions which make it impossible to generalize as to which rental arrangement is best. The results of this study along with previous research seem to indicate that the type of rental arrangement used is not as important as the terms of the lease such as the length of the agreement, provisions for property improvements, and knowledge of the rights and obligations of both parties under the lease.

## II. LIMITATIONS AND IMPLICATIONS

As stated previously, the results of this study are limited to the restrictions and activities specified for representative farms. The possible activities and available resources used in the model, however, were made as broad as practical in order for the results to be of benefit to as many persons as possible. The results of the programs apply to an individual representative farm only, and the aggregate effects of the programs upon the entire area were not studied. The



results of this study are not predictions of what farmers will actually do, but rather they indicate the optimum organizations and adjustments under the assumed conditions. The individual farmer who wishes to adjust to the optimum organizations must start from his present position and plan additional changes and investments accordingly. Linear programming of a large number of activities, such as were used, does not apply economies of size within particular enterprises, thus the advantages of specializing in beef, dairy, or some other enterprise were not considered. Personal preferences of farm operators were not taken into account and these may be important limitations for many farmers. The net income figures given for the various representative farm situations resulted only from the combination of enterprises which entered into the optimum solutions. Any other combination of enterprises would change the income values. The net profits which resulted from the programs were used as the average values which a farm operator with the specified resources might expect to earn.

Two primary limitations of this study relate to the assumptions that a competent farm operator could be hired at the assumed salary and that equitable rental methods were used. The assumption was made that a responsible man could be hired for \$300 per month for a period of at least two years. Under the various rental arrangements, it was assumed that a legal written agreement was used which was fair to both parties and that the contract was for a long enough period of time to make efficient use of resources. These are extensive assumptions, but

the results of the programs indicated what can be expected if these assumptions are met.

This study along with previous research in this area seems to indicate the need for more research in the area of leasing contracts and the need for the dissemination of information concerning rental arrangements to farm owners. A lease is used to provide the basis for combining resources and to distribute income to the resource owners. Because of the variations among farms and the different financial abilities and interests of landlords and renters, standardized leasing practices cannot fit equally well in all cases. The renter and the landlord need a system for calculating what to do and how to do it in developing the terms of a lease and in operating the farm under the lease. Previous studies indicate the need for programs of education in which renters and landowners will be encouraged to make adaptations to fit the particulars of their situations.

The renting of land is not without its disadvantages. Widespread land rental might influence the prices at which land could be sold and might retard the sale of less than economic units either to renters or to persons who wish to enlarge their present operations. The use of proper leasing contracts would require greater detail of participation by both parties in decisions concerning sharing of all variable expenses, thus requiring more and better farm bookkeeping. For more effective rental units, improved communication is needed between landowners and renters. Also, the bargaining process between landlord and renter should be strengthened.



Limited data are available concerning the relative efficiencies of alternative leasing arrangements in Tennessee. The present study was concerned with only four types of rental arrangements. With the modern computers now available, the advantages of numerous different rental arrangements and the effects of relatively minor factors can be analyzed. This might include analysis of operator reactions to incentive conditions and the analysis of the effects of income transfers between resource owners.

The renting of quantities of land, as indicated by this study, could have important effects in the farm credit field. While renting of large amounts of land could mean fewer but larger accounts for farm credit businesses, land rental might also mean that the large landowners would be more nearly able to furnish the credit needs of the renter and the farm operation than the present farm operators are able to do. Leasing on a large scale might lead to more efficient use of some resources such as machinery and labor. In addition, the leasing of a particular type of cropland such as cotton land could lead to specialization, better management, and thus higher yields at lower costs.

There is much room for more research in the above mentioned areas. Additional research is needed to identify more of the obstacles to renting land and hiring farm operators. Also, the effects of various price levels and cost estimates on the optimum solutions need to be studied.

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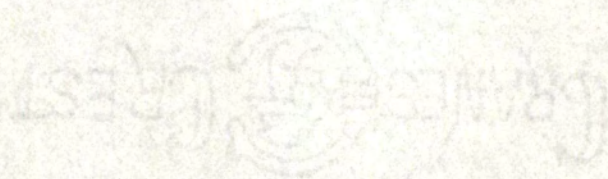
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APPENDIXES





APPENDIX A

SURVEY OF PCA COUNTY MANAGERS



UNIVERSITY OF TENNESSEE

Agricultural Experiment Station

Department of Agricultural Economics and Rural Sociology

Survey of PCA County Managers

Concerning Land and Labor Acquisition Practices

I. General Information

- A. Name \_\_\_\_\_
- B. County \_\_\_\_\_
- C. PCA District Office \_\_\_\_\_

II. Average custom rates for

- |                         |                                 |
|-------------------------|---------------------------------|
| A. Cutting hay _____    | G. Picking cotton (hand) _____  |
| _____                   | (machine) _____                 |
| B. Raking hay _____     | H. Harvesting small grain _____ |
| _____                   | I. Harvesting soybeans _____    |
| C. Baling hay _____     | J. Applying pre-emerge _____    |
| _____                   | K. Applying post-emerge _____   |
| D. Hauling hay _____    | L. Spraying cotton _____        |
| E. Snapping corn _____  | M. Defoliation _____            |
| F. Picker-sheller _____ | N. Mowing pasture _____         |

## III. Present Rental and/or Leasing Arrangements

|                                       | Type of operator   |                    |                    |                |                          |                        |                       |                      |
|---------------------------------------|--------------------|--------------------|--------------------|----------------|--------------------------|------------------------|-----------------------|----------------------|
|                                       | Resident<br>tenant | Owner-<br>operator | Resident<br>tenant | Land-<br>owner | Renter of<br>cotton only | Renter of<br>corn only | Renter of<br>soybeans | Renter of<br>pasture |
| Resources furnished<br>by tenant      |                    | X                  |                    | X              | X                        | X                      | X                     | X                    |
| Resources furnished<br>by operator    | X                  |                    | X                  | X              | X                        | X                      | X                     | X                    |
| Resources furnished<br>by land-owner  | X                  | X                  | X                  |                | X                        | X                      | X                     | X                    |
| Resources furnished<br>by renter      | X                  | X                  | X                  | X              |                          |                        |                       |                      |
| Share of costs                        |                    |                    |                    |                |                          |                        |                       |                      |
| Share returns                         |                    |                    |                    |                |                          |                        |                       |                      |
| Cash rent per<br>acre                 |                    | X                  |                    | X              |                          |                        |                       |                      |
| Per cent of time cash<br>rent is used |                    | X                  |                    | X              |                          |                        |                       |                      |



IV. Availability of Hired Labor

A. How difficult is the task of hiring the following types of labor? Please check appropriate column.

| Characteristics of worker              | Type of Labor  |              |                |                |              |                |                |              |
|----------------------------------------|----------------|--------------|----------------|----------------|--------------|----------------|----------------|--------------|
|                                        | Hired seasonal |              |                | Hired resident |              |                | Hired operator |              |
|                                        | No problem     | Some problem | Very difficult | No problem     | Some problem | Very difficult | No problem     | Some problem |
| Is dependable                          |                |              |                |                |              |                |                |              |
| Needs overseer                         |                |              |                |                |              |                |                |              |
| Needs no overseer                      |                |              |                |                |              |                |                |              |
| Has own machinery                      | X              | X            | X              |                |              |                |                |              |
| Will stay settled for at least 3 years | X              | X            | X              |                |              |                |                |              |

B. Other problems with hired labor

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V. What are the major uses of seasonal labor?

- A. \_\_\_\_\_
- B. \_\_\_\_\_
- C. \_\_\_\_\_
- D. \_\_\_\_\_
- E. \_\_\_\_\_

VI. Costs of Labor

- A. Average price paid for seasonal labor \_\_\_\_\_
- B. Average price paid for resident labor \_\_\_\_\_
- C. Average price paid for a hired operator to manage and work the entire farm \_\_\_\_\_

VII. Price of land

- A. What would be an average or typical price per acre for farms with from 30 to 99 total acres (average of 54 acres) given the following conditions:
  - 1. farm is predominately upland.
  - 2. 71 per cent of the farm is open land of which slightly over one-half is suitable for continuous row crop or could be cropped one year out of two.
  - 3. 18 per cent of the land is in woodland and 11 per cent is in waste and other land.
  - 4. farm is located so that it would be of value only to another farmer.
  - 5. average buildings and fences.



6. no unusual conditions which would effect selling price of the farm.
7. sell land and farm buildings but not residence house and lot.

- 
- B. What would be an average or typical price per acre for farms with from 100 to 179 total acres (average of 130 acres) given the same conditions as in "A" above? \_\_\_\_\_
  - C. What would be an average or typical price per acre for farms with from 180 to 259 total acres (average of 214 acres) given the same conditions as in "A" above? \_\_\_\_\_
  - D. What is the market value of good row crop land? \_\_\_\_\_  
\_\_\_\_\_
  - E. What is the market value of average row crop land? \_\_\_\_\_  
\_\_\_\_\_
  - F. What is the market value of other crop land? \_\_\_\_\_  
\_\_\_\_\_
  - G. What is the market value of woodland? \_\_\_\_\_  
\_\_\_\_\_

#### VIII. Miscellaneous questions

- A. What are the most prevalent types of rental arrangements at present for:
  1. Swine \_\_\_\_\_?
  2. Beef cattle \_\_\_\_\_?



3. Grade C dairy \_\_\_\_\_ ?

B. What are the average taxes per acre for farms with from:

1. 30 to 99 acres \_\_\_\_\_ ?

2. 100 to 179 acres \_\_\_\_\_ ?

3. 180 to 259 acres \_\_\_\_\_ ?

C. What are the major types of off-farm work that part-time farmers do and what are the wage rates?

| Type of work | Wage rate |
|--------------|-----------|
| 1. _____     | _____     |
| 2. _____     | _____     |
| 3. _____     | _____     |
| 4. _____     | _____     |
| 5. _____     | _____     |



## APPENDIX B

### PRODUCT AND INPUT PRICES



TABLE XXII

SELECTED SAMPLE OF PROJECTED PRICES RECEIVED AND PAID BY FARMERS  
IN THE BROWN SOIL AND HILL AREAS OF WEST TENNESSEE, 1963

| Item                                         | Unit | Price   |
|----------------------------------------------|------|---------|
| <b>Prices Received</b>                       |      |         |
| Cotton (Base Price)                          | lb.  | .21     |
| Cotton seed                                  | ton  | \$45.00 |
| Corn, shelled                                | bu.  | 1.10    |
| Soybeans                                     | bu.  | 2.40    |
| Calves at 500 lbs.                           | cwt. | 22.50   |
| Steers at 1000 lbs.                          | cwt. | 23.50   |
| Heifers at 810 lbs.                          | cwt. | 23.50   |
| Hogs at 210 lbs.                             | cwt. | 14.50   |
| Pigs at 40 lbs.                              | each | 10.50   |
| Manufactured Milk                            | cwt. | 3.30    |
| Hay                                          | ton  | 25.00   |
| <b>Prices Paid</b>                           |      |         |
| <b>Seed:</b>                                 |      |         |
| Cotton                                       | lb.  | .12     |
| Soybeans                                     | bu.  | 4.25    |
| Corn                                         | bu.  | 10.00   |
| Orchard grass                                | lb.  | .32     |
| Ladino clover                                | lb.  | .65     |
| Red clover                                   | lb.  | .45     |
| Lespedeza                                    | lb.  | .22     |
| Oats                                         | bu.  | 1.40    |
| Alfalfa                                      | lb.  | .45     |
| <b>Feed:</b>                                 |      |         |
| Mineralized salt                             | cwt. | 2.00    |
| Hog supplement (37.5 % protein)              | cwt. | 4.30    |
| <b>Fertilizer:</b>                           |      |         |
| 6-12-12                                      | ton  | 52.00   |
| 0-20-30                                      | ton  | 59.00   |
| Lime                                         | ton  | 5.00    |
| Atrazine                                     | lb.  | 3.00    |
| 0-20-20                                      | ton  | 49.00   |
| Nitrogen                                     | lb.  | .12     |
| <b>Custom Work:</b>                          |      |         |
| Cotton picking                               | cwt. | 2.25    |
| Corn picking                                 | acre | 6.00    |
| Soybean combining                            | bu.  | .30     |
| Poisoning and defoliation (without material) | acre | 2.10    |



TABLE XXII (CONTINUED)

| Item    | Unit | Price |
|---------|------|-------|
| Baling  | ton  | 5.00  |
| Raking  | acre | 1.50  |
| Ginning | bale | 20.00 |