FIRM GROWTH SIMULATION AS A FARM MANAGEMENT AND CREDIT EVALUATION DEVICE

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PREFACE

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TABLE OF CONTENTS

Chapter | Page

LIST OF TABLES

Table		Page

LIST OF FIGURES

CHAPTER I

INTRODUCTION

Farm operators have been consolidating their farms into larger units over the past several decades. From 1935 to 1954 to 1964, the average farm size in Oklahoma increased from 166 to 300 to 407 acres, respectively [32].[1] The trend towards larger farms has resulted primarily from the biological and mechanical innovations which continue to influence agricultural production. Biological innovations generally increase output and result in lower product prices when they are inevitably adopted by the majority of farmers [15, pp. 818-824]. Mechanical innovations usually allow greater acreages to be operated at lower costs per unit of output [28, Ch. 6, pp. 36-40]. Thus, farmers are likely to continue expansion of their farming operations in order to maintain or increase net farm income. The process by which they achieve expansion, firm growth, is the subject of this study. Attributes of firm growth are defined later in this chapter.

Farmers striving for expansion of the farm firm are likely to have a number of questions. What effect does land acquisition through renting and/or purchase have on firm growth? Does the production plan followed affect firm growth? How much growth can be expected when the

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[1]Numerals appearing in [] refer to bibliography references in this dissertation.

level of equity in the firm is low? What effect do capital withdrawals for consumption have on firm growth? How do price and yield variabilities influence firm growth? Answers to these questions could serve as a management guide to farmers when planning for the future.

Firm growth is brought about primarily through the use of credit or borrowed funds [15, pp. 546-550]. Since firm growth depends considerably on financial arrangements, credit agencies are also likely to have a number of questions. Does non-amortization of a loan used to purchase real estate enhance firm growth and eventual repayment capacity? What effect do alternative payment plans for loans used to purchase non-real estate items have on firm growth? How do credit limitations affect firm growth? Answers to these questions could benefit credit agencies when constructing financial arrangements with farmers.

A model is needed that is capable of evaluating these questions which farm operators and farm lenders have. This model must also be able to analyze individual firm growth situations since farm operators need specific information on land, labor, and capital requirements currently and over time. Thus, "a model is needed which starts where farm operators are in terms of resources and goals, and carries the analysis to the point of estimating where they can or will go" [36, p. 1523].

Many types of models could be used to analyze firm growth. Several aspects of firm growth, however, limit the usefulness of certain model types. Firm growth takes place in a dynamic and uncertain environment where changes occur continually in prices and yields. Firm growth involves the acquisition of such resources as land and machinery in lumpy units. The objectives or goals of a farmer are likely to change or become more inclusive over time.[2] For example, maintaining firm solvency and a satisfactory standard of family living while seeking the highest possible rate of expansion may be the objective until an economic size of unit is achieved. Thereafter a goal of farm ownership or increasing equity or a higher standard of family living may be the objective. In effect, the information generated by models that require perfect knowledge, infinitely divisible resources, and a single objective would not be of much use to farmers and credit agencies.

A simulation model, however, lends itself well to an analysis of firm growth [19, p. 94]. Variabilities, indivisibilities, and multiple goals can be represented in such a model since the built-in relationships do not have to be continuous and linear. The process by which decisions are made in a simulation model can be specified by the model builder. Once the simulation model has been constructed, its use involves experimentation. For example, simulation experiments can be conducted to determine the effects of selected variables on firm growth.

Objectives

The objectives of this study are:

1. To construct a firm growth simulation model capable of evaluating the effects of numerous variables on

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[2]For a more complete discussion of goals over time, see Eidman [11] and Fergusson [12].

firm growth under conditions of price and production variability.

2. To estimate the effects of selected variables on firm growth by conducting simulation experiments. These growth determinant variables are:

    a. Methods of land acquisition

    b. Alternative financial arrangements

    c. Different production plans

    d. Levels of beginning equity in land.

Area of Study

Input tables are needed for the simulation model constructed for this study. Quantification of the tables requires the formulation of a realistic firm growth situation. The firm growth situation formulated is based on previous farm management research conducted for the north central Oklahoma economic farming area. The north central area includes all or part of Alfalfa, Blaine, Canadian, Garfield, Grant, Kay, Kingfisher, Logan, Major, Noble, and Woods counties as indicated in Figure 1. Cropland and soil resource characteristics are specified in Processed Series P-550 [8].

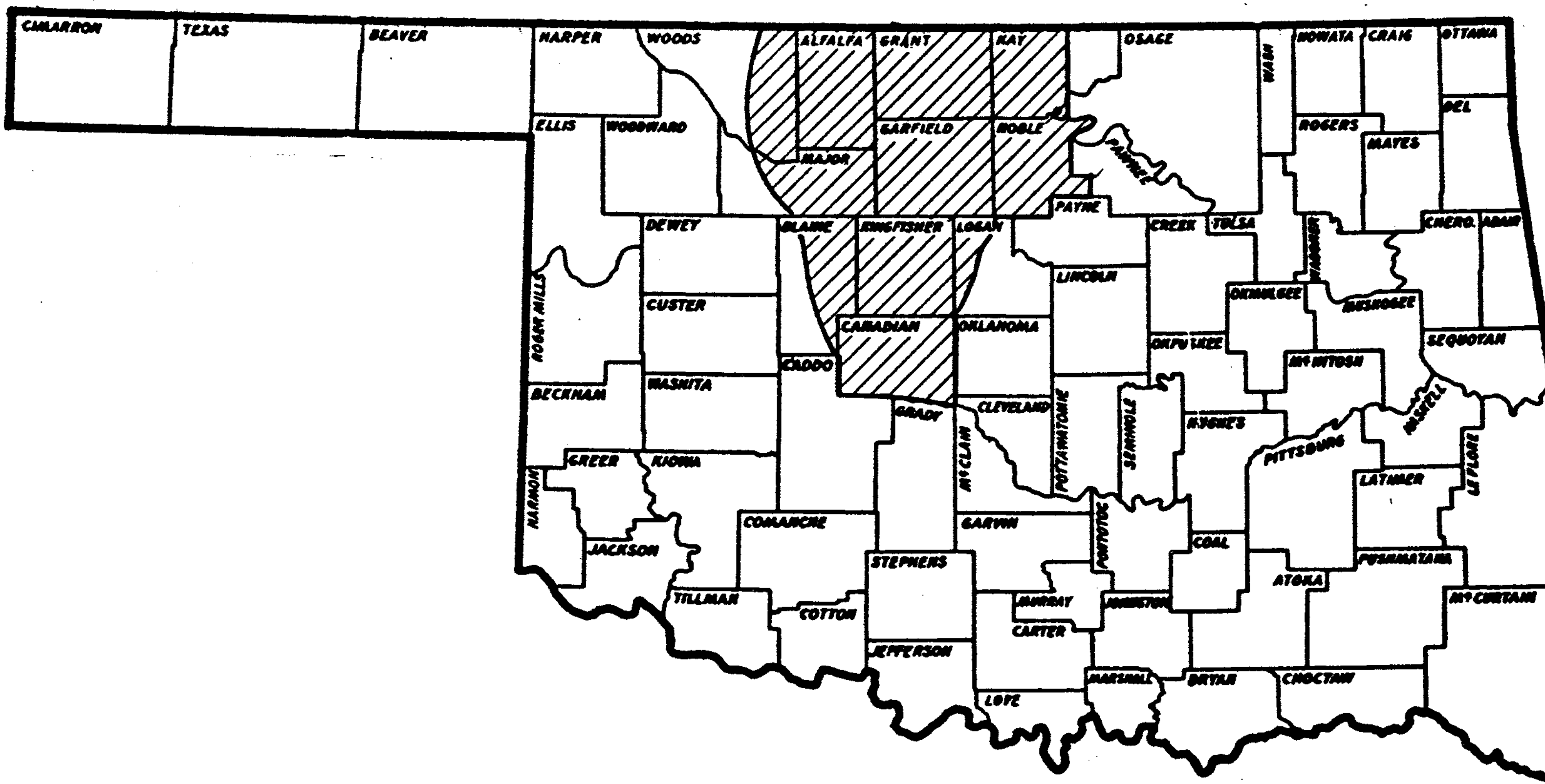

Figure 1. Map of Oklahoma Showing North Central Area Included in This Study

Census data [32] indicate that farms in the study area are being consolidated into larger units. Furthermore, expansion appears to be occurring by renting land. In the counties of Alfalfa, Canadian, Garfield, Grant, Kingfisher, and Noble, the number of farms decreased from 10,267 in 1954 to 8,974 in 1959 to 7,849 in 1964. In 1964, there were 2,418 fewer farms than in 1954, a decrease of 24 percent. The average farm size increased from 323 acres in 1954 to 381 acres in 1959 to 439 acres in 1964. From 1954 to 1964, the average farm size increased by 116 acres, an increase of 36 percent. The percentage of full owners decreased from 35 percent in 1954 to 34 percent in 1959 and has since remained constant. The percentage of part owners, however, increased from 32 percent in 1954 to 38 percent in 1959 to 40 percent in 1964.

Review of Literature

The simulation model constructed must be capable of evaluating numerous growth determinant variables. What are the relevant variables? How can the variables be represented in a model? At what level do the variables require study? These three questions guided the following review of previous firm growth research.

Various objective functions, levels of credit availability, consumption levels, and beginning farm sizes were analyzed for their effects on firm growth by Martin [23]. Dynamic linear programming was employed to simulate the growth of farm firms in the Rolling Plains of Oklahoma and Texas. Six production periods, each representing five years of farm operations, described a planning horizon of 30 years.

An objective of maximizing discounted net returns resulted in the same farm organization and land acquisition over the planning horizon as did the objectives of maximizing discounted gross sales, undiscounted net returns, ending owned capital, and acres of land operated both through and at the end of the planning period. The present value of net returns was reduced by about 38 percent under the objective of maximizing discounted land investments. Consumption above the minimum level allowed occurred only under the objective of maximizing the present value of consumption.

Increasing consumption from $3,000 to $3,000 plus 25 percent of net returns decreased the acres operated by 56 percent and the present value of net returns by 39 percent. A marginal propensity to consume of 50 percent decreased the present value of net returns by 61 percent. a marginal propensity to consume of 75 percent actually reduced total consumption over 30 years and almost prevented growth.

Reducing the availability of credit from 50 percent of the unmortgaged value of owned land to 25 percent decreased the amount of land operated and net returns by 20 percent. A further reduction of credit to 12.5 percent decreased growth by about 33 percent. Restricting capital usage to owned capital did not allow $3,000 annual consumption during the first production period nor did it allow complete operation of a 426 acre farm during the first two production periods.

Decreasing the initial farm size by 50 percent reduced the additional value of equity accumulated over 30 years by 38 percent. Restricting rented acres to 50 percent of the total acres operated almost doubled the minimum starting farm equity required to maintain a level of $3,000 consumption over time.

Johnson [20] also employed dynamic linear programming to analyze the growth of dryland farms in the Southern High Plains of Texas. However, he brought the concept of risk into his analysis. Risk was introduced by generating a gross crop income coefficient for each year of the planning horizon from a bivariate normal distribution of grain sorghum and cotton yields. This was done 10 to 20 times to provide a distribution of outcomes.

Four situations provided information about the effects of initial asset positions and investment policies (credit usage) on firm growth. Whether a liberal or conservative investment policy was used, average net worth after 15 years was about 300 percent greater when the initial asset position was doubled. A conservative investment policy for both initial asset positions provided an average net worth after 15 years which was about 25 percent less than under a liberal investment policy. The variation in net worth, however, was reduced under a conservative investment policy. The effect of serial correlation in the yield data on net worth of the firm and its variance was also analyzed. Results indicated that serial correlation had a negligible effect on firm growth.

One phase of a firm growth study conducted by Eddleman and Golden [10] included historical crop yields for each year in the analysis. The results from their minimum equity linear programming model indicated that beginning equity requirements were considerably higher and net worth at the end of 15 years was also higher for actual crop yields than for average yields. However, negative cash balances occurred during years of low crop yields. During these years of low yields, refinancing of loans would have been necessary.

The effects of various management strategies on firm growth were analyzed within a framework of uncertainty by Schneeberger [26]. Ten years of operations by an Oklahoma Panhandle farm were simulated 20 times. Annual enterprise net returns were defined by discrete probability distributions. Land acquisition was not allowed.

Organizational strategies had a very significant effect on the magnitude and variability of firm growth (net worth). A specialized strategy of grain sorghum, broomcorn, and cows on native pasture provided the highest average net worth during each of the 10 years. But, net worth varied considerably during each year. The only strategies characterized by greater variation in net worth were those that included steers instead of cows. Furthermore, the net worth values generated by the latter strategies were substantially lower on the average. The second highest average net worth during year 10 was generated by a strategy developed through linear programming. The least amount of annual variation in net worth was associated with this linear programming strategy which included both cows and steers (5:1 ratio) as well as wheat, grain sorghum, and broomcorn.

Lins [22] and Bostwick [5] placed emphasis on financial arrangements in their firm growth simulation studies of midwest cash grain farms. Deterministic as well as stochastic prices and yields were considered. Normal distributions were employed. However, neither study replicated the firm growth process to provide a distribution of outcomes. The variables were stochasticized only to determine their effects on financial arrangements. Effects were negligible in both studies. Technological change was represented by trending crop yields and production costs.

The Lins study considered the effects of selected growth determinant variables on alternative financial strategies. A strategy of mortgage contract in which refinancing was permitted allowed the greatest growth in net worth under a wide range of conditions. It failed to do so when (a) the planning horizon was short, (b) the level of consumption and the unit of land acquisition were high, and (c) real estate interest rates were high and equity requirements were low. A strategy of land contract (low downpayment) allowed the greatest growth in net worth after 15 years when (a) the level of consumption was very low, and (b) interest rates on real estate loans were high, repayment schedules were extended, and equity requirements were low. A strategy of cash rent allowed the greatest growth in net worth when (a) the planning horizon was short, and (b) the level of consumption and the unit of land acquisition were high. A strategy of mortgage contract in which refinancing was not permitted never allowed the greatest growth in net worth under any conditions.

A completely non-amortized real estate loan was featured by one strategy in the Bostwick study. Although the downpayment required by this land purchase strategy was greater than for the other strategies, it allowed the greatest increase in net worth at the end of a 30 year planning horizon. A slightly lower ending net worth was achieved under a strategy of mortgage contract in which refinancing was permitted (30 year Standard payment plan). The third highest ending net worth was achieved under a strategy that required a maximum acreage to be rented before land could be purchased (for every acre purchased an acre less was rented). Of the strategies that permitted land acquisition, the lowest ending net worth was achieved when land was rented.

Hutton and Hinman [17] developed a model capable of simulating farm firm situations over as many periods as desired. The periods may be years or replications of a year. The simulation results are printed at the end of each period. A summary analysis of the results across periods is not provided.

The problem situation investigated must be completely specified as data. If a firm growth situation is investigated, the year during which a change is to occur in the acreage owned and/or in the acreage rented must be specified along with the new acreages owned and rented. Corresponding modifications of the crop and livestock activity levels must also be specified as data. The model is non-analytical. Optimizing routines are not built into the model.

Product outputs in the Hutton-Hinman model may be deterministic or probabilistic. Prices (input and output) are subject to trends and may be deterministic or probabilistic. Price and yield variabilities are represented by standard deviations.

Resources can be purchased, sold, depreciated, and used as security for loans. Loans can be obtained and refinanced when additional credit is needed for investments. Financial arrangements are divided into three categories. The three categories include real estate, chattel, and other. Principal payments during each period must be specified as data for each type of financial arrangement.

Literature Summary

Each of the studies reviewed identified one or more growth determinant variables. Collectively, these variables included farmer's objectives, methods of land acquisition, different farm sizes, equity levels, levels of consumption, various production plans, production and price variability, and alternative financial arrangements.

Firm growth was generally defined in previous studies as an increase in net worth. Growth in net worth through land acquisition was the objective pursued in most models. Martin's study indicated that an objective of maximizing acres of land operated resulted in the same firm growth as a number of other objectives. Regarding land acquisition, a limitation of the simulation model seems to be the simultaneous consideration of renting and purchase of land. Land must be acquired only through renting or only through purchase or only through renting until a maximum acreage has been acquired. Once the maximum acreage has been acquired through renting, the land rented can be purchased.

The growth of relatively small firms was the issue in most studies. These firms were characterized by equity levels in excess of 50 percent. Standards of living maintained by farm families were generally represented by a consumption function which permitted a "certain" level plus some percentage of net income or after-tax income. The "certain" level was usually about $3,000 and the percentages were set at levels ranging from zero to 75 percent.

The production plan followed in previous firm growth research models was always specified. Martin [23, p. 20] states:

> The selection of several dozen enterprise alternatives and an analysis over a number of time periods not only presents computational problems, but increases the problem to such proportions that the model becomes difficult to work with.

Normal distributions were usually employed where variability of prices and yields was an issue in previous studies.

Firm growth in this study is defined as an increase in net worth of the firm. The simulation model constructed for this study is discussed in the following chapter. Input tables for the simulation model are discussed and quantified in Chapter III. The simulation experiments conducted for this study are also discussed in Chapter III. Results from the simulation experiments are presented in Chapter IV. In Chapter V, the results are interpreted and the simulation model is critiqued. Chapter VI presents the summary and conclusions.

CHAPTER II

THE SIMULATION MODEL

Effects of numerous variables on firm growth need to be evaluated. As Chapter I indicated, important variables include methods of land acquisition, different production plans, prices, yields, alternative financial arrangements, levels of beginning equity in the firm, and levels of consumption. The model developed for this study simulates the effects of these variables on firm growth. This chapter provides a general description of the model's capabilities, components, computer requirements, and procedures. Details important to application of the model are given special attention.

Nature and Scope of the Model

The model is designed to simulate the growth of a firm producing small grain crops, forages, and beef cattle in a dynamic and uncertain environment. Growth through land acquisition is emphasized. Land procurement, investment, production, consumption, and credit "decisions" are governed by built-in rules and data specifications. Monthly cash flows are generated to portray linkage of the firm's financial transactions throughout the year as well as over the years. Resources and products are assumed to be purchased and sold in purely competitive markets.

Representing a Firm Situation

The acreage of land owned, the amount of family labor available annually, liquid assets on hand, unused credit, and the existing complement of machinery are inventoried as data. This inventory represents the firm's initial resource situation. The model is capable of simulating a farm operation with 5,000 or less acres of land (60 percent cropland).

The model can process any number of production plans. Wheat, barley, grain sorghum, forage sorghum, alfalfa, small grain pasture, sudan grass pasture, native pasture, feeders, and beef cows are enterprise alternatives that can be represented in the firm's production plan. Four production plans are specified as alternatives in this study. Each plan is specified as a percentage of the total acreage operated since the firm can grow through land acquisition.

Conceptually, and in fact, the economic, climatic, and institutional environment for production as well as management's application of technology is represented by levels of enterprise coefficients. The coefficients reflect expected yields, prices, government payments, production expenses, and livestock labor requirements. Crop labor requirements are determined within the model. Coeffecients are specified by months where relevant. For example, prices are specified by month to reflect seasonality. Enterprise variability is represented by coefficients of variation. Crop and livestock prices and crop yields are subject to variation, while livestock production is invariant. The data must specify whether prices and yields are to be variable or fixed at expected levels.

Specifying a relatively small amount of economic and technical information on machinery enables the model to conduct a machinery inventory analysis. The data required are described later in this chapter.

The growth determinant variables are inputed as data. The type of repayment schedule and number of payments must be defined for alternative financial arrangements. The model can determine when and how much land acquisition is possible, but, a rent, purchase, or rent-purchase method must be specified. Land acquisition does not have to be determined by the model. The acreages owned and rented can be specified as data. Two consumption functions are built into the model. However, the type of function desired and the necessary parameters must be specified as data.

Representing a Firm's Annual Operations

Information about the firm growth process is derived by simulating the firm's annual operations for a specified production plan. The acreages owned and rented are examined first by the model. If land is purchased, the amount of investment capital required is determined. Overhead and related expenses, such as land rental payments, are calculated. The overhead expenses per acre decrease as farm size increases.

All enterprises in the production plan are land based. Thus, the level of each enterprise (crop and livestock) is adjusted to the acreage of land operated. If the cow-calf enterprise is expanded, an investment in additional breeding stock is made.

A least-cost machinery inventory is selected for the acreage of land operated. Additional machines can be added to the existing inventory or existing machines can be traded for larger machines. Also, a machine is traded if its accumulated hours of use exceeds the amount of time when average hourly costs are about at a minimum or if the age of the machine is greater than the number of years it is allowed to be kept. The amount of investment capital required is the cash price of the new machine minus the market value of the existing machine if a trade is involved. The operating and ownership costs of each machine in the inventory depend on the age of the machine and the number of hours it is used annually.

Labor is hired on a hourly basis if crop and livestock labor requirements exceed the amount of family labor available. Under conditions described later in this chapter, unused family labor can find employment outside the firm.

Although most costs of production (including forage production) are specified as data, net returns from livestock enterprises must be computed. If a shortage of any forage exists, the shortage is purchased or rented-in at a price subject to variation. A shortage can prevail due to the variability of forage production. Feeders are purchased and cull cows, calves, and feeders are sold at prices subject to variation. Forage can be a source of income to the firm if an excess amount of any forage is produced.

Net returns from small grain crops are calculated in the model. The material costs of production are "certain" but product prices and yields are subject to variation. The government payments associated with the crop enterprises also are calculated.

Cash is withdrawn for consumption, Federal and state income taxes, and social security. Income from the previous year is taxed on a cash basis. Consumption is computed on the basis of one of the consumption functions described later in this chapter. In brief, consumption can be "certain," a function of after-tax income from the previous year, or a function of after-tax income from the previous year and family size.

Capital for investment, operating, consumption, and tax paying purposes can be obtained from sources external to the firm if the amount of capital required exceeds the amount of capital available. Annual principal and interest payments depend on the type of financial arrangements constructed. Unused capital can be placed in a savings account.

The financial condition of the firm is summarized as a final step in representing one year of a firm's operations. Assets, liabilities, net worth, and a net worth (equity) ratio are computed. Also, two ratios for later use in testing the firm's solvency are calculated. These two solvency ratios are the ratio of real estate debt to the real estate debt limitation and the ratio of non-real estate debt to the non-real estate debt limitation. The firm solvency test is discussed later in this chapter.

Representing a Firm's Operations Over Time

The model simulates the firm's operations over 25 years to depict the expansionary and increasing equity stages of the firm's life cycle. The simulation is accomplished by linking the firm's annual operations over a 25 year period. The resource base at the end of the year one provides the base for the beginning of year two and so on. This resource base includes land (owned and rented), family labor, machinery, livestock (cows, bulls, and feeders), unused credit, and cash savings.

The model can provide 50 different replications of the firm's operations over 25 years. The purpose of replicating the firm's operations is to provide a distribution of outcomes. The number of replications desired must be specified as data.

A firm solvency test is performed after the firm's operations have been simulated over 25 years and replicated the specified number of times. The probability of the firm surviving over 25 years can be required to exceed a level specified as data when prices and yields are variable. When prices and yields are set at their average level, the firm is required to maintain solvency during each of the 25 years.

Presenting Information Generated

One of the major problems of simulation is what to do with the enormous amount of information generated. It would be nearly impossible to get an overall picture of the firm growth process if a presentation was made of all the information generated during months, years, and replications.

The model provides a monthly and annual statistical summary of the firm's operations over 25 years. Monthly summary statistics include only the monthly average across replications. Annual summary statistics include the lowest and highest values generated annually during the replications, the annual average across replications, the annual standard deviation, and the annual coefficient of variation.

The annual rate of growth in the net worth after year one is summarized by ordinary least-squares regression (NW = a + bX).

Definitions

Various terms are used in this and later chapters which may be unique to this study. To avoid misinterpretation, these terms are defined to clarify their meaning.

A computer run or run refers to the computer's execution of the simulation program. Repetitive runs refers to a series of computer runs. The simulation experiments conducted for this study generally involved repetitive runs.

A run is divided into stages when land acquisition is determined by the model. A stage involves simulating the firm's operations over 25 years with no replications when prices and yields are invariant. When prices and yields are variable, a stage involves simulating the firm's operations over 25 years with the specified number of replications. When the acreages owned and rented are specified as data, there is only one stage to a run.

A simulation solution represents the final results of a computer run. When the acreages owned and rented are specified as data, the final results are obtained after the firm's operations over 25 years have been simulated and replicated. When land acquisition is determined by the model, however, the final results are not obtained until all the stages of a run have been completed.

A feasible solution indicates that the firm solvency test has been passed. When prices and yields are variable, an infeasible solution indicates that the probability of the firm surviving over 25 years is less than the required probability. When prices and yields are invariant, an infeasible solution indicates the firm could not maintain solvency during each of the 25 years.

The preceeding general description gives a basic idea of the model's simulation procedures and computations. Components and computer requirements of the model are discussed next after which the procedures and computations performed by the model are discussed in detail. The procedures and computations vary primarily according to conditions of prices and yields and land acquisition. Thus, special attention is given to the simulation procedure and computations performed when (1) the acreages owned and rented are specified as data and prices and yields are variable, (2) land acquisition is determined by the model and prices and yields are variable, and (3) land acquisition is determined by the model and prices and yields are invariant.

Components and Computer Requirements

The simulation computations are performed by a MAIN program and nine subroutines (INPUT, LAND, STNMDV, PRODUC, MCHNRY, FINANC, TAXES, WANDR, and OUTPUT). The subroutines are referred to throughout this chapter when their functions are discussed.

The simulation program (presented in Appendix A, Table XVI) is written in Fortran IV and is designed for the IBM 360 computer. The program requires about 180,000 bytes of core when several subroutines are overlaid. The OUTPUT subroutine overlays the MCHNRY subroutine which overlays the INPUT subroutine. The program requires about 230,000 bytes of core when the subroutines are not overlaid. About

196,000 bytes of disk are required for program storage. About 825,000 bytes of scratch disk and one 1,200 foot magnetic tape are required for data storage. The use of tape and disk for data storage is explained in Appendix D.

Simulation Procedure and Computations Performed When the Acreages Owned and Rented are Specified as Data and Prices and Yields are Variable

The simulation procedure begins by inputing data. Next, the firm's annual operations over 25 years are examined and replicated a specified number of times. Then, a firm solvency test is performed. Finally, the simulation solution is printed. A generalized flow chart of the simulation procedure is presented in Figure 2.

Data Input

The simulation model depends primarily on data that are inputed on cards. The data that are inputed on cards are arranged in table form by the INPUT subroutine. The arrangement of these data on cards and in table form is discussed in Chapter III.

A set of data can also be inputed on tape after a preliminary computer run has been made to create the data set. This set of data is discussed in Appendix D.

Land Investment and Overhead Expenses

The acreages owned and rented are examined by the MAIN program. If land is purchased, the amount of investment capital required is determined.

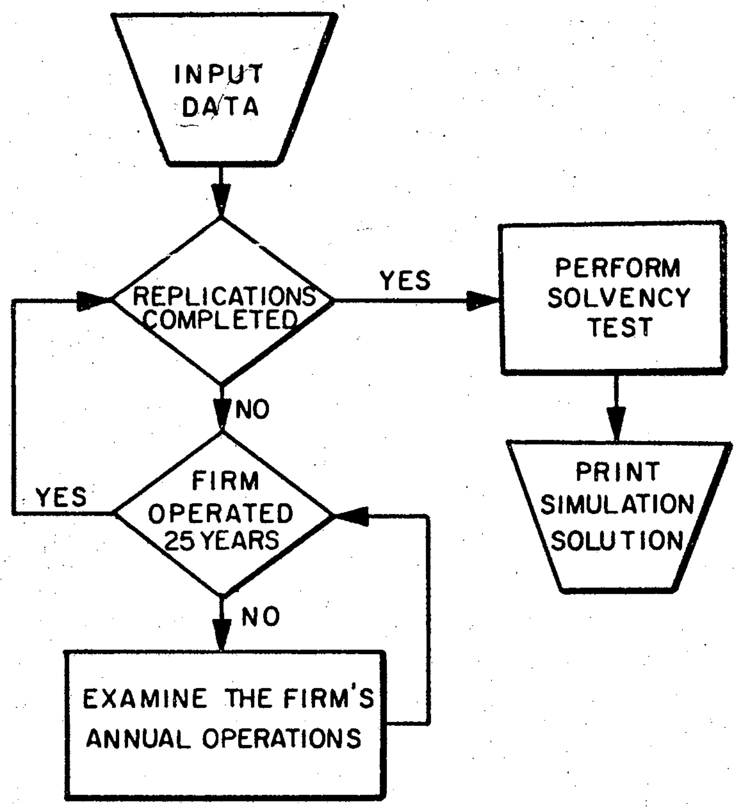

Figure 2. Generalized Flow Chart of the Simulation Procedure When the Acreages Owned and Rented are Specified as Data and Prices and Yields are Variable.

Overhead and related expenses are also computed by the MAIN program. The overhead expense is computed by the following equation:

$$E = a + bX_1 + cX_2 \tag{2-1}$$

where E is the total overhead expense, a is the overhead expense per farm, b is the overhead expense per owned acre, X_1 is the acreage owned, c is the overhead expense per rented acre, and X_2 is the acreage rented. The related expenses include land rental payments and real estate tax payments.

The Production Plan and Breeding Stock Investment or Disinvestment

Any of the four production plans can be specified to be followed during the 25 years. The PRODUC subroutine treats acquired land as having been operated under the same type of production plan as the land currently operated. At the beginning of the first year, livestock is not included in the production plan.

A change can be made in the production plan followed during any year of the 25 years (the year of change must be specified as data). But, a different plan cannot always be completely implemented during the year the change is made. Livestock enterprises are completely adjusted in size during the year the change is made. If the cow-calf enterprise is expanded, an investment in additional breeding stock is made. If the cow-calf enterprise is reduced within eight years after initiation of the livestock program, proceeds from the cows sold are not considered taxable income by the simulation program. After eight years, an appropriate portion of the income from the cows sold is taxed. Breeding stock investment or disinvestment is computed by the

MAIN program.

Winter crop acreages are also properly adjusted during the year a change is made in the production plan followed. However, due to the overlapping of field operations between winter and summer crops, a summer crop acreage is increased during the year a change is made only if the acreage of another summer crop is decreased. The PRODUC subroutine is constructed to allow the acreage of forage sorghum to increase by the amount of decrease in grain sorghum acreage. A summer crop acreage is increased during the year after a change is made if only the acreage of a winter crop is decreased.

Machinery - Requirements, Investments, Labor Usage, and Expenses

The MCHNRY subroutine selects a least-cost machinery inventory for the acreage of land operated, computes machinery usage (monthly, annual, and accumulated hours), determines when machinery is to be traded, and calculates annual costs.

The number of replications does not influence the number of times the MCHNRY subroutine is called since the acreage of land operated does not change from one replication to the next during a run. Thus, the results of the machinery analysis conducted during the first replication are applicable to all remaining replications.

The MCHNRY subroutine is called every year during the first replication. A least-cost machinery inventory needs to be selected during the years in which the acreage operated changes. For example, if the acreage operated changes during years one and eleven, the inventory selected during year one is applicable until year eleven and the inventory selected during year eleven is applicable through year 25.

The monthly hours each machine is used need to be computed during the years in which the acreage operated changes and during the first year after each acreage change. Unless land is acquired during January, the labor requirements during a year of an acreage change will be different than during subsequent years. Investments, depreciation, annual costs, and accumulated hours of machinery usage need to be computed during each of the 25 years.[1]

A least-cost machinery inventory is selected on the basis of tractor requirements during the month with the greatest labor requirements. Six steps are involved in this process. They are as follows:

1. The hours each machine (in the five sets of machinery specified as data) is used monthly are computed on the basis of acres operated after land acquisition.
2. The month with the highest labor requirements is determined on the basis of size one machinery. During that month, as many as 240 different tractor combinations can be subjected to an hourly usage test. The tractor combinations are specified as data. Each combination consists of one to five tractors. A tractor combination is negated if any tractor in the combination is used more than a permitted number of hours or if any tractor in the

[1]For the inventory existing prior to year one (specified as data), accumulated hours until year one are computed on the basis of the beginning acreage specified as data.

combination is unused. The maximum number of hours a tractor or implement can be used per month is specified as data.

3. A complement of implements is derived for each tractor in the remaining tractor combinations. The implements in each complement must always be of an appropriate size for the tractor. A complete complement of implements (eight) is assigned to the first tractor. A complement of implements for each of the other tractors in a tractor combination is derived on a monthly basis. These complements do not have to contain all eight implements. During the first month, the second complement includes only those implements needed to meet the labor requirements for field operations unmet by the implements in the first complement. The third complement includes those implements needed to meet the labor requirements unmet by the implements in the first and second complements. This process continues until the labor requirements for each field operation have been satisfied. During the second and subsequent months, the labor requirements for each field operation are reviewed to determine if additional implements need to be added to each complement. After step 3 has been completed, as many as 240 machinery inventories can exist.

4. For each machinery inventory, the hours each machine is used is averaged among machines of the same size. For example, if two plows are included in the inventory and they are both of the same size, the total monthly labor

requirements for plowing are averaged between the two plows.

5. The annual cost of each machinery inventory is computed. Costs considered include labor, repairs, fuel, lubricants, taxes, housing, insurance, interest on investment, market depreciation, and dependability (discussed in Chapter III). Where relevant, tractors costs are based on power usage (90 percent of labor time) and implement costs are based on implement usage (80 percent of labor time). The tractor cost equations are taken from a study by Kletke [21]. The implement cost equations are structured in the same manner as the tractor cost equations. Parameters for the implement cost equations are based on data and formulas presented in the 1967 Agricultural Engineers Yearbook [2]. The price of Diesel fuel burned by the tractors is $0.13 per gallon. The labor charge and interest rate are specified as data (discussed in Chapter III). Investment credit is subtracted from total costs at whatever rate is specified as data (discussed in Chapter III). The planning horizon for each machine is determined independently. The planning horizon is either the number of years a machine is allowed to be kept (specified as data) or the number of years it takes for a machine's accumulated hours of use to exceed the amount of time when average hourly costs are about at a minimum. Whichever method yields the shortest planning horizon determines the length of the planning horizon. The amounts of accumulated use when average hourly costs are about at a minimum were taken from a study by Bowers [6].

6. An inventory is selected which has the lowest annual costs.

Under certain conditions, a considerable amount of computer processing time can be saved by employing the MCHNRY subroutine apart from the complete simulation model. Suppose a number of simulation experiments are to be conducted and none of the experiments involve coefficient changes (labor charges, interest rates, etc.) which would affect the selection of least-cost machinery inventories. Under these conditions, the MCHNRY subroutine should be used to derive least-cost machinery inventories for relevant acreages before employing the complete simulation model. After the inventories have been selected, they must be specified in the MCHNRY subroutine. Each time the MCHNRY subroutine is called from the MAIN program to select a least-cost machinery inventory, an inventory is selected for the relevant acreage from one of the inventories specified. A detailed explanation of this procedure is presented in Appendix B in terms of how the procedure was used in this study.

After the machinery inventory has been selected, the monthly hourly usage of each machine is again computed and averaged among machines of the same size. However, usage is based on the actual acreage operated each month instead of the acreage involved after land acquisition. Investments are computed as discussed earlier in this chapter.

Each year, the existing inventory is checked to determine if machines need to be traded. A machine is kept if its accumulated hours of use does not exceed the amount of time when average hourly costs are about at a minimum and if the age of the machine does not exceed the number of years the machine is allowed to be kept.

Depreciation is computed on old and new machinery (20 percent declining balance method of depreciation) as well as investment credit (at a rate specified as data) on machinery purchased. Accumulated hours of use are updated. Costs for repairs, fuel, lubricants, taxes, housing, and insurance are computed on a monthly basis. The equations used are the same as those used when the least-cost inventory was selected.

Labor Requirements and External Employment of Family Labor

The crop labor requirements are computed when the machinery analysis is conducted. Livestock labor requirements are derived by multiplying the level of each activity times the livestock labor requirements specified as data on a per unit basis (computed by the PRODUC subroutine). If total labor requirements exceed the amount of family labor available, specified as data, additional labor is hired within the MAIN program at a rate specified as data.

The MAIN program allows unused family labor to be employed outside the firm under certain conditions. Family labor can be externally employed if 50 percent or less of the family labor available is required on the farm and if the size of the farm does not exceed a certain acreage specified as data. No more than 75 percent of the family labor available can be externally employed. External employment is considered by month. The hourly wage earned on external employment is the same as the wage paid on hired labor.

Enterprise Net Returns and Government Payments

Enterprise Variability. Crop prices and yields and livestock prices are subject to variation in the model. Thus, before enterprise net returns are computed, random numbers are generated which lead to prices and yields that vary about the mean values specified as data.

Normal frequency distributions were assumed for prices and yields. Thus, a normal random number generator (GAUSS) is called from the computing center library of subroutines [18] to generate standard normal deviates. GAUSS is called by the STNMDV subroutine. The same deviates are always generated for each computer run since a starting position for GAUSS is specified in the simulation program.

Standard normal deviates are generated by GAUSS for:

1. Wheat production
2. Barley production
3. Small grain pasture production from October to March
4. Small grain pasture production from March to May
5. Grain sorghum, forage sorghum, grain sorghum stubble pasture, alfalfa hay, alfalfa pasture, and sudan grass pasture production
6. Native pasture production
7. Wheat price
8. Grain sorghum price
9. Barley price
10. Alfalfa hay price
11. Small grain pasture price
12. Grain sorghum stubble pasture price

13. Native pasture price

14. Livestock prices for the appropriate calendar year.

The STNMDV subroutine limits the deviates to a magnitude of plus or minus three except for lower limits on barley production (-2.288) and native pasture production (-2.597). The latter limits prevent negative yields. Wheat and barley production share the same deviate except for the adjustment. Deviates for 11, 12, and 13 above are generated independently, but their sign is changed if not opposite of 1, 5, and 6, respectively. In effect, pasture prices vary inversely with pasture production.

Forage - Availability, Usage, Returns, and Expenses. Pasture and hay usage is determined after yields have been determined. Excess production is sold or rented-out. If there is a shortage of any forage, the forage is purchased or rented-in. These computations are performed by the PRODUC subroutine.

The yield computations are of the general form:

$$Y_j = \sum_{i=1}^{8} Q_i \ (A_{ij} + C_{ij} \ A_{ij} \ S_{ij}), \quad j = 1,\ldots,6 \tag{2-2}$$

where Y_j is the production of the j th forage. Q_i is the acreage of the i th forage producing enterprise, A_{ij} is the average yield of the i th forage producing enterprise, C_{ij} is the coefficient of variation, and S_{ij} is the standard normal deviate associated with the i th forage producing enterprise. Each of the eight enterprises produce one or more of the six forages on land divided into several productivity classes. Although the productivity classes are not represented in Equation (2-2), they are included in the input tables discussed in Chapter III and accounted for in the model.

The shortage of surplus of a forage is computed as follows:

$$F_j = Y_j - \sum_{i=1}^{4} Q_i' A_{ij}', \quad j = 1,\ldots,6 \tag{2-3}$$

where F_j is the shortage or surplus of the j th forage. Y_j is the production expressed in Equation (2-2), Q_i' is the quantity of the i th forage using enterprise, and A_{ij}' is the resource requirement of the i th forage using enterprise. The four forage using enterprises include three feeder activities and one cow-calf activity.

The return-expense equation for the excesses or shortages is as follows:

$$Z = \sum_{j=1}^{6} F_j \, (P_j + C_j' \, P_j \, S_j') \tag{2-4}$$

where Z is a return if positive and an expense if negative. F_j is the remaining amount expressed in Equation (2-3), P_j is the average price of the j th forage, C_j' is the price coefficient of variation, and S_j' is the standard normal deviate associated with the j th price.

Five of the eight forage producing enterprises produce forages exclusively. The production costs associated with these five enterprises are considered by the model. They are computed by multiplying the level of each activity times the material costs specified as data on a per acre basis. Three of the forage producing enterprises are small grain crops which are evaluated later in this chapter.

Livestock Returns and Expenses. After returns have been computed, expenses are calculated. The computations are performed by the PRODUC subroutine.

Livestock production is "certain" but sale prices are not. Gross returns (R') from livestock in the previous production plan (if different from the current plan) are computed as follows:

$$R' = \sum_{j=1}^{4} Q_j A_j (P_j + C_j P_j S_j) \tag{2-5}$$

where Q_j is the quantity of the j th livestock enterprise and A_j is the expected yield of the j th enterprise. The average selling price of the j th livestock activity is P_j, and its coefficient of variation and standard normal deviate are C_j and S_j, respectively. R' is added to the return account, and if R' is feeder animal returns, R' is also added to the tax account. Cull cow sales are not considered taxable income by the simulation program during the first eight years after initiation of a livestock program. It is assumed that during this time, the cull cows sold were originally purchased (first in first out), and that the sale price of each cow equals the adjusted basis (12.5 percent declining balance method of depreciation) plus selling expense. After eight years it is assumed that 80 percent of the cull cows sold are raised replacements so that 40 percent (50 percent of the capital gain or .50 x .80) of a sale is taxable income.

Feeder animals in the current production plan are purchased as follows:

$$E' = \sum_{j=1}^{3} Q'_j A'_j (P'_j + C'_j P'_j S_j) \tag{2-6}$$

where E' is the purchase cost. Q'_j is the quantity of the j th livestock enterprise and A'_j is the purchase weight of the j th animal. The average purchase price associated with the j th livestock activity is

P'_j, and its coefficient of variation and standard normal deviate are C'_j and S_j, respectively. E' is added to the expense account but is not subtracted from the tax account during the current year. Since the cost of feeder steers is a tax deductable expense during the year they are sold, E' from the previous year is subtracted from the tax account. No feeder activities were included which involved purchase and sale during the same year.

The livestock material expenses are specified as data. By multiplying these expenses by the livestock activity levels, total livestock expenses are obtained.

Small Grain Crop Returns and Expenses. Returns and expenses are computed by the PRODUC subroutine. Gross returns are computed as follows:

$$R = \sum_{j=1}^{3} Q_j \; (A_j + C_j \; A_j \; S_j) \; (P_j + C'_j \; P'_j \; S'_j) \qquad (2\text{-}7)$$

where R is the return. Q_j represents the acreage of the j th crop, A_j is the average yield of the j th crop, C_j is the production coefficient of variation, and S_j is the production standard normal deviate associated with the j th crop. The three crops are produced on land divided into seven productivity classes. The average price of the j th crop is P_j, its coefficient of variation is C'_j, and its standard normal deviate is S'_j.

The crop material expenses are specified as data. By multiplying these expenses by the crop activity levels, total crop expenses are obtained.

Government Payments. The payments, which are computed by the PRODUC subroutine, are added into the stream of returns (R) as follows:

$$R = \sum_{i=1}^{2} \sum_{j=1}^{3} Q_{ij} G_{ij} \qquad (2\text{-}8)$$

where Q_{ij} represents the i th acreage of the j th crop qualifying for a government payment. G_{ij} represents the government payment for the i th acreage of the j th crop. The government payments are further discussed in Chapter III.

Cash Withdrawals

Income and Social Security Taxes. Federal, and state income taxes are computed as well as a self-employment social security tax. Social security taxes on wages paid are also computed. The taxes are computed by the TAXES subroutine on a cash basis according to the *Farmer's Tax Guide* [33] except for the state income tax. The state income tax was assumed to be five percent of the Federal income tax. The taxes computed during the current year are paid during the following year.

The Federal income tax is based on net family income. Investment credit, personal deductions, and dependent exemptions are considered when the Federal income tax is computed. The self-employment social security tax is based on net farm income.

Net farm income includes returns and expenses reportable on Federal Income Tax Form 1040 (cash basis). The expenses do include depreciation on machinery and purchased breeding stock. Net family income includes net farm income plus income from employment external to the firm. Both net incomes are computed by the MAIN program.

An after-tax income is computed by the MAIN program after taxes have been computed. The after-tax income includes net family income less Federal, state, and social security taxes. The after-tax income on which consumption is based during the following year excludes the state income tax and the social security taxes on wages paid.

Consumption. Two consumption functions are available. The data specifies which function is to be evaluated by the MAIN program.

The first function permits a "certain" level of consumption plus some percentage of after-tax income. This function is given by the following equation:

$$C = a + bI \tag{2-9}$$

where C is the family consumption, a is the "certain" level, b is the percentage, and I is the after-tax income from the previous year. The parameters a and b are specified as data.

The second function allows consumption to vary according to the level of after-tax income and family size. This function, discussed by Brake [7, pp. 769-772], is defined by the following equation:

$$C = 24.32\, I^{.59}\, S^{.163} \tag{2-10}$$

where C is the family consumption, I is the after-tax income from the previous year, and S is the number of family members which is specified as data. The after-tax income in Equation (2-10) was required to be at least $2,500.

Credit Usage and Cash Savings

The MAIN program allows cash downpayments to be made on machinery, breeding stock, and land investments in that order. Cash available for each downpayment includes cash savings accumulated from previous years plus net returns up to the month of each investment.

The amount of each debt is the difference between the investment and the downpayment plus interest on the balance up to the month of each scheduled annual payment. The annual cost of capital is not included as a part of investment capital. The amount of each downpayment is recorded as an expense during the month of each investment.

Individual repayment schedules are constructed for the machinery debt, cow debt, and real estate debt. The payments can be scheduled on a Standard or Springfield plan and they can be non-amortized and/or amortized. The FINANC subroutine will accommodate repayment schedules up to 120 years on loans used to purchase land. The repayment schedules are limited to 50 years on loans used to purchase cows and machinery.

Existing loans are refinanced when additional credit is needed for investments. A payment is not due during the year in which a loan is scheduled except in the case of renewal. Financing charges are recorded as an expense during the month of investment.

There can never be a disinvestment in land and machinery. However, the cow-calf enterprise can be reduced or completely dispersed. If the cow-calf enterprise is reduced, proceeds from the sale are applied to any existing scheduled payment on cows. If the whole herd is sold, proceeds from the sale are applied toward any existing outstanding principal on cows.

Short term debt and cash savings are recorded on a monthly basis by the MAIN program. If returns less expenses are positive, the amount is considered cash savings and accumulates interest for one month. If the amount is negative, the amount is considered short term debt and a monthly interest charge is computed.

Financial Summary

Assets, liabilities, net worth, and a net worth (equity) ratio are computed. Also, two ratios important to a firm solvency test are computed. These two solvency ratios are (1) the ratio of real estate debt to the real estate debt limitation and (2) the ratio of non-real estate debt to the non-real estate debt limitation. These computations are performed by the MAIN program.

The following example defines the variables referred to in the two ratios. Suppose the data specify that credit is limited to 48, 66, 50, and 75 percent of current real estate, new machinery, used machinery, and livestock market values, respectively. The real estate debt is limited to 48 percent of the current real estate value. The real estate debt is the outstanding principal at the end of the current year on loans used to purchase real estate. The non-real estate debt limitation comprises 48 percent of the current real estate value less the real estate debt, 66 percent of the new machinery value, 50 percent of the current used machinery value, and 75 percent of the current livestock (cows, bulls, and feeders) value. The non-real estate debt is the outstanding principal at the end of the current year on loans used to purchase machinery, cows, and bulls plus short term debt.

Firm Solvency Test

A firm solvency test is performed by the MAIN program after the firm's operations have been simulated 25 years and replicated the specified number of times. The firm solvency test involves determining if a lower limit to an interval estimate of the probability that the firm can survive over 25 years is as great as a required probability specified as data.

An interval estimate is computed because a statement about the interval containing the probability of firm survival can be made with a degree of confidence. An interval within which it can be stated, with 95 percent confidence, that the probability lies is called a 95 percent confidence interval [24, pp. 89-94]. Boundaries to a 95 percent confidence interval are called 95 percent confidence limits.

It is critical that the probability of firm survival not be overestimated. Hence, a 95 percent one-sided confidence interval estimate of the probability is derived by computing a 95 percent lower confidence limit. If the lower limit is greater than or equal to the required probability, it can be stated (with 95 percent confidence) that the probability of firm survival is greater than or equal to the required probability. Appendix C provides additional information on the statistical concepts incorporated in the solvency test.

Suppose it is required that the probability be at least .85 that the firm can survive over 25 years. The required probability is specified as data. The procedure followed in the solvency test is as follows:

1. A point estimate of the probability that the firm can survive over 25 years is derived by determining the proportion of replications in which both solvency ratios were less than or equal to one during each of the 25 years.

2. A 95 percent one-sided confidence interval estimate of the probability that the firm can survive over 25 years is derived by computing a 95 percent lower (L) confidence limit as follows:

$$L = \frac{n}{n + 2.69}\left[\frac{\hat{p} + 2.69}{2n} - 1.64\left(\frac{\hat{p}\,(1 - \hat{p})}{n} + \frac{2.69}{4n^2}\right)^{1/2}\right] \qquad (2\text{-}11)$$

where n denotes the number of replications, $\hat{p}$ is the point estimate of the probability, 1.64 is equal to $z_{.95}$, and 2.69 is equal to $z^2_{.95}$. Equation (2-11) is generalized in Appendix C.

3. The lower limit, derived through Equation (2-11), is compared to the required probability of .85. The lower limit must be greater than or equal to .85 for the firm to pass the solvency test.[2]

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[2]The simulation results presented in Chapter IV were derived under a solvency test that required a 68 or 95 percent probability that firm solvency could be maintained during any one of the 25 years. Upon analyzing the results, it was discovered that under a 95 percent probability, both ratios were less than or equal to one every year during 33 or 34 replications out of 35. Consequently, by Equation (2-11), the probability of the firm surviving over 25 years would be at least 85 percent. Under a 68 percent probability, both ratios were less than or equal to one every year during 22 replications out of 35. Hence, by Equation (2-11), the probability of the firm surviving over 25 years would be at least 50 percent. Because the solvency test presented in this chapter was implicitly performed in the simulation experiments conducted and because it allows a more exact probability statement to be made about results from the simulation model than otherwise could be made, the solvency test outlined in this chapter was presented instead of the test under which the simulation experiments for this study were conducted. Throughout the remainder of this thesis, probabilities of .50 and .85 that the firm can remain solvent over 25 years are asserted. The simulation program presented in Appendix A, Table XVI has been amended to include the solvency test outlined in this chapter.

If the firm passes the solvency test, it can be stated (with 95 percent confidence) that the probability of the firm surviving over 25 years is at least .85. If the firm fails the solvency test, the test is repeated annually. Each annual test is based on the proportion of replications in which both solvency ratios were less than or equal to one during each of the years represented in the test. If the test is being performed during year 10, the years 1-10 are represented in the test. The annual testing is performed so that if the simulation solution printed is infeasible, the first year during which the solvency test could not be passed can be denoted on the first page of output. The probability of the firm surviving over 25 years is also given on the first page of output if the solution printed is infeasible.

Simulation Solution Printed

The simulation solution is printed by the OUTPUT subroutine. A sample solution is presented in Appendix A, Table XVII. Frequency distributions of items in the simulation results are discussed in Appendix C.

The simulation results over 25 years are presented in 14 tables as follows:

1. Farm Plans, The acreages operated, owned, and rented during the first and last half of each year are presented. Also shown are the acreages of crops and numbers of livestock in the production plan followed each year. The number of different land situation simulated is presented as a footnote to the table.

2. Machinery - Combinations, Sizes, and Ages. The least-cost machinery inventory for each year is presented along with the age of each machine in the inventory.
3. Crop Labor Requirements. The amount of labor required during each month and year by the crop enterprises is specified.
4. Total Labor Requirements. The total amount of labor required during each month and year by the crop and livestock enterprises is specified.
5. Total Returns. The total inflow of cash including outside income and cows sold (money borrowed is excluded) is included in total returns. For each month, average total returns are presented. For each year, average total returns are presented along with the low, high, standard deviation, and coefficient of variation.
6. Machinery Expenses - Repairs, Taxes, Housing, Insurance, Fuel, and Lubricants. Monthly and total machinery expenses are presented for each of the 25 years.
7. Total Expenses. The total outflow of cash including the cash paid on investments, scheduled loan payments, taxes (Federal, state, and social security), and consumption is included in total expenses. For each month, average total expenses are presented. For each year, average total expenses are presented along with the low, high, standard deviation, and coefficient of variation.
8. Savings and Short Term Debts. This table has the dual purpose of illustrating cash savings (positive amounts) and short term debts (negative amounts) by month. For each month,

average savings and short term debts are presented. For the month of December, the low, high, average, standard deviation, and coefficient of variation are presented. Average amounts increase or decrease from one month to the next by the difference between average monthly total returns and expenses.

9. Investments and Current Values - Land, Machinery, and Breeding stock. Current value refers to current market value as of the end of each year.

10. Financial Arrangements - Land. The outstanding principal at the end of each year is presented along with the principal, interest, and total payments. For each of these, the low, high, average, standard deviation, and coefficient of variation are given.

11. Financial Arrangements - Machinery. The same type of output is presented as in Output Table 10.

12. Financial Arrangements - Cows. The same type of output is presented as in Output Table 10.

13. Financial Arrangements - Total. A summation is presented of Output Tables 10-12.

14. Farm Operation Monetary Summary. The low, high, average, standard deviation, and coefficient of variation are presented for each of the following farm operation monetary measures except net family income in which only the average is given.

    a. Operating capital includes the variable costs of crop and livestock production, overhead, feeder purchases, land rent, real estate taxes, personal property taxes, interest on all loans, and the cost of financial arrangements.

b. Net farm income includes returns and expenses reportable on Federal Income Tax form 1040 (cash basis).

c. Net family income includes net farm income plus income from employment external to the firm.

d. After-tax income includes net family income minus Federal, state, and social security taxes. It represents the annual return after taxes to equity in land, breeding stock, machinery, and operating capital; family labor; and management.

e. Consumption is based on a modified after-tax income from the previous year. The modified after-tax income includes net family income minus Federal income tax and self-employment social security tax.

f. Assets include the current value of land, machinery, livestock, and cash savings at the end of each year.

g. Liabilities include the outstanding principal at the end of each year on land, machinery, livestock, and short term loans.

h. Net worth equals assets minus liabilities. As a footnote to the table, the annual rate of growth in net worth after year one is presented as determined by ordinary least-squares regression ($NW = a + bX$).

i. The net worth (equity) ratio is net worth divided by assets.

j. The real estate debt to limitation ratio is the real estate debt divided by the real estate debt limitation.

k. The non-real estate debt to limitation ratio is the non-real estate debt divided by the non-real estate debt limitation.

Simulation Procedure and Computations Performed When Land Acquisition is Determined by the Model and Prices and Yields are Variable

The computations performed by the model are essentially the same as the situation just described when the acreages owned and rented were specified as data. The simulation procedure, however, is somewhat different. The difference results because of the manner in which land is acquired.

Two aspects of the simulation procedure are discussed in this section of the chapter. The first aspect relates to the land acquisition process. The second aspect pertains to the machinery analysis.

Land Acquisition

Three land acquisition options are provided by the simulation model. They are (1) purchase, (2) rent, and (3) rent and purchase. Land is acquired on a unit basis. A unit may be one acre or 40 acres or 160 acres or any other acreage. Land is purchased one unit at a time while land is rented four units at a time. All land acquisition options are subject to annual and total land acquisition limits.

The years during which land acquisition can be attempted is controlled by a variable which increments the land acquisition year by a specific number of years each time it is determined that additional land cannot be procured during the current land acquisition year. A variable also defines the last year during which land acquisition can be attempted (last land acquisition year). On the basis of data specified for these programming variables, the LAND subroutine controls the acreages operated, owned and rented.

Each time the acreages owned and rented are adjusted by the model, the firm's annual operations are examined and the firm solvency test is performed. A generalized flow chart of the simulation procedure is presented in Figure 3.

<u>Purchase</u>. The land acquisition process begins by increasing the owned acreage by one unit of land during year one. The next step taken depends on several factors.

Suppose that the firm continues to pass the solvency test. Land acquisition continues during year one until the annual limit is reached. Land is then acquired during a later year until the annual limit is again reached. This process continues until either the total limit is reached or the last land acquisition year is surpassed.

Suppose that the first time a unit of land is purchased, the firm fails the solvency test. The acreage owned is reduced to the original acreage. If the firm still cannot pass the solvency test, the simulation results are printed.

Suppose that the first time a unit of land is purchased, the firm passes the solvency test. Another unit is purchased given that the annual limit has not been reached. If the solvency test is failed, the acreage owned is reduced by a unit of land and a unit is purchased during a later year. If the solvency test is passed, another unit is

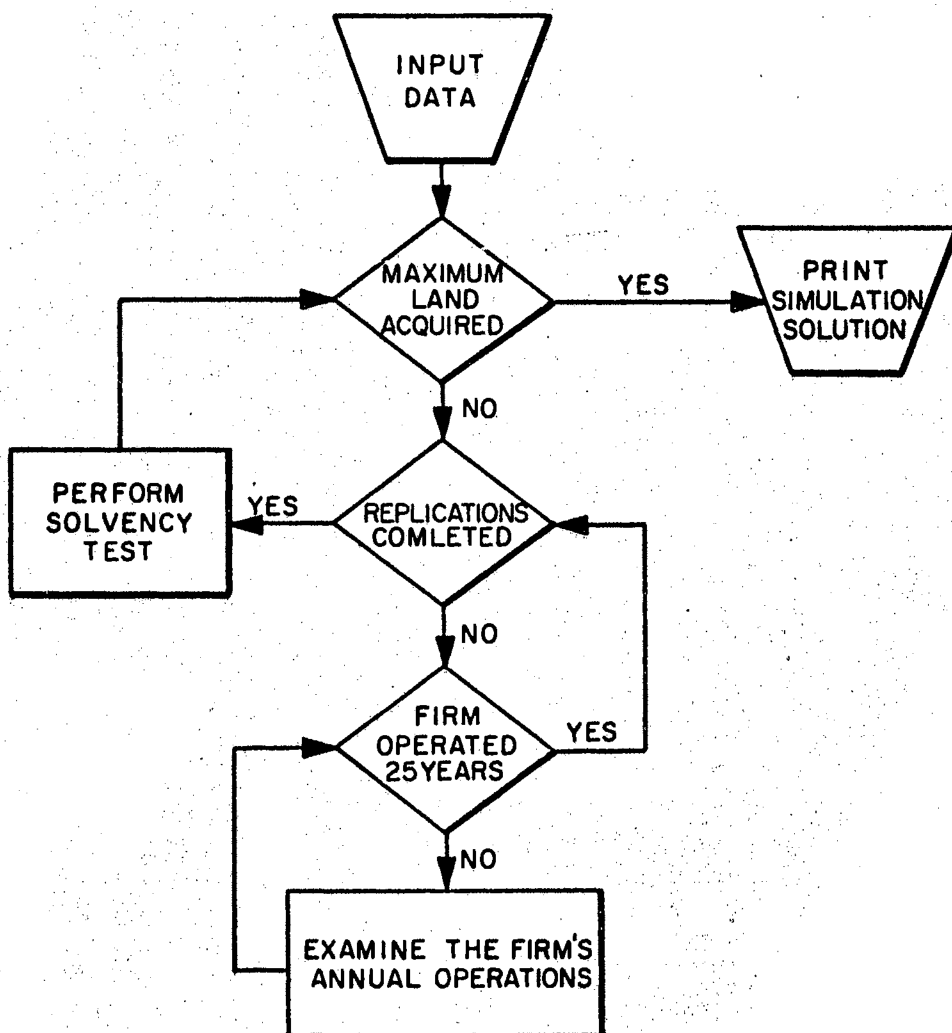

Figure 3. Generalized Flow Chart of the Simulation Procedure When Land Acquisition is Determined by the Model and Prices and Yields are Variable.

purchased given that the annual limit has not been reached. If the solvency test is failed, the acreage owned is reduced by a unit of land and a unit is purchased during a later year. This process continues until either the total limit is reached or the last land acquisition year is exceeded.

Rent. The land acquisition process begins by increasing the rented acreage by four units of land during year one. As when land was acquired through purchase, the next step taken depends on several factors.

Suppose that the firm continues to pass the solvency test. Land acquisition continues during year one until the annual limit is reached. If the annual limit should be exceeded when four units are rented, however, one unit less is rented. If the annual limit is still exceeded, one unit less is rented. If the rented acreage is now less than or equal to the annual limit, the firm's operations are simulated and land acquisition is attempted during a later year. This process continues until either the total limit is reached or the last land acquisition year is passed. If the total limit should be exceeded when four units are rented, adjustments are made in the same manner as when renting four units exceeded the annual limit. The only difference is that land is not acquired during a later year when the total limit is reached.

Suppose that the first time four units of land are rented, the solvency test is failed. Renting three units is tried. If the solvency test is failed, two units are rented. If the solvency test is failed again, one unit is rented. If the solvency test cannot be passed when only unit of land is rented, the firm's operations without additional land are simulated over 25 years and the simulation results are printed.

Suppose that the first time four units of land are rented, the firm passes the solvency test. Another four units are rented given that the annual limit has not been reached. If the solvency test is failed, the acreage rented is reduced by one unit. If the solvency test is failed again, the acreage rented is reduced by one more unit. If the solvency test is then passed, four units are rented during a later year. If the solvency test is passed, another four units are rented given that the annual limit has not been reached. If the solvency test is failed, a unit less is rented. If the solvency test is then passed, four units are rented during a later year. This process continues until either the total limit is reached or the last land acquisition year is surpassed.

Rent and Purchase. The land acquisition process is exactly the same as under the rent method of land acquisition until the total limit is reached. Once the total limit is achieved, however, land can be purchased. When a unit of land is purchased, a unit less is rented. The acreage of land operated remains constant.

Suppose that while land is being purchased the firm continues to pass the solvency test. The process of purchasing one unit of land and renting one unit less continues until all the acres operated are owned.

Suppose that the first time a unit of land is purchased and a unit less is rented, the firm passes the solvency test. Another unit is purchased and a unit less is rented. If the solvency test is failed, the acreage owned is reduced by one unit, the acreage rented is increased by one unit, and the rent-purchase conversion is attempted during a later year. This process continues until the last land acquisition year is exceeded.

Machinery Analysis

The machinery analysis conducted is exactly the same as discussed for the case when the acreages owned and rented were specified as data. The simulation procedure, however, is modified to conserve computer processing time.

During the first replication of the first stage of the run, the MCHNRY subroutine is called every year. Since land is first acquired during year one, the acreage operated changes only during year one. Thus, a least-cost machinery inventory needs to be selected only during year one. The monthly hours each machine is used need to be computed during years one and two. Investments, depreciation, annual costs, and accumulated hours of machinery usage need to be computed during each of the 25 years.

If the second stage of the run involves an acreage change during year six, the MCHNRY subroutine is called during the years 6-25. The results from the machinery analysis derived during the first stage of the run can be used during the years 1-5.

If the third stage of the run involves an acreage change during year eleven, the MCHNRY subroutine is called during the years 11-25. The results from the machinery analysis derived during the first stage of the run can be used during the years 1-5. The results from the machinery analysis derived during the second stage of the run can be used during the years 6-10. This process continues until the maximum acreage is operated.

Simulation Procedure and Computations Performed When Land Acquisition is Determined by the Model and Prices and Yields are Invariant

Firm growth in a dynamic but "certain" environment is simulated by the model when prices and yields are invariant. Each time land is acquired by the model, the firm's operations over 25 years are examined only once. A generalized flow chart of the simulation procedure is presented in Figure 4.

Enterprise net returns and the firm solvency test are affected when prices and yields are set at their average level. These two variables and one alternative use of the model are discussed in this section of the chapter.

Enterprise Net Returns

The set of equations built into the model is designed to compute enterprise net returns when prices and yields are variable. However, these same equations can be used to compute enterprise net returns when prices and yields are invariant.

All the coefficients of variation are set equal to zero in the model. Thus, when a coefficient of variation, at its zero level, is multiplied times an average and standard normal deviate, the variation in each equation is eliminated.

Firm Solvency Test

Two solvency ratios are computed at the end of each year in preparation for applying the solvency test. The two solvency ratios

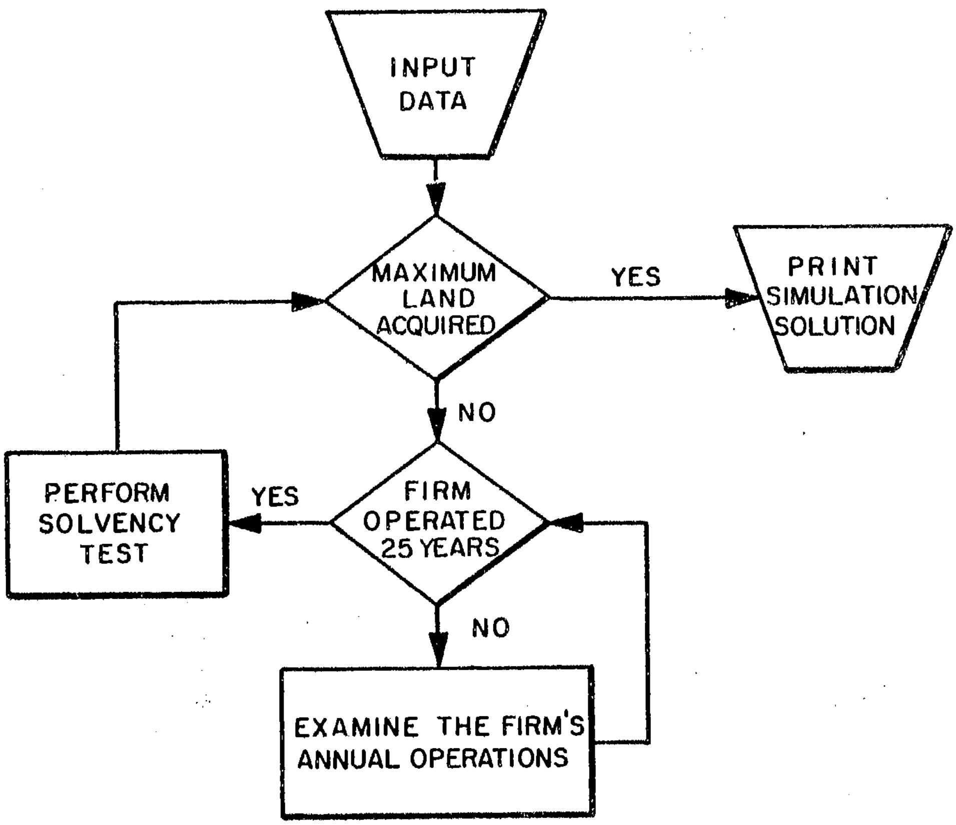

Figure 4. Generalized Flow Chart of the Simulation Procedure When Land Acquisition is Determined by the Model and Prices and Yields are Invariant

are (1) the ratio of real estate debt to the real estate debt limitation and (2) the ratio of non-real estate debt to the non-real estate debt limitation.

The firm solvency test is performed after the firm's operations have been simulated 25 years. The two solvency ratios must be less than or equal to one during each of the 25 years for the firm to pass the solvency test. The test is performed annually so that if the solvency test is not passed, the first year during which one or both ratios were greater than one can be detected. Hence, if the simulation solution printed is infeasible, the first year during which the solvency test could not be passed can be denoted on the first page of output.

Alternative Option

The acreages owned and rented can be specified as data instead of letting the model determine when and how much land can be acquired over the 25 years. In reference to Figure 4, the "Maximum Land Acquired" decision can be ignored. The firm's annual operations are examined 25 times, the solvency test is performed, and the simulation solution is printed.

CHAPTER III

DATA FOR THE SIMULATION MODEL AND THE SIMULATION EXPERIMENTS CONDUCTED

The simulation model discussed in Chapter II utilizes input data arranged into twelve tables. Input tables are designated for:

1. Production Coefficients. Small grain crop and forage yields are per acre by soil productivity class. Feeder steer production and forage requirements are per head. Cow-calf production and forage requirements are per cow.
2. Expenses. The unit costs are specified by months. The variable costs of small grain crop and forage production are per acre. The variable costs of producing feeders are per head. The variable costs of cow-calf production are per cow. The land tax and rent expenses are per $1,000 of land value. The hired labor charges are per hour. Some overhead expenses are specified per farm, some per owned acre, and some per rented acre.
3. Labor Requirements and Family Labor Availability. The hourly requirements for various enterprises are specified on a per unit basis by months. The labor requirements for feeders are per head. The cow-calf labor requirements are per cow. The family labor availability is on a monthly basis.

4. Monthly Field Operations. The months during which field operations are performed are specified for each small grain crop and forage enterprise.
5. Capital Investments. The per unit purchase price of each capital item is specified as is the month of investment. The purchase price of a cow includes the value of a cow, calf, and replacement heifers (four heifers for every 25 cows). The purchase price of a bull is per head. Two coefficients represent the purchase price of land. One coefficient represents the current value of an acre of land. The other coefficient represents the average annual increase in the value of an acre of land.
6. Machinery - Size, Price, and Labor Requirements. Data can be specified for five different size sets of machinery.
7. Tractor Combinations. A total of 240 different tractor combinations can be specified. Each combination can represent up to five different tractor sizes.
8. Crop Prices and Government Payments. The prices and payments specified are effective during specified months.
9. Livestock Prices. For selected livestock activities, the prices per hundredweight expected to prevail over 25 years and the month associated with each set of prices are specified.
10. Coefficients of Variation. Values can be specified for crop and livestock prices and crop yields. Livestock yields are not subject to variation.

11. Production Plan Alternatives. Four different plans can be specified. They are specified as a percentage of the total acreage operated.
12. Programming Variables. These variables include the beginning resource inventory, external firm employment of family labor, consumption, the production plan to be followed, land acquisition options, financial arrangements, and the solvency criteria.

Data specified in the twelve input tables are explained in this chapter, especially in terms of the data required for this study. The basic data required for the simulation experiments are discussed in the first part of this chapter. The simulation experiments conducted are discussed in the latter part of this chapter.

Basic Data

The basic data assembled for the simulation experiments conducted for this study are presented in Appendix A, Table XVIII. This appendix table shows the data as arranged in table form by the simulation program. To the right of each input table heading is the code name which represents respective coefficients in the simulation program. Under subheadings in Input Tables 1, 3, and 11, reference is made to activity identifications in the linear programming tableau from which the production plans were derived.

The arrangement of data on cards is illustrated in Appendix A, Table XIX. Data are presented which show the possible magnitude of each coefficient in the twelve input tables. When the data printed in one row of a table must be inputed on two cards, the second card is identified by a "B" in column 4. All the headings, subheadings, and explanations associated with each table are inputed on cards.

Production Coefficients (Input Table 1)

The small grain, forage, and livestock production coefficients are expected values. The coefficients for small grain pasture available from October to March (SGPMCH) and from March to May (SGPMAY); grain sorghum stubble pasture (GSSP); alfalfa hay (ALFHAY); prairie hay (PRARYH); and native pasture (NATPAS) represent output from crops or input to livestock. Except for small grain pasture production, these coefficients were taken from Oklahoma Agricultural Experiment Station Processed Series P-459 [14] and P-550 [8].

Small grain pasture yields were assumed to be a function of wheat yields. To derive a functional relationship, small grain pasture yields were regressed on wheat yields over a 17 year period (1950-66 data). The wheat yields were obtained from unpublished data at the Stillwater Experiment Station. The small grain pasture yields were obtained on the basis of an estimating equation derived by Walker and Plaxico [37, p. 21]. The resulting estimating equation for the expected amount of small grain pasture available from October to March (Y) is given by:

$$Y = .437998 + \underset{(.005744)}{.009519}\ X \qquad (3\text{-}1)$$

where X is wheat yield in bushels per acre and the figure in parentheses is the standard error of the regression coefficient.

Equation (3-1) is built into the simulation program. Three times the amount of small grain pasture generated by this equation is the expected amount of small grain pasture available from October to May. "In general, forage production up to stooling stage was about a third of that produced when forage was clipped all season" [27, p. 6].

Expenses (Input Table 2)

Small grain crop and forage expenses were based on the material costs and the costs of custom harvesting specified in Processed Series P-550 [8]. Machinery operating costs are computed within the simulation program primarily on the basis of data specified in Input Table 6.

Livestock expenses were based on the costs specified in Processed Series P-459 [14], except for the purchase costs of feeder animals, pasture, and hay. The feeder purchase prices are presented in Input Table 9.

Land rent per $1,000 land value (LR) was determined as follows:

$$LR = (1{,}000 \times .035) + 8.42 \tag{3-2}$$

where .035 is the rate of interest and 8.42 is the tax per $1,000 land value. Land taxes as well as hired labor costs were those assumed to prevail in the study area.

Certain overhead expenses are required at a constant level regardless of the acres operated. However, some of the overhead expenses are associated with the size of the farm. An overhead expense per farm of $1,700 was assumed. Overhead expenses of $1.25 and $1.00 per owned acre and per rented acre, respectively, were assumed.

Labor Requirements and Family Labor Availability (Input Table 3)

Livestock labor requirements and family labor availability are specified as data in Input Table 3. Crop labor requirements are computed within the simulation program on the basis of data specified in Input Tables 5 and 6. The livestock labor requirements were taken from Processed Series P-459 [14]. The amount of family labor available, 200 hours per month, was assumed to be typical of what a farm manager can devote to tasks apart from managerial duties.

Monthly Field Operations (Input Table 4)

The division of crop labor requirements by months depends on when the field operations are performed. Thus, the months during which the field operations of each crop are performed must be specified. Months are denoted by number. For example, July equals 7. Nine different field operations can be performed for each crop during any month. Each of the nine operations can be performed as many as three times. Monthly field operations were based on Processed Series P-550 [8, p. 29].

Capital Investments (Input Table 5)

The current land value is an average of 1968 projected values weighted by county acreages in the study area [25]. The average annual increase in land value is an average of two sources of information. Ordinary least-squares regression was applied to (1) 1945-64 census data [32] weighted by county acreages in the study area and (2) an index of Oklahoma land values [29]. Breeding stock values were obtained from Processed Series P-459 [14]. Machinery prices are specified in

Input Table 6. However, the month of machinery invest must be specified as must be the months of land and breeding stock investments.

Machinery - Size, Price, and Labor Requirements (Input Table 6)

Data regarding the purchase prices and labor requirements for various sizes of machinery must be provided for the simulation program in order for the program to select a least-cost machinery inventory. Such data are specified for five sets of machinery in Input Table 6. Each set represents a different tractor size and contains implements that are compatable with the tractor size.

Cash purchase prices must be specified for all machines except the fertilizer or lime spreader. The fertilizer or lime spreader is rented instead of purchased. Cash purchase prices for 1968 were obtained from dealers at Enid, Oklahoma.

Per acre labor requirements must be specified for all implements. The requirements specified were based on a field capacity formula from the 1967 Agricultural Engineers Yearbook [2].

Tractor Combinations (Input Table 7)

Tractor combinations must also be specified as data in order for the simulation program to select a least-cost machinery inventory. A tractor combination can represent up to five different tractor sizes. The tractor size is denoted by a set number from Input Table 6. The combinations are such that the second tractor is no larger than the first, the third is no larger than the second, and so on. As many as 240 tractor combinations can be specified. The 55 tractor combinations which were specified for this study are presented in Input Table 7.

The reason for specifying these particular tractor combinations is explained in Appendix B.

Crop Prices and Government Payments (Input Table 8)

Crop prices were those expected to prevail in the study area. For small grain, the month denotes when the crop is sold. For pasture and hay, the month denotes when the excess is sold or the shortage is purchased.

Government payments were those provided by the 1969 Government Farm Program [3, pp. 22-26]. The month specified for each kind of payment denotes when a farmer receives the payment.

Livestock Prices (Input Table 9)

Livestock prices were specified for the years 1968-92. The prices were based on projections of deflated monthly prices (1910-14 = 100) paid per hundredweight by Federally inspected slaughter establishments for all U. S. slaughter cattle [30]. The projections were derived through a model developed by Franzmann [13] which considered cyclical and seasonal fluctuation as well as trend. The projections were inflated to the 1968 price level and adjusted to classes and grades of livestock at the Oklahoma City Market [4].

The prices specified in the table are on a per hundredweight basis. The month specified for each set of prices denotes the time of purchase or sale. Feeder steers were purchased during the same month and for the same price as the steer calves sold.

Coefficients of Variation (Input Table 10)

Variation in crop and livestock enterprise returns is based on the coefficients of variation specified in Input Table 10. Setting these coefficients equal to zero would yield simulation results based on averages alone. Since a representation of price and yield uncertainties was desired in the results of this study, coefficients of variation were determined for crop and livestock prices and crop yields. Livestock yields are not subject to variation.

Coefficients of variation for wheat, grain sorghum, and barley production were based on unpublished data from the Cherokee, Woodward, and Stillwater Experiment Stations, respectively. The data were obtained over the period 1950-67 for wheat, 1950-63 for grain sorghum, and 1950-66 for barley.

The coefficient of variation for small grain pasture available from October to March was derived by averaging the estimates obtained when wheat yields were held constant at several levels. The coefficient of variation for small grain pasture available from March to May was based on Aanderud's study [1, pp. 42-43] which showed the amount available until May to have 48.86 percent as much variation as the amount available until March.

The measure of forage sorghum production variability was based on unpublished data from the Woodward Experiment Station over the period 1952-63. Grain sorghum stubble pasture was assumed to have the same coefficient of variation as forage sorghum. The coefficient of variation for sudan grass pasture was based on the relationship shown in Aanderud's study between sudan grass and forage sorghum.

The coefficient of variation for alfalfa hay production was based on north central area county data and Woodward data. The coefficient of variation derived from county data (1958-65) was adjusted upward according to the relationship between the grain sorghum coefficient of variation derived from county data and the grain sorghum coefficient of variation derived from Woodward data. Alfalfa pasture was assumed to have the same variability as alfalfa hay. The coefficient of variation for native pasture production was based on Aanderud's study.

A measure of the variation in wheat prices was based on 1959-65 data from Enid, Oklahoma. The coefficients of variation for grain sorghum, barley, and alfalfa hay prices were obtained from Bulletin B-590 [34]. Other hay and pasture prices were assumed to have the same variation as alfalfa hay prices. Bulletin B-642 [4] provided the coefficients of variation for livestock prices.

Production Plan Alternatives (Input Table 11)

Alternative production plans can be implemented during the firm's 25 years of operation. The production plan alternatives are (1) crops, cows, and feeders, (2) crops and feeders, (3) crops and cows, and (4) crops only. These plans were derived through a linear programming model developed by Bitney [3] for the north central area. The cow-calf activities were deleted from the model when deriving the crops only production plan. The feeder activities were deleted from the model when deriving the crops-cows production plan. All livestock activities were deleted from the model when deriving the crops only production plan. The representative farm programmed was 560 acres of which 58 percent was cropland and 42 percent was native pasture land.

The production plans are specified in Input Table 11 as a percentage of the total acreage operated since the firm can grow through land acquisition. Crop acreages qualifying for government payments are also represented in each production plan. The qualifications include the additional acreages of wheat, grain sorghum, and barley which qualify for diversion payments; the acreage of wheat which qualifies for wheat certificates; and the acreages of grain sorghum and barley which qualify for price support payments.

Programming Variables (Input Table 12)

Variables important to the analysis of a growing firm are specified in this input table. These variables include the beginning resource inventory, external firm employment of family labor, consumption, the production plan to be followed, land acquisition options, financial arrangements, and the solvency criteria.

Beginning Inventory. The amount of land owned was set at 320 acres to represent a class III commercial farm. The amount of liquid assets (cash, non-firm investments transferable to firm use, the net value of livestock, and crop and feed inventories) was set at $5,000. The amount of real estate debt was set at several different levels in this study (the levels set are discussed later in this chapter). Size one machinery from Input Table 6 was specified for the 320 acres of land. This machinery was assumed to be about one-half worn-out.

Family Size. The number of family members can be increased or decreased every other year over the 25 years. Family size was assumed to remain constant at five members in this study. Specifying this information is necessary for tax deductions and one of the consumption functions.

<u>Consumption</u>. Two consumption functions are available. The first function permits a "certain" level of consumption plus some percentage of after-tax income. The second function allows consumption to vary according to the level of after-tax income and family size. The after-tax income functional in the equations is from the previous year. The level of after-tax income prior to the first year of simulation was assumed to be $5,000 in this study. The second consumption function was used in applications of the model.

<u>Production Plan Alternatives</u>. Any one of the four plans specified in Input Table 11 can be implemented during any year. All four plans can be employed over the 25 years. The production plan followed in this study varied with the simulation experiment conducted.

<u>External Firm Employment</u>. Family labor can be employed outside the farm firm. External firm employment can be represented in the model by one of two methods. The first method was used in this study.

The first method allows external employment of family labor if 50 percent or less of the family labor available is required on the farm and if the size of the farm does not exceed a certain acreage. A limitation of 960 acres was specified for this study. No more than 75 percent of the family labor available can be externally employed. The simulation model considers external employment by month. Federal, state, and social security taxes are computed within the simulation model.

A second method involves specifying the amount of monthly external farm income before taxes. Federal, state, and social security taxes must also be specified. This method is not subject to an acreage limitation nor any other constraint.

Land Acquisition. The firm's operations over 25 years are simulated without additional land when land acquisition is not allowed. When land acquisition is allowed, the acreages owned and rented during each of the 25 years can be either specified as data or determined by the simulation model.

When land acquisition is determined by the simulation model, three land acquisition options are available. These options are (1) purchase, (2) rent, and (3) rent and purchase. The years during which land acquisition can be attempted depend on the coefficients specified for (1) the year of land acquisition incrementation and (2) the last year land acquisition is permitted. In this study, the first coefficient was set at 5 and the second at 21. Thus, land acquisition during the years 1, 6, 11, 16, and 21 could be attempted. A unit of land was specified as 160 acres. Annual and total land acquisition limits were both set at 2,240 acres.

When the acreages owned and rented during each of the 25 years are specified as data, the coefficient for "land input" must be set equal to "1". The acreages owned and rented can be specified for years 1-5, 6-10, 11-15, 16-20 and 21-25. Thus, a change in the acreages owned and rented is permitted every five years.

Financial Arrangements. Interest rates on loans to purchase real estate and non-real estate items were set at 7 and 7.5 percent, respectively. The interest rate for cash savings was set at 2.5 percent. Since short term debt and cash savings are computed on a monthly basis, the interest rate per month for each is one-twelfth of 2.5 and 7.5 percent, respectively.

It was specified that the annual payments on loans to purchase land, machinery, and cows had to be made during the months in which the investments occurred. The costs of securing these loans were set at levels assumed to be typical in the study area.

The remaining financial arrangements varied with the simulation experiments conducted. These arrangements include (1) alternative payment plans on loans to purchase real estate, machinery, and cows, (2) the percentage of each asset value to which credit is limited and (3) the probability of the firm remaining solvent over 25 years.

Loans to purchase real estate, machinery, and cows can be scheduled on a Standard payment plan or a Springfield payment plan. By specifying the proper code (Standard = 1 and Springfield = 2) as data for each type of loan (real estate, machinery and cows), the simulation program constructs the desired schedules. A Standard plan denotes a constant annual total payment (increasing principal payment and decreasing interest payment). A Springfield plan denotes a decreasing annual total payment (constant principal payment and decreasing interest payment).

A loan can be completely non-amortized, partially non-amortized, or amortized depending on data specifications of the researcher. A loan can be non-amortized and then amortized but not vice versa. The number of years a loan is to be non-amortized and amortized must be specified as data. A completely non-amortized loan is denoted by specifying a number greater than 25.

Loans can be refinanced when additional credit is needed for investment. Suppose a loan to purchase real estate is non-amortized for 10 years and then scheduled on a 25 year Standard payment plan.

If the loan is refinanced, the loan is again non-amortized for 10 years.

Assets that can be used as security for loans include real estate, new machinery, used machinery, and livestock (feeders and breeding stock). The percentage of each asset value to which credit is limited must be specified as data. Only real estate can be used as security for loans to purchase real estate. Real estate can also be used as security for loans to purchase non-real estate items.

The solvency criteria involves specifying what the probability of the firm surviving over 25 years must be in order for the firm to pass the solvency test (relevant only when prices and yields are variable). A probability as high as .85 can be specified if the firm growth process is replicated 35 or more times. A probability as high as .90 can be specified if the firm growth process is replicated 50 times. The relationship between the number of replications and the magnitude of the probability is explained in Appendix C.

Miscellaneous Variables. The maximum number of replications which can be specified is 50. Thirty-five replications were specified in this study when the firm growth process was simulated under variable prices and yields. One replication was specified when the firm growth process was simulated under average prices and yields.

A coefficient for the variable "prices and yields" must be specified. A "1" indicates variable prices and yields and a "2" indicates average prices and yields. The coefficients in Input Table 10 do not have to be set equal to zero to obtain results based on averages.

Results of the calculations performed by the STNMDV and PRODUC subroutines can be written on tape during a preliminary run and read off tape instead of computed during subsequent runs as discussed in Appendix D. However, the two variables "tape input" and "creating" must be set equal to "1" to create a data set on tape. In order for the simulation program to read the data off tape, it is necessary to specify a "1" for the variable "tape input" and a "2" for the variable "creating."

Several variables pertain to machinery investment. A dependability coefficient for tractors was set at $25 [21, pp. 36-38]. The coefficient represents the returns forgone as a tractor ages. That is, the older the tractor the more frequent are the repairs during critical field operations. Specifying $25 for this coefficient indicates that the returns forgone is zero the first year, $25 the second, $50 the third, $75 the fourth, and so on. The dependability coefficient is considered only when a least-cost machinery inventory is selected. The coefficient is not considered when annual expenses are computed. Investment credit was set equal to zero. The maximum number of years any machine could be kept was set at 10. The maximum number of hours any machine could be used per month was set at 250.

Data Cards for More Than One Simulation Solution Per Computing Operation

New coefficients for the programming variables in Input Table 12 can be specified for subsequent simulation solutions in one continuous computing operation by adding additional input cards. These cards must specify (1) the solution number for which the new coefficients are to apply, (2) the row number of the new coefficient, and (3) the new coefficient. Coefficient changes are cumulative. For example, new coefficients specified for solution two apply also to solution three. If the original coefficient is desired for solution three, it must be specified as a new coefficient for solution three. One input card is required for each new coefficient. Its format is as follows:

Column (s)	Content
1	Solution number (≥2)
3-5	Row number (right justified)
7-15	New coefficient (decimal in column 12)

The last card of the data deck must contain the number 9 in the first column.

Simulation Experiments Conducted

Simulation experiments were conducted to determine the effects of four variables on firm growth. These variables included methods of land acquisition, different production plans, alternative financial arrangements, and levels of beginning equity in land. Attention was focused on these four variables although it was recognized that other variables may also influence firm growth.

The method by which a farm operator acquires land is very likely affected by a number of factors. The financial condition of the firm may be such that land can be acquired only if rented. The farm operator may desire to expand as rapidly as possible by renting land until an acreage operated goal is achieved (2,560 acres in this study) and then either purchase the land rented or enjoy a higher current standard of family living. Farm ownership may be such an important goal that the farm operator will only consider land acquisition through purchase. Because a number of factors probably affect the method by which land is acquired, several methods of land acquisition were employed in the simulation experiments conducted. These methods included (1) purchase, (2) rent, and (3) rent and purchase.

A production plan that includes crops, cows, and feeders is most prevalent throughout the study area. For this reason, such a plan was basic to the simulation experiments conducted. However, the production plan itself may have an effect on firm growth. The capital (cash and credit) needs of livestock enterprises may compete with the capital needs of land acquisition so as to inhibit growth. Conversely, the net returns from livestock enterprises may stimulate firm growth. Also, the variability of net returns may differ among production plans. This variability may have an effect on firm growth. Thus, the effects of four production plans on firm growth were simulated. The first plan included crops, cows and feeders. The second plan included crops and feeders. The third plan included crops and cows, but it did not include many more cows than did plan one because it was more profitable to rent-out small grain pasture than to have it grazed by cows. Just enough cows were included in plan three to utilize the average amount of native pasture produced. The fourth plan included only crops. Thus, the pasture was rented-out and the hay was sold under plan four. The four production plans are summarized in Table I. The four plans are fully described in Appendix A, Table XVIII, Input Table 11.

Equity in the firm is composed primarily of equity in land. Several different land equity levels were considered in this study. In 1968, the average amount of real estate equity in all U. S. farm firms was about 87 percent [31, p. 27]. This level of equity in land as well as equity levels of 55 and 35 percent were specified in the simulation

TABLE I

PRODUCTION PLAN ALTERNATIVES INCLUDED IN THE SIMULATION EXPERIMENTS CONDUCTED[a]

Item	Unit	Production Plans			
		Crops, Cows, and Feeders (1)	Crops and Feeders (2)	Crops and Cows (3)	Crops Only (4)
Total Land	Acres	100	100	100	100
Cropland	Acres	58	58	58	58
Native Pasture	Acres	42	42	42	42
Cropland Organization					
Wheat	Acres	17	17	17	17
Grain Sorghum	Acres	3	3	4	4
Barley	Acres	1	1	2	2
Small Grain Pasture	Acres	23	23	23	23
Forage Sorghum	Acres	2	2		
Alfalfa	Acres	12	12	12	12
Livestock Enterprises					
Feeders (1)[b]	Head	14	14		
Feeders (2)[c]	Head	3	3		
Feeders (3)[d]	Head		6		
Cows[e]	Cow	3		4	

[a]The four production plans are fully described in Appendix A, Table XVIII, Input Table 11.

[b]The feeders (1) are purchased in October and sold in May. They are wintered on small grain pasture, forage sorghum, and cotton seed cake.

[c]The feeders (2) are purchased in October and sold in May. They are wintered on small grain pasture, grain sorghum stubble, forage sorghum, and cotton seed cake.

[d]The feeders (3) are purchased in October and sold in October one year later. They are wintered on native pasture and cotton seed cake.

[e]The calves are born in March and sold in October.

experiments conducted.

Six financial strategies were formulated to represent alternative financial arrangements between the firm and credit agency. These six strategies are described in Table II.

The first financial strategy was formulated to represent the most common financial arrangement. Credit was limited to 48, 66, 50, and 75 percent of current real estate, new machinery, used machinery, and livestock market values, respectively. A loan to purchase real estate was scheduled on a 35 year Standard payment plan. Loans to purchase machinery and cows were scheduled on three year Springfield payment plans. The probability of the firm remaining solvent over 25 years was required to be at least 85 percent.

Financial strategies 2-5 were formulated to represent arrangements which credit institutions have either practiced to a limited extent or considered practicing.[1] Strategy 6 was formulated to represent a financial arrangement which may be implicitly practiced.

The second, third, and fifth financial strategies featured modified payment plans. In the second strategy, a loan to purchase real estate was non-amortized for 10 years and then scheduled on a 25 year Standard payment plan. A loan to purchase real estate was completely non-amortized in the third strategy. Loans to purchase machinery and cows were scheduled on five year Standard payment plans in strategy 5.

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[1]Information based on consultation with current and former credit agency personnel.

TABLE II

DESCRIPTION OF THE FINANCIAL STRATEGIES REPRESENTED IN THE SIMULATION EXPERIMENTS CONDUCTED

Financial Variables	Unit	Financial Strategies					
		1	2	3	4	5	6
Loans to Purchase Real Estate							
Payment[a]	Plan	*	*		*	*	*
Non-Amortized	Years	0	10	35	0	0	0
Amortized	Years	35	25	0	35	35	35
Loans to Purchase Cows and Machinery							
Payment[a]	Plan	**	**	**	**	*	**
Amortized	Years	3	3	3	3	5	3
Percentage of Asset Value to Which Credit was Limited							
Real Estate	Pct.	48	48	48	75	48	48
New Machinery	Pct.	66	66	66	80	66	66
Used Machinery	Pct.	50	50	50	75	50	50
Livestock	Pct.	75	75	75	90	75	75
Probability That Firm Solvency can be Maintained Over 25 Years	Pct.	85	85	85	85	85	50

[a]A Standard payment plan is denoted by * and a Springfield payment plan is denoted by **.

Financial strategy 4 featured a liberal credit situation. Credit could be obtained on 75, 80, 75, and 90 percent of current real estate, new machinery, used machinery, and livestock market values, respectively.

Financial strategy 6 featured a relatively low probability of the frim surviving over 25 years. The probability of the firm surviving over 25 years was required to be at least 50 percent.

The combinations of land acquisition options, production plans, financial strategies, and levels of beginning equity in land represented in the simulation experiments conducted are presented in Table III. Effects of the six financial strategies on firm growth were simulated when the production plan followed included crops, cows, and feeders; the level of beginning equity in land was 55 percent; and the land was acquired through renting and purchase. Effects of the three levels of beginning equity in land on firm growth were simulated when the production plan followed included crops, cows, and feeders; financial strategy 4 was specified; and the land was acquired through renting, purchase, and renting and purchase. These latter simulation experiments also indicated what effects the three land acquisition options would have on firm growth. Effects of the four production plans on firm growth were simulated when the level of beginning equity in land was 55 percent; financial strategy 4 was specified; and land was acquired through renting and purchase.

The simulation experiments were generally conducted by making a series of computer runs. The first run involved letting the model determine when and how much land could be acquired under average prices and yields. On the basis of the results obtained from the first run,

TABLE III

THE COMBINATIONS OF LAND ACQUISITION OPTIONS, PRODUCTION PLANS, FINANCIAL STRATEGIES, AND LEVELS OF BEGINNING EQUITY IN LAND REPRESENTED IN THE SIMULATION EXPERIMENTS CONDUCTED

Production Plans[a]	Beginning Equity in Land	Land Acquisition Options		
		Purchase	Rent	Rent and Purchase
	(%)	--Financial Strategies[b]--		
Crops, Cows, and Feeders (1)	35	4	4	4
Crops, Cows, and Feeders (1)	87	4	4	4
Crops, Cows, and Feeders (1)	55	4	4	1-6
Crops and Feeders (2)	55			4
Crops and Cows (3)	55			4
Crops Only (4)	55			4

[a]The four production plans were summarized in Table I. The four plans are fully described in Appendix A, Table XVIII, Input Table 11.

[b]The financial strategies were described in Table II.

the acreages owned and rented during each of the 25 years were specified as data and a second run was made. The second and subsequent runs involved variable prices and yields. If the second run gave an infeasible solution, the acreages were adjusted and a third run was made. This process of adjusting acreages and making runs continued until a feasible solution was obtained or until it became obvious that a feasible solution could not be obtained. The simulation experiments were conducted in the above manner to minimize computer processing time requirements.

CHAPTER IV

RESULTS OF THE SIMULATION EXPERIMENTS

The effects of selected variables on firm growth are compared in in this chapter. The chapter is divided into three sections. In the first section, alternative financial arrangements are compared. Different production plans are compared in the second section. In the third section, methods of land acquisition are compared as well as levels of beginning equity in land.

Several items are examined from each of the simulation experiments conducted. In Chapter I, firm growth was defined as an increase in net worth of the firm. Thus, net worth and the determinants of net worth (assets and liabilities) are examined. Since greater net worth is achieved in this study primarily through land acquisition, the amount of land acquired and related resource requirements are examined. Capital withdrawals for consumption also affect net worth growth. Hence, the standard of family living maintained is examined.

Most of the items examined are subject to variation. The variability of two items, net worth and consumption, is illustrated (see Figures 5 and 6 for examples). The lowest (Low) and highest (High) values generated during the 35 replications, the average (Avg.) of the 35 replications, and the average $\pm$ one standard deviation (S_L and S_H) are presented for each of the 25 years. In some instances, the net worth and consumption values are summarized only by the average and standard deviation. Properties of the summary statistics are discussed in Appendix C. Tables and figures throughout this chapter present simulation results derived under variable prices and yields.

Effects of Various Financial Strategies on Firm Growth

The results of six simulation experiments are compared in this section of the chapter. Each experiment involved a different financial strategy. In analyzing results, it will be helpful to remember unique features of the financial strategies as follows:

- Strategy 1. The most common financial arrangement offered by agricultural credit institutions.
- Strategy 2. A 10 year non-amortized loan used to purchase real estate.
- Strategy 3. A completely non-amortized loan used to purchase real estate.
- Strategy 4. A liberal credit situation.
- Strategy 5. A modified payment plan for loans used to purchase machinery and cows.
- Strategy 6. A relatively low probability of the firm surviving over 25 years.

Details of the financial strategies were described in Chapter III, Table II.

The method of land acquisition, the beginning level of equity in land, and the production plan were held constant while conducting the simulation experiments as denoted in Chapter III, Table III. Land was acquired through renting and purchase. The beginning level of equity in land was 55 percent. The production plan included crops, cows, and feeders (1). The production plan was summarized in Chapter III, Table I.

Land Acquisition and Related Resource Requirements

Land Rented and Purchased. The acreages owned and rented during each of the 25 years under financial strategy 1 were exactly the same as under strategies 2, 3, and 5 when the computer runs involved average prices and yields. During the years 1-5, 6-10, 11-15, 16-20, and 21-25, the acreages rented totaled 160, 480, 1,440, 2,240 and 2,080 acres, respectively. The acreage owned remained constant at 320 acres until year 21. During year twenty-one, 160 acres were purchased. Because the acreages acquired through renting and purchase under strategies 2, 3, and 5 were the same as under strategy 1 when the computer runs involved average prices and yields, strategies 2, 3 and 5 were not subjected to computer runs involving variable prices and yields.

Financial strategies 1, 4,and 6 were subjected to computer runs involving variable prices and yields. The results of those runs are discussed in this section of the chapter. Table IV presents the acreages owned, rented, and operated during each of the 25 years under strategies 1, 4, and 6.

Strategy 4 was the only strategy under which land was purchased over the 25 years. By the end of year twenty-one, 1,760 acres were owned and 800 acres were rented. Strategy 6 did not allow as much land to be rented and purchased over the 25 years as did strategy 4. But, strategy 6 was much more conducive to land acquisition than was strategy 1. Eleven times as much land was rented by the end of year 21 under strategy 6 as under strategy 1. Only 160 acres were rented under strategy 1 over the 25 years. The 160 acres were rented during

TABLE IV

LAND OWNED, RENTED, AND OPERATED OVER 25 YEARS WHEN LAND WAS ACQUIRED THROUGH RENTING AND PURCHASE UNDER SELECTED FINANCIAL STRATEGIES[a]

Years	Financial Strategies[b]		
	1	4	6
		-Acres Owned-	
1-5	320	320	320
6-10	320	640	320
11-15	320	960	320
16-20	320	1,280	320
21-25	320	1,760	320
		Acres Rented-	
1-5	160	1,920	160
6-10	160	1,920	320
11-15	160	1,600	480
16-20	160	1,280	1,120
21-25	160	800	1,760
		-Acres Operated-	
1-5	480	2,240	480
6-10	480	2,560	640
11-15	480	2,560	800
16-20	480	2,560	1,440
21-25	480	2,560	2,080

[a]Farm size before simulation was 320 acres of owned land.

[b]The financial strategies were described in Chapter III, Table II.

year one.[1]

Considerably more land was acquired over the 25 years under strategy 4 than under strategy 1 because a much greater amount of credit could be obtained on various assets. From land alone, only $2,275 of additional credit could be obtained under strategy 1 during year 1 while $22,752 of additional credit could be obtained under strategy 4. Consequently, only 160 acres were rented under strategy 1 during year 1 while 1,920 acres were rented under strategy 4.

Net returns from the 2,240 acres operated under strategy 4 during the years 1-5 resulted in the firm accumulating an amount of cash savings sufficient to purchase 320 acres during year 6. Throughout the remainder of the planning horizon, the credit that could be obtained on owned and purchased land (land appreciated in value) allowed the firm to purchase additional acreages. In contrast, the 480 acres operated under strategy 1 did not provide sufficient net returns for the firm to rent additional land during subsequent years. Per acre costs of overhead and machinery were considerably higher when 480 instead of 2,240 acres were operated.

More land was rented over the 25 years under strategy 6 than under strategy 1 because the minimum required survival probability was 50 instead of 85 percent. Liabilities generally increased during each

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[1]Two simulation experiments were conducted in which external employment of family labor was not allowed. These two experiments involved financial strategies 1 and 6. Strategy 4 was not subjected to such an experiment since more than 960 acres were operated annually. Land could not be acquired when external employment of family labor was not allowed. In fact, the firm could not pass the solvency test when external employment of family labor was not allowed.

year additional land was rented due to operating and investment (machinery and breeding stock) capital requirements. The extent to which liabilities increased depended on prevailing economic and climatic conditions. When conditions were favorable during a replication, only a small amount of credit was needed, however, a large amount of credit was needed when conditions were adverse. These liabilities were not always adequately secured. More land was rented under strategy 6 because, of the 35 replications, strategy 1 required that liabilities be secured every year during 11 more replications.

Least-cost machinery inventories for selected acreages, the annual cost of each inventory, and the labor requirements for each inventory are presented in Appendix B, Table XXII. Trade intervals for different machines are also discussed in Appendix B. By comparing Tables IV and XXII, the machinery requirements can be obtained for the acreages specified in Table IV. For example, size 1 machinery was required to operate 480 acres while size 4 and 1 machinery was required to operate 2,560 acres.

Labor Requirements. A substantial amount of labor was required to operate 480 acres with size 1 machinery relative to the amount of labor required to operate 2,560 acres with size 4 and 1 machinery. The crop and livestock labor requirements are presented in Table V. About 2.38 hours of labor per acre were required for crop and livestock enterprises when size 1 machinery was employed to operate 480 acres. About 1.67 hours of labor per acre were required for crop and livestock enterprises when size 4 and 1 machinery was employed to operate 2,560 acres.

TABLE V

LABOR AND CAPITAL REQUIREMENTS OVER 25 YEARS WHEN LAND WAS ACQUIRED THROUGH RENTING AND PURCHASE UNDER SELECTED FINANCIAL STRATEGIES

Year	Crop and Livestock Labor Requirements Under Financial Strategies			New Investment Capital Requirements Under Financial Strategies			Average Operating Capital Requirements Under Financial Strategies[a]		
	1	4	6	1	4	6	1	4	6
	-Hours-			-Dollars-					
1	793	2,362	793	2,723	35,166	2,723	18,473	75,273	18,473
2	1,141	4,065	1,141				24,102	111,676	24,102
3	1,141	4,065	1,141				23,948	110,764	23,948
4	1,141	4,065	1,141		446		23,208	107,140	23,208
5	1,141	4,065	1,141		444		22,607	103,700	22,607
6	1,141	4,024	1,163	7,050	109,413	11,852	21,778	109,017	26,280
7	1,141	4,267	1,287				22,426	118,878	29,895
8	1,141	4,267	1,287		361		22,505	119,152	29,982
9	1,141	4,267	1,287		347		23,807	125,724	31,701
10	1,141	4,267	1,287				24,549	130,474	32,632
11	1,141	4,267	1,329		92,799	11,066	25,503	136,529	38,924
12	1,141	4,267	1,451		1,058		25,799	139,823	43,235
13	1,141	4,267	1,451		5,518		25,228	135,993	42,205
14	1,141	4,267	1,451	556			24,898	135,004	41,652
15	1,141	4,267	1,451		12,168		24,025	128,421	39,811
16	1,141	4,267	2,123	6,456	107,576	13,400	23,349	128,045	58,146
17	1,141	4,267	2,613		347		24,311	132,428	72,122
18	1,141	4,267	2,613		697		24,593	133,410	72,764
19	1,141	4,267	2,613				25,573	138,459	75,559
20	1,141	4,267	2,613		5,532	934	26,598	143,844	78,657
21	1,141	4,267	3,284		164,987	18,183	27,350	149,330	103,632
22	1,141	4,267	3,774	556		801	27,437	154,462	118,887
23	1,141	4,267	3,774				27,254	153,074	117,701
24	1,141	4,267	3,774		13,226	902	26,745	148,595	115,231
25	1,141	4,267	3,774		347		26,164	146,543	112,416

[a]Standard deviations ranged from $404 to $4,146.

Labor requirements were also distributed more uniformly throughout the year when size 4 and 1 instead of size 1 machinery was employed. Labor requirements ranged from a low of 2.72 percent of the total during December to a high of 19.46 percent of the total during June when size 1 machinery was employed. The low and high were 3.87 and 15.21 percent of the total during December and June, respectively, when size 4 and 1 machinery was employed.

The crop labor requirements are presented in Appendix B, Table XXII. By comparing Tables V and XXII, the livestock labor requirements can be obtained. Livestock on the 480 acre farm required 443 hours of labor while livestock on the 2,560 acre farm required 2,362 hours of labor.

Capital Requirements. Investment and average operating capital requirements are presented in Table V.[2] By summing the two types of capital, average total capital requirements can be obtained. Total capital represents the total amount of capital used and includes owned as well as borrowed capital.

The investment capital requirements in Table V represent capital outlays for land, machinery, and breeding stock in the year indicated. In the case of land and breeding stock, the values represent net investment (addition to the firm's stock of capital). In the case of machinery, investment replaces worn-out capital (replacement investment) and/or increases the stock of capital (net investment).

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[2]The annual average operating capital requirements presented in Table V are referred to in the text as operating capital requirements.

Capital outlays for the purchase of feeders are included in operating capital requirements.

Investment in machinery of a larger size was unnecessary under strategy 1. The size 1 machinery contained in the beginning inventory was sufficient to operate 480 acres. The $2,723 investment capital required during year 1 was for breeding stock. Investment capital was required during the other years when machinery was traded.

Investment in machinery of a larger size and in breeding stock was necessary during years 1 and 6 under strategy 4. During the other years, investment capital was required when machinery was traded and when land was purchased. The purchase of land required substantial amounts of investment capital. For example, the purchase of 320 acres during year 11 required $92,799 of investment capital.

Investment in machinery of a larger size was necessary under strategy 6 during years 6 and 11. During years 16 and 21, machinery of the same size and samller was added to the machinery inventory. Since the acreage operated was expanded during years 1, 6, 11, 16 and 21, investment in breeding stock was necessary during each of those years.

Operating capital requirements were much greater than investment capital requirements during each of the 25 years under strategies 1 and 6 since additional land was never purchased under those two strategies. Even under strategy 4, which allowed a substantial amount of land investment, operating capital requirements were greater than investment capital requirements during 23 of the 25 years. Only during years 6 and 16 were investment capital requirements greater than operating capital requirements.

Operating capital requirements were not subject to much annual variation. The standard deviations under all strategies were less than $4,146 during each of the 25 years. The higher the averages, the higher the standard deviations. Thus, the standard deviations ranged from $404 to $900 under strategy 1. In contrast, the standard deviations ranged from $1,842 to $4,146 under strategy 4. The upward trend and cyclical movement of operating capital requirements over time for a given acreage resulted from the movement of feeder purchase prices.

Financial Condition of the Firm

Assets. The assets accumulated over 25 years under financial strategies 1, 4, and 6 are presented in Table VI.[3] The values are the average total assets of the firm at the end of each year. Averages for each year were derived from 35 replications of the firm's operations over 25 years.

Assets increased under all strategies as a result of cash savings accumulation, an upward trend in feeder prices, land value appreciation, and investments. Sharp increases resulted when investments occured in machinery, breeding stock, and land.

The 25 year accumulation of assets under strategy 4 was much greater than under strategies 1 and 6. Under strategy 4, assets increased from $156,443 during year 1 to $731,549 during year 25. Assets under strategies 1 and 6 were the same ($93,169) during year 1 since the same amount of land (480 acres) was operated under both

[3]The asset averages across replications presented in Table VI are referred to in the text as assets.

TABLE VI

ASSETS AND LIABILITIES OVER 25 YEARS WHEN LAND WAS ACQUIRED THTOUGH RENTING AND PURCHASE UNDER SELECTED FINANCIAL STRATEGIES

Year	Asset Averages Under Financial Strategies			Liability Averages Under Financial Strategies		
	1	4	6	1	4	6
	------------------- Dollars -------------------					
1	93,169	156,443	93,169	43,237	117,713	43,237
2	94,745	157,668	94,745	40,962	96,451	40,962
3	95,944	157,121	95,944	40,491	86,681	40,491
4	96,621	154,341	96,621	39,908	77,181	39,908
5	97,344	151,751	97,344	39,333	67,528	39,333
6	102,063	253,212	108,420	45,852	173,606	53,688
7	103,051	253,951	109,171	45,960	166,352	52,899
8	104,298	255,957	110,233	45,221	145,627	51,248
9	106,785	264,463	112,950	45,265	148.228	50,703
10	108,888	270,695	115,157	45,430	142,934	50,315
11	111,044	369,945	127,040	45,145	228,738	64,139
12	112,657	375,578	128,246	44,695	223,092	61,150
13	113,507	379,181	128,212	43,596	216,069	57,520
14	114,799	380,783	128,481	43,812	208,328	55,311
15	115,261	386,079	127,905	43,864	212,688	53,683
16	119,692	491,473	150,998	49,801	312,450	78,848
17	120,966	497,278	151,980	50,842	312,898	76,583
18	122,331	503,624	153,179	51,276	309,839	74,057
19	124,414	513,349	156,480	51,467	305,350	71,217
20	126,807	527,235	161,145	51,819	307,536	70,251
21	128,787	700,729	192,524	51,818	468,359	101,948
22	130,539	709,251	193,665	52,140	466,972	93,427
23	131,594	715,649	192,699	51,781	462,078	85,451
24	132,355	727,249	190,891	51,768	470,905	80,182
25	133,098	731,549	188,493	51,721	467,393	73,334
	------------- Standard Deviation Range ($1,000) -------------					
1-25	0-1	2-5	0-4	1-9	7-34	1-16

strategies during year 1. By the end of year 25, however, assets under strategy 6 were $55,395 greater than under strategy 1.

The 25 year accumulation of assets under strategy 4 was substantial even when land value appreciation was negated. Without land value appreciation, assets under strategy 4 increased from $156,443 during year 1 to $507,677 during year 25. In contrast, assets decreased from $93,169 to $92,394 over the 25 years under strategy 1. Under strategy 6, assets increased from $93,169 to $147,789 over the 25 years. The asset values without land value appreciation were derived by adjusting the values in Table VI.

Assets over the 25 years were not subject to much annual variation. The range in standard deviations under each strategy over the 25 years is denoted toward the bottom of Table VI. The standard deviations under all strategies never exceeded $5,000 during any of the 25 years. The higher the asset averages, the higher the asset standard deviations. Thus, assets under strategy 1 varied the least while assets under strategy 4 varied the most. Assets varied primarily because of the variability associated with livestock prices.

Liabilities. The liabilities that existed during each of the 25 years under financial strategies 1, 4, and 6 are presented in Table VI.[4] The values represent the average total debt that existed at the end of each year. Averages for each year were derived from the 35 replications of the firm's operations over 25 years.

Liabilities were considerably higher under strategy 4 than under

[4]The liability averages across replications presented in Table VI are referred to in the text as liabilities.

strategies 1 and 6 since substantial acreages were purchased under strategy 4 while land was rented under strategies 1 and 6. Liabilities under strategy 4 ranged from a low of $67,528 during year 5 to a high of $468,359 during year 21. Liabilities ranged from $39,333 to $52,140 under strategy 1. Under strategy 6, liabilities ranged from $39,333 to $101,948.

Although larger amounts of debt existed under strategies 4 and 6 than under strategy 1, the liabilities associated with a given acreage under strategies 4 and 6 were gradually reduced. Under strategy 1, each time a machinery investment increased liabilities, such as during years 6 and 16, liabilities remained relatively constant at the higher level. In effect, large amounts of debt were associated with expansion of the firm. But, the larger firm was aslo characterized by a greater loan repayment capacity.

The liability standard deviation ranges, denoted toward the bottom of Table VI, indicate that liabilities were the most variable under strategy 4. The liability standard deviations under strategy 4 ranged from $7,000 to $34,000 over the 25 years. Since the liability averages were the lowest under strategy 1, the liability standard deviations were also the lowest under strategy 1, ranging from $1,000 to $9,000 over the 25 years. Liabilities were more variable than assets primarily because of the variability of short term debt.

Net Worth. The net worth achieved during each of the 25 years under each of the three financial strategies is presented in Figure 5. The figure contains four graphs. The net worth averages are compared in one graph. Individual attention is given to the net worth achieved under each financial strategy in the other three graphs.

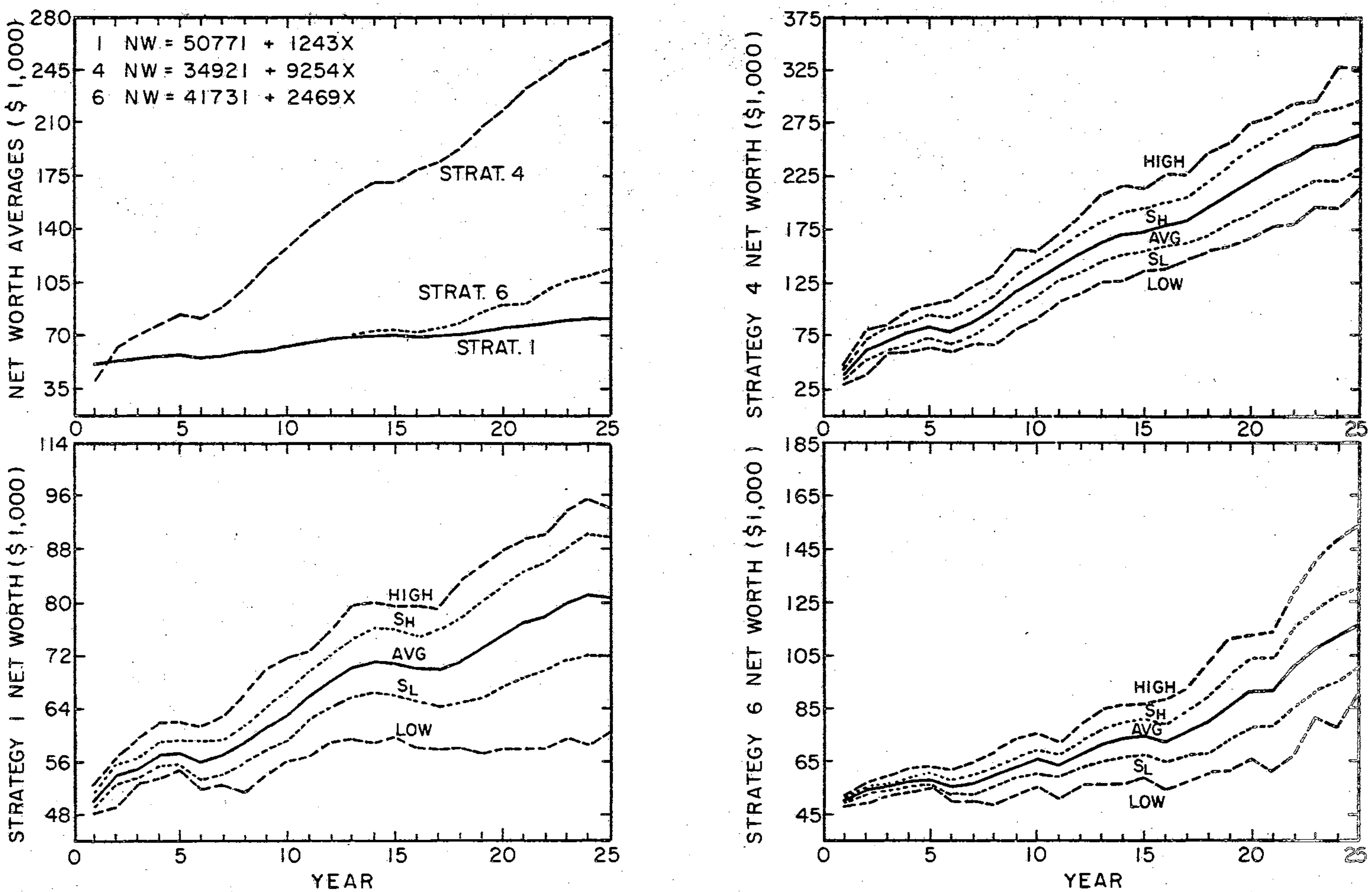

Figure 5. Net Worth Over 25 Years When Land was Acquired Through Renting and Purchase Under Selected Financial Strategies

The greatest growth in net worth was exhibited by strategy 4. The average annual increase in net worth after the first year was $9,254 as determined by ordinary least-squares regression. The average growth is net worth under strategy 1 was about the same as under strategy 6 until year 13. Thereafter, strategy 6 allowed net worth to grow much more on the average than did strategy 1. The average annual increases in net worth under strategies 1 and 6 after the first year were $1,243 and $2,469, respectively.

Heteroscedasticity describes the pattern of variation exhibited by the three strategies. That is, the variability of net worth increased as average net worth increased. The net worth standard deviations under strategy 4 ranged from a low of $4,165 during year 1 to a high of $34,638 during year 24. The lowest standard deviation under strategies 1 and 6 was $1,065 and occurred during year 1. The highest standard deviation under strategy 1 was $9,043 and occurred during year 25. Under strategy 6, the highest standard deviation ($15,622) occurred during year 23.

Standard of Family Living Maintained

Consumption levels during each of the 25 years under financial strategies 1, 4, and 6 are presented in Figure 6. Four graphs are presented in Figure 6. In one graph, the consumption averages under the three financial strategies are compared. Capital withdrawals for consumption under each of the financial strategies are summarized in the other three graphs.

The consumption averages were the highest under strategy 4 during all but four of the 25 years. During those four years, the

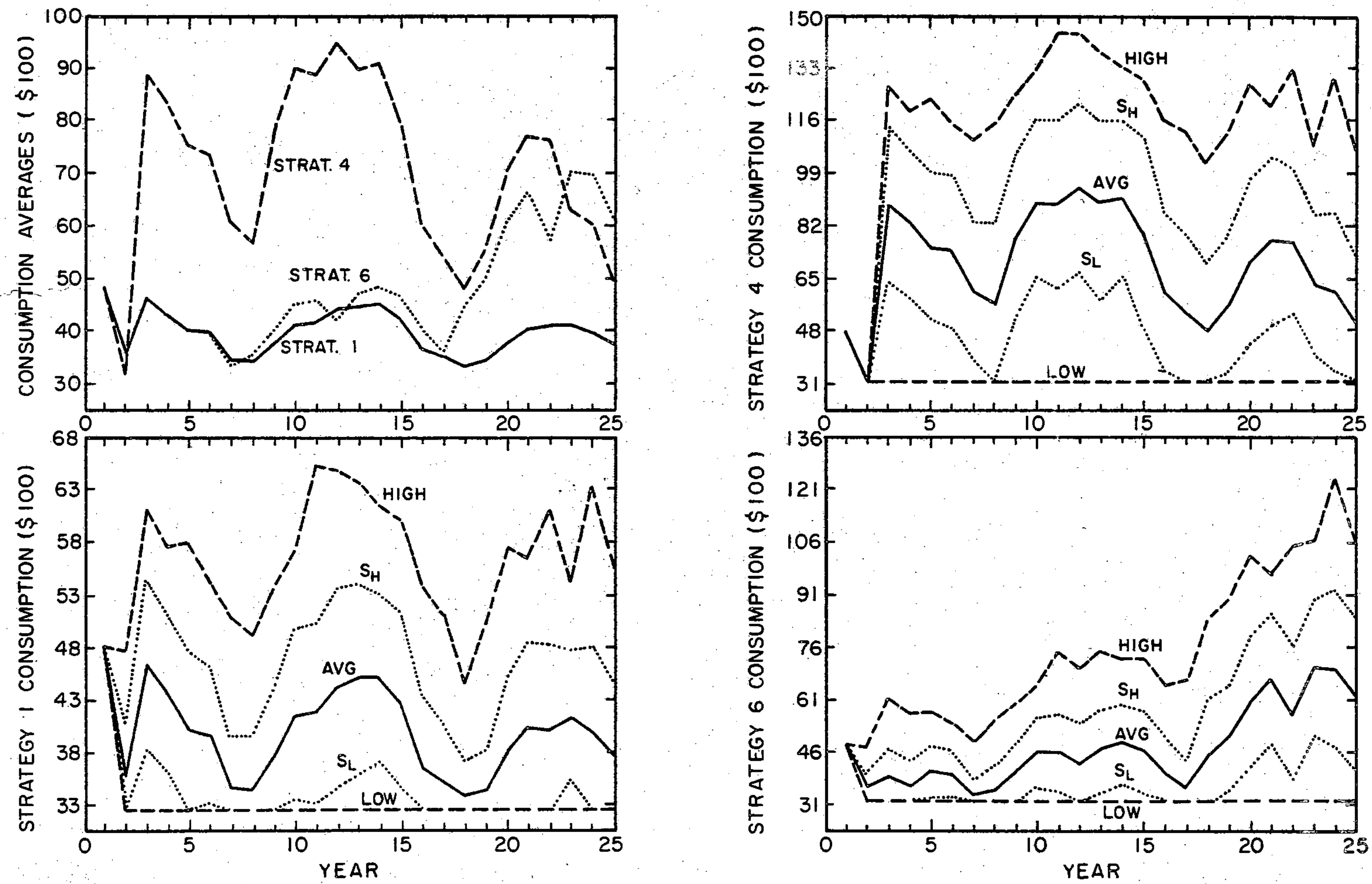

Figure 6. Consumption Over 25 Years When Land was Acquired Through Renting and Purchase Under Selected Financial Strategies

consumption averages under strategy 6 were the highest. The consumption averages under strategy 6 were about the same as under strategy 1 until year 18. Thereafter, the consumption averages were considerably higher under strategy 6 than under strategy 1. Strategies 1, 4, and 6 allowed average consumption levels over the 25 years of $3,991, $6,973, and $4,780, respectively.

Investments emphasize savings rather than consumption. Thus, the land investments that occurred under strategy 4 led to consumption averages that declined over the 25 years. The purchase of land increased interest payments which decreased after-tax income and consumption (consumption was a function of after tax income). In contrast, the consumption averages generally increased over the 25 years under strategy 6 because land was rented instead of purchased. Expansion of the firm through renting increased after-tax income and consumption.

The consumption averages under all three strategies varied considerably over the 25 years. Most of this variation was due to the cyclical movement of feeder prices (explained later in this chapter). The acquisition of additional land also influenced consumption. After-tax income was low during years when additional land was acquired because one-half the cash rent had to be paid and field operations performed for crops from which returns were not forthcoming until during the following year. Thus, consumption was low during the year following the year of land acquisition. In addition, the age of machinery and machinery investments influenced after-tax income and consumption. The older the machinery, the smaller the deductions from taxable income for depreciation (20 percent declining balance method of depreciation). However, the deductions from taxable income for repair costs increased as the age of machinery increased. If a loan was needed for machinery investment (loans were usually needed), interest payments were deducted from taxable income for at least three years. Exactly three years of interest payments were required unless a loan was renewed.

A considerable amount of annual variation in consumption was also exhibited. The lowest level of consumption allowed was $3,196 for a family of five. Minimum consumption levels occurred at least once during each of 25 years under all three strategies. How often the minimum level or any other level of consumption occurred during each year's 35 replications is not given in the graphs presented in Figure 6. But, probability statements can be made concerning consumption levels with the aid of Tchebycheff's inequality. This inequality and the reason for using it are explained in Appendix C. According to Tchebycheff's inequality, the probability of a deviation less than two standard deviations from the mean is greater than .75. In calculating deviations, the minimum level of consumption allowed constitutes the lowest possible level of consumption.

The level of consumption that could be maintained is potentially higher almost every year under strategy 4 than under strategies 1 and 6. During year 10, for example, the probability is at least .75 that consumption will lie between $3,704 and $14,232 under strategy 4. Under strategies 1 and 6, making the same probability statement for year 10 yields intervals ranging from $3,196 to $5,701 and from $3,196 to $6,514, respectively.

Effects of Various Production Plans on Firm Growth

Four simulation experiments were conducted to determine the effects of production plans on firm growth. The major enterprises included in each plan were as follows:

Plan 1. Crops, cows, and feeders

Plan 2. Crops and feeders

Plan 3. Crops and cows

Plan 4. Crops only

The four plans are fully described in Appendix A, Table XVIII, Input Table 11. A summary of the crop acreages and livestock numbers in each plan was presented in Chapter III, Table I.

While conducting the simulation experiments, the method of land acquisition, the beginning level of equity in land, and the financial strategy were held constant as denoted in Chapter III, Table III - land was acquired through renting and purchase, the beginning level of equity in land was 55 percent, and financial strategy 4 was followed. The remaining section of this chapter is devoted to comparing the effects of the four production plans on firm growth.

Land Acquisition and Related Resource Requirements

Land Rented and Purchased. The acreages of land owned, rented, and operated during each of the 25 years under production plans 1-3 are presented in Table VII. Production plan 4 (crops only) is not included in Table VII because the firm solvency test could not be passed when the production plan included only crops.

TABLE VII

LAND OWNED, RENTED, AND OPERATED OVER 25 YEARS WHEN LAND WAS ACQUIRED THROUGH RENTING AND PURCHASE UNDER VARIOUS PRODUCTION PLANS[a]

	Production Plans[b]		
Years	Crops, Cows and Feeders (1)	Crops and Feeders (2)	Crops and Cows (3)
	-Acres Owned-		
1-5	320	320	320
6-10	640	320	480
11-15	960	640	800
16-20	1,280	800	960
21-25	1,760	1,120	1,120
	-Acres Rented-		
1-5	1,920	1,440	2,240
6-10	1,920	2,240	2,080
11-15	1,600	1,920	1,760
16-20	1,280	1,760	1,600
21-25	800	1,440	1,440
	-Acres Operated-		
1-5	2,240	1,760	2,560
6-25	2,560	2,560	2,560

[a]Farm size before simulation was 320 acres of owned land.

[b]The production plans were summarized in Chapter III, Table I.

Under plan 4, the firm could not rent additional land and pass the solvency test nor could it continue operating the 320 acres of owned land over 25 years and pass the solvency test. The test could not be passed primarily because 42 percent of the land owned and rented-in consisted of native pasture. An acre of native pasture was rented-out for $3.30 on the average. An acre of land was rented-in for $10.24 to $15.73.[5] Pasture was always rented-out and hay was always sold under plan 4 since livestock was not available through which to market the forages.

Plan 1 allowed the most land to be purchased over the 25 years (see Table VII). Although the maximum acreage (2,240 acres) could not be rented during year one, 320 acres were purchased during year 6. By the end of year 21, more than two-thirds of the land operated was owned.

Plan 3 allowed the most rapid expansion of the firm. The maximum acreage was rented during year 1. During year six, 160 acres were purchased and by the end of year 21 about 44 percent of the land operated was owned.

The least amount of land was rented during year 1 under plan 2. Land could not even be purchased under plan 2 until year 11. However, by the end of year 21, the acreages owned and rented under plan 2 were the same as under plan 3.

The purchase of feeders under plan 2 required a much greater amount of capital than did the purchase of cows under plan 3.

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[5]Land rent was a function of land value. The land value increased annually at a rate of $5.30 per acre.

Consequently, firm expansion was slower under plan 2 than under plan 3. The feeders, however, provided greater net returns than did the cows. The net returns from feeders eventually allowed as much land to be purchased under plan 2 as under plan 3.

The capital requirements of feeders also prevented the maximum acreage from being rented during year 1 under plan 1. Yet, 320 acres were purchased in year 6 under plan 1 that could not be purchased under plan 2. Under plan 1, however, 480 rented acres were a source of net returns unavailable under plan 2 during the first five years of the planning horizon. Also, approximately the same number of feeders were included in both plans 1 and 2 during the first five years while plan 1 also included cows.

Greater acreages were purchased later in the planning horizon under plan 1 than under plan 2 because plan 1 allowed more land to be purchased early in the planning horizon. The land purchased early in the planning horizon was an important source of security for later land investments, especially because of land appreciation. For example, the land purchased during year 6 for $42,160 per 160 acres was worth $46,400 during year 11.

Least-cost machinery inventories for selected acreages are presented in Appendix B, Table XXII. By comparing Tables VII and XXII, the machinery requirements can be obtained for the acreages specified in Table VII.

Labor Requirements. The crop and livestock labor requirements under production plans 1-3 are presented in Table VIII. The following comparison of labor requirements among the three plans is made after year 6 when the same amount of land was operated under all three

TABLE VIII

LABOR AND CAPITAL REQUIREMENTS OVER 25 YEARS WHEN LAND WAS ACQUIRED THROUGH RENTING AND PURCHASE UNDER VARIOUS PRODUCTION PLANS

Year	Crop and Livestock Labor Requirements Under Production Plans			New Investment Capital Requirements Under Production Plans			Average Operating Capital Requirements Under Production Plans[a]		
	1	2	3	1	2	3	1	2	3
	Hours			Dollars					
1	2,362	1,929	1,870	35,166	22,956	46,763	75,273	72,859	24,629
2	4,065	3,393	2,846				111,676	102,711	61,317
3	4,065	3,393	2,846				110,764	101,843	61,297
4	4,065	3,393	2,846	446		876	107,140	98,254	60,965
5	4,065	3,393	2,846	444	907		103,700	94,670	60,808
6	4,024	3,890	2,846	109,413	23,478	45,029	109,017	118,229	61,452
7	4,267	4,556	2,846			697	118,878	134,415	63,248
8	4,267	4,556	2,846	361		5,879	119,152	134,718	62,877
9	4,267	4,556	2,846	347	709		125,724	134,674	63,845
10	4,267	4,556	2,846				130,474	149,478	64,309
11	4,267	4,556	2,846	92,799	92,799	108,495	136,529	156,826	64,173
12	4,267	4,556	2,846	1,058	697	709	139,823	161,380	68,353
13	4,267	4,556	2,846	5,518	5,879	697	135,993	156,774	68,495
14	4,267	4,556	2,846				135,004	155,216	69,154
15	4,267	4,556	2,846	12,168	12,168	5,170	128,421	147,082	68,744
16	4,267	4,556	2,846	107,576	56,575	54,218	128,045	145,675	69,850
17	4,267	4,556	2,846	347	709		132,428	148,893	72,029
18	4,267	4,556	2,846	697	697		133,410	150,279	72,470
19	4,267	4,556	2,846			697	138,459	156,890	73,184
20	4,267	4,556	2,846	5,532	5,170	709	143,844	164,380	73,602
21	4,267	4,556	2,846	164,987	110,468	70,576	149,330	170,806	73,371
22	4,267	4,556	2,846			5,170	154,462	174,653	75,842
23	4,267	4,556	2,846				153,074	172,820	76,935
24	4,267	4,556	2,846	13,226	12,865	709	148,595	167,269	77,672
25	4,267	4,556	2,846	347	709	697	146,543	164,091	78,171

[a]Standard deviations ranged from $424 to $5,090.

production plans.

Plan 2 which included feeders required considerably more labor than plan 3 which included cows. Plan 1 which included feeders and cows in about a 6:1 ratio required almost as much labor as plan 2. Plan 2 contained about 4.5 feeders for every cow in plan 3. Under plans 1, 2, and 3, the crop and livestock labor requirements were 4,267, 4,556, and 2,846 hours, respectively, when 2,560 acres of land were operated.

The crop labor requirements were less than one-half of the total (crop and livestock labor requirements under all three plans. Crops required 1,905 hours of labor under plans 1 and 2 when 2,560 acres were operated. Forty-two hours less or 1,862 hours of labor were required by crops under plan 3 when 2,560 acres were operated. Crop labor requirements for other acreages can be determined by referring to Appendix B, Table XXII. The labor requirements presented in Table XXII apply directly to plans 1 and 2. The labor requirements can be applied to plan 3 after they are adjusted downward by 27 percent.

Capital Requirements. Investment and average operating capital requirements are presented in Table VIII. Capital outlays for breeding stock were unnecessary under production plan 2. Likewise, capital outlays for feeders were unnecessary under plan 3.

Operating capital requirements were about twice as high under plan 2 as under plan 3 when the same acreage was operated under both plans (years 6-25). Operating capital requirements were also very high under plan 1. Total operating capital requirements over the 25 years under plans 1, 2, and 3 were $3,215,758, $3,534,885, and $1,666,792, respectively. The totals were derived by summing vertically the three columns of operating capital requirements presented in Table VIII.

The cyclical movement of feeder purchase prices over the 25 years can be exemplified by the operating capital requirements under plan 2. For example, during years 8, 10, 12, 14, and 16, operating capital requirements were $134,718, $149,478, $161,380, $155,216, and $145,674, respectively. The upward movement of operating capital requirements over time resulted from the trend in feeder prices and the interest payments associated with land investment.

Operating capital requirements were not subject to much annual variation. The standard deviations under all plans were less than $5,090 during each of the 25 years. Under plan 3, the standard deviation for operating capital never exceeded $2,818. The standard deviations were higher under plans 1 and 2 than under plan 3 primarily because of feeder price variability.

Financial Condition of the Firm

Assets. Production plan 1 allowed the greatest accumulation of assets over the 25 years. Asset averages under production plans 1-3 are presented in Table IX. Under plan 1, assets increased from $156,443 during year 1 to $731,549 during year 25, an increase of 468 percent. In contrast, assets increased by 345 percent under plan 2. Under plan 3, assets increased by 360 percent. At the end of the 25 year planning horizon, the accumulation of assets under plan 1 was greater than under plans 2 and 3 by 45 and 63 percent, respectively.

Assets were the highest under plan 1 during the years 1-5 because of the contribution of feeder values to assets. During the remaining 20 years, assets were the highest under plan 1 primarily because of land investment. During the years 1-5, more land was

TABLE IX

ASSETS AND LIABILITIES OVER 25 YEARS WHEN LAND WAS ACQUIRED THROUGH RENTING AND PURCHASE UNDER VARIOUS PRODUCTION PLANS

Year	Asset Averages Under Production Plans			Liability Averages Under Production Plans		
	1	2	3	1	2	3
	-Dollars-					
1	156,443	146,408	124,904	117,713	112,773	76,908
2	157,668	147,680	127,717	96,451	97,963	63,800
3	157,121	147,096	122,931	86,681	92,261	50,645
4	154,341	143,942	119,752	77,181	86,182	39,476
5	151,751	141,467	125,656	67,528	80,471	36,794
6	253,212	170,125	174,351	173,606	119,900	79,344
7	253,951	168,949	178,370	166,352	109,494	77,908
8	255,157	169,221	186,189	154,627	96,213	81,193
9	264,463	178,376	191,009	148,228	91,498	78,358
10	270,695	184,358	195,194	142,934	87,549	75,859
11	369,945	283,388	294,357	228,738	174,235	174,284
12	375,578	287,651	297,598	223,092	170,158	170,749
13	379,181	288,776	304,810	216,069	164,505	167,186
14	380,783	287,953	308,527	208,328	157,115	165,103
15	386,079	289,736	311,507	213,688	161,767	164,920
16	491,473	342,031	362,242	312,450	210,451	211,543
17	497,278	345,659	361,389	312,898	210,241	209,497
18	503,624	349,750	365,347	309,839	206,861	207,941
19	513,349	358,404	368,495	305,350	202,209	205,819
20	527,235	371,555	372,424	307,536	204,861	206,097
21	700,729	488,931	437,237	468,359	312,123	271,517
22	709,251	494,270	441,907	466,972	309,968	274,685
23	715,649	496,743	443,743	462,078	304,560	272,208
24	727,249	503,716	445,962	470,905	312,196	272,823
25	731,549	503,594	449,228	467,393	307,615	273,666
	-Standard Deviation Range ($1,000)-					
1-25	2-5	2-5	4-18	7-34	4-34	0-31

operated under plan 3 than under plan 2 (see Table VII). Yet, assets were higher under plan 2 than under plan 3 during those five years (see Table IX). Assets were higher under plan 2 than under plan 3 because the feeders contributed more to assets than did the cows. For example, the feeders in plan 2 contributed $51,156 to the $146,408 of assets which existed at the end of year 1. In contrast, the cows in plan 3 contributed only $17,050 to the $124,904 of assets which existed at the end of year 1. Assets were also higher under plan 2 than under plan 3 during the years 21-25 because of the contribution of feeder values to assets. During the years 6-20, assets were higher under plan 3 than under plan 2 because of land investment.

The range in standard deviations under each plan over the 25 years is shown at the bottom of Table IX. Although the standard deviations were not very great, they were the highest under plan 3. Assets varied the most under plan 3 primarily because of the variability of cash savings. Only under plan 3 did any significant amount of cash savings occur annually during the replications. Assets varied under plans 1 and 2 primarily because of the variability of feeder prices. The more feeders, the greater the variability of assets. Thus, assets were more variable under plan 2 than under plan 1.

Liabilities. During 21 of the 25 years, liabilities were the highest under production plan 1 (see Table IX). Liabilities were the highest under plan 2 during the years 2-5. Liabilities were higher under plan 2 than under plan 3 during the years 1-10 and 21-25. During the years 11-20, liabilities were approximately the same under plans 2 and 3.

Liabilities were the highest under plan 1 mainly because of the real estate debt. Liabilities were higher under plan 2 than under plan 3 during the years 1-10 primarily due to the debt associated with the purchase of feeders. During the years 21-25, both land investments and feeder purchases were responsible for liabilities being higher under plan 2 than under plan 3.

The annual variation in liabilities was about the same under the three plans. The range in standard deviations under each plan over the 25 years is presented in Table IX.

Net Worth. The greatest growth in net worth was achieved under production plan 1 (see Figure 7). The second highest net worth at the end of 25 years was achieved under plan 2. Plan 3 allowed the least amount of growth in net worth. From the end of year 1 to the end of year 25, average net worth increased 682, 583, and 366 percent, respectively, under production plans 1, 2, and 3.[6]

The net worth averages were the highest under plan 3 during the first eight years of the planning horizon. However, the net worth averages under plan 3 were the lowest during the last six years of the planning horizon. During the first 19 years of the planning horizon, the net worth averages under plan 2 were the lowest.

The annual variation in net worth did not differ much among the plans when average net worth was about the same under all three plans during a given year. For example, average net worth was approximately

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[6]The linear programming analysis from which the production plans were derived indicated that annual returns over variable costs were the highest under production plan 1. Production plans 2 and 3 were the second and third most profitable plans, respectively.

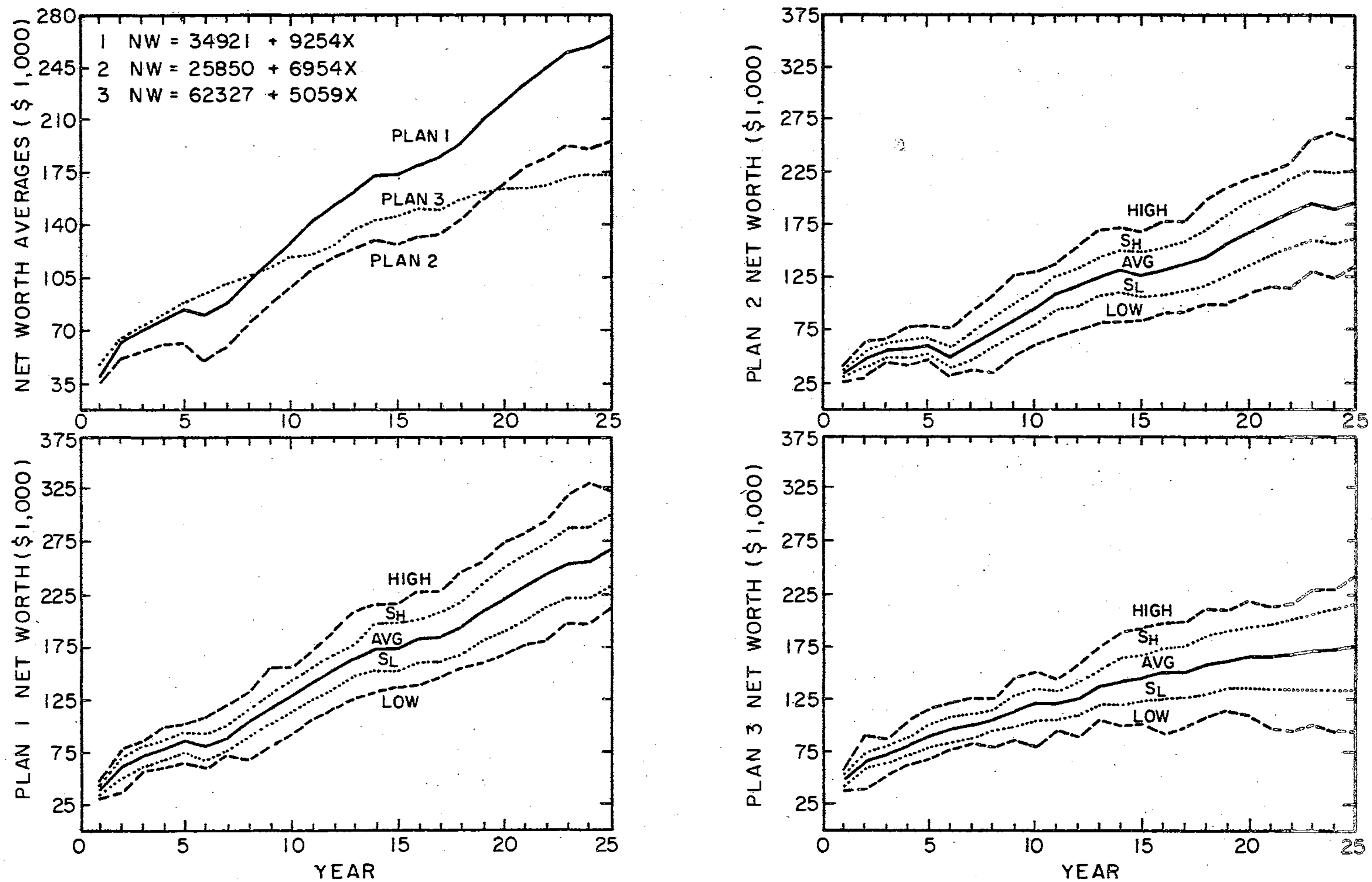

Figure 7. Net Worth Over 25 Years When Land was Acquired Through Renting and Purchase Under Various Production Plans

$114,000 under plans 1 and 3 during year 9. During year 20, average net worth was approximately $166,000 under plans 2 and 3. The net worth standard deviation was approximately $14,000 during year 9 under plans 1 and 3 and approximately $30,000 during year 20 under plans 2 and 3.

Standard of Family Living Maintained

Consumption levels were somewhat higher on the average under production plans 1 and 3 than under plan 2 during the first eight years of the planning horizon. During the last 17 years, however, plans 1 and 2 allowed higher levels of consumption than plan 3. Consumption levels during each of the 25 years under the three plans are presented in Figure 8.

The pattern of consumption was about the same under plans 1 and 2. Under both plans, the consumption averages varied considerably over the 25 years. Most of the variation was due to the cyclical movement of feeder prices. On the average, feeder net returns were at a peak during years 11 and 21 while during years 6 and 17, they were at a low. Consumption, being a function of after-tax income from the previous year, was generally high during years 12 and 22 and generally low during years 7 and 18. Under both plans 1 and 2, the consumption averages generally declined over time as a result of land investment. The purchase of land increased interest payments which decreased after-tax income and consumption.

The consumption averages under plan 3 also decreased over time as a result of land investment. The decline was more noticeable under plan 3 than under plans 1 and 2, however, since cows provided a lower

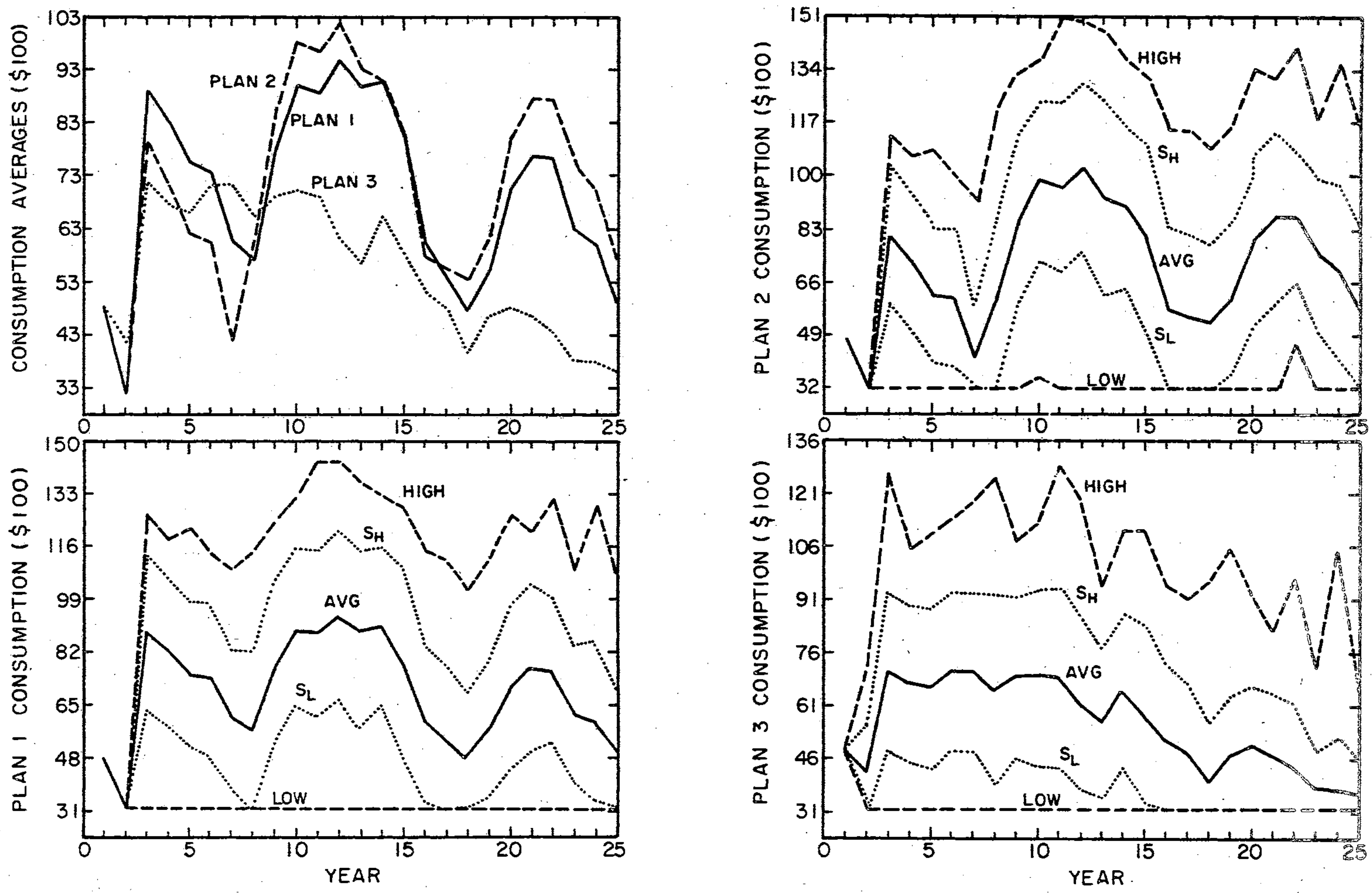

Figure 8. Consumption Over 25 Years When Land was Acquired Through Renting and Purchase Under Various Production Plans

level of net returns than did the feeders. In addition, when 2,560 acres were operated, plan 2 included 578 feeders while plan 3 included only 88 cows. The contribution to after-tax income from 578 feeders was about four times greater than from 88 cows. Net returns from the 88 cows did not even have much effect on the variability of consumption averages over time.

The annual variation in consumption was similar under all three plans during the first half of the planning horizon. During the last half, less consumption variability occurred under plan 3 than under plans 1 and 2. Under plan 3, the consumption averages fell relatively close to the Low values during the last half of the planning horizon. Although the High values indicate that relatively high standards of family living could be maintained during each of the 25 years under all three plans, the chances are that relatively low levels of consumption would result under plan 3. Applying Tchebycheff's inequality (see Appendix C), the probability of maintaining a level of consumption between $3,196 and $5,501 during year 25 under plan 3 is greater than .75. The same probability statement for consumption during year 25 under plans 1 and 2 yields intervals ranging from $3,196 to $9,347 and from $3,196 to $10,807, respectively.

Effects of Different Land Acquisition Methods and Beginning Land Equity Levels on Firm Growth

Three land acquisition methods and three beginning land equity levels were combined in nine simulation experiments. The combinations, by alphanumeric notation, included:

R35. Land acquisition through renting under a beginning land equity level of 35 percent.

R55. Land acquisition through renting under a beginning land equity level of 55 percent.

R87. Land acquisition through renting under a beginning land equity level of 87 percent.

B35. Land acquisition through purchase under a beginning land equity level of 35 percent.

B55. Land acquisition through purchase under a beginning land equity level of 55 percent.

B87. Land acquisition through purchase under a beginning land equity level of 87 percent.

RB35. Land acquisition through renting and purchase under a beginning land equity level of 35 percent.

RB55. Land acquisition through renting and purchase under a beginning land equity level of 55 percent.

RB87. Land acquisition through renting and purchase under a beginning land equity level of 87 percent.

Henceforth, the combinations will be referred to by the alphanumeric notation. For example, land acquisition through renting under a beginning land equity level of 35 percent will be referred to as combination R35.

While the nine simulation experiments were conducted, the financial strategy and production plan were held constant as denoted in Chapter III, Table III. The production plan included crops, cows, and feeders. Financial strategy 4 was followed.

Land Acquisition and Related Resource Requirements

Land Rented and Purchased. Table X presents the acreages of land owned, rented, and operated during each of the 25 years when land was acquired through renting and/or purchase under various levels of beginning equity in land. Combination B35 is not included in Table X because the firm could not pass the solvency test when the beginning land equity level was 35 percent.

Land acquisition through renting allowed the maximum acreage to be operated (2,560 acres) during the first year of the 25 year planning horizon when the beginning land equity level was 87 percent. In contrast, only 960 acres were operated during year 1 under combination R35. The maximum acreage was operated under all three combinations (R35, R55 and R87) by the end of year 11. Considerably greater acreages of land could have been rented under all three beginning land equity levels had it not been for the limit set on land acquisition. During year 25, the average net worth ratios under combinations R35, R55 and R87 were .81, .92, and .98, respectively.

Land acquisition through purchase was much less conducive to firm expansion than land acquisition through renting. Land could not be purchased under combination B55. Combination B87 allowed 480 and 160 acres to be purchased during years 1 and 6, respectively. Further expansion under combination B87 was impossible because the payments on loans used to purchase land had to be subsidized by the net returns from owned land. The average annual total (interest plus principal) payments on land during the years 2-5 and 7-25 were $19.91 and $19.40 per purchased acre, respectively.

TABLE X

LAND OWNED, RENTED, AND OPERATED OVER 25 YEARS WHEN LAND WAS ACQUIRED THROUGH RENTING AND/OR PURCHASE UNDER VARIOUS LEVELS OF BEGINNING EQUITY IN LAND[a]

	Land Acquisition Through Renting Under Equity Levels			Land Acquisition Through Purchase Under Equity Levels		Land Acquisition Through Renting and Purchase Under Equity Levels		
Years	35	55	87	55	87	35	55	87
				Acres Owned				
1-5	320	320	320	320	800	320	320	640
6-10	320	320	320	320	960	320	640	1,120
11-15	320	320	320	320	960	480	960	1,600
16-20	320	320	320	320	960	640	1,280	2,240
21-25	320	320	320	320	960	800	1,760	2,400
				Acres Rented				
1-5	640	1,920	2,240			640	1,920	1,920
6-10	1,440	2,240	2,240			1,440	1,920	1,440
11-15	2,240	2,240	2,240			2,080	1,600	960
16-20	2,240	2,240	2,240			1,920	1,280	320
21-25	2,240	2,240	2,240			1,760	800	160
				Acres Operated				
1-5	960	2,240	2,560	320	800	960	2,240	2,560
6-10	1,760	2,560	2,560	320	960	1,760	2,560	2,560
11-25	2,560	2,560	2,560	320	960	2,560	2,560	2,560

[a]Farm size before simulation was 320 acres of owned land.

Greater acreages of land were purchased over the 25 years under the rent-purchase method than under the purchase method of land acquisition. Under the rent-purchase method of land acquisition, the payments on loans used to purchase land could be subsidized not only by the net returns from owned land but by the net returns from rented land. Also, the firm could rapidly expand through renting and take advantage of size economics.[7] Consequently, more than three times as much land was purchased under combination RB87 than under combination B87 by the end of year 21. Almost as much land was purchased over the 25 years under combination RB35 as under combination B87.

The beginning land equity level significantly influenced the amount of land purchased. Combination RB87 allowed the purchase of 320 acres during year 1 while combinations RB55 and RB35 did not allow 320 acres to be purchased until years 6 and 16, respectively. Over the 25 years, combinations RB35 and RB55 allowed the purchase of 480 and 1,440 acres, respectively, while combination RB87 allowed the purchase of 2,080 acres.

A simulation experiment was conducted in which an attempt was made to rent land when the beginning level of equity in land was 30 percent. At that level of equity, however, land could not be rented. In fact, the firm could not pass the solvency test.

Least-cost machinery inventories for selected acreages are presented in Appendix B, Table XXII. By comparing Tables X and XXII, the machinery requirements can be obtained for the acreages specified in Table X.

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[7]Per acre costs of overhead, machinery, and labor decreased as farm size increased.

<u>Labor Requirements</u>. The total (crop and livestock) labor requirements under the purchase and rent-purchase methods of land acquisition are presented in Table XI. The labor requirements under the rent and rent-purchase methods of land acquisition were the same since the same acreage was operated each year under both methods. Hence, the labor requirements under the rent method of land acquisition are not presented in Table XI.

The labor requirements under combination B55 were the lowest during each of the 25 years. However, the per acre labor requirements under combination B55 were the highest since the 320 acres owned under combination B55 were operated with the smallest machinery. A total of 761 hours of labor were required to operate 320 acres which amounts to 2.38 hours of labor per acre. In contrast, 4,267 hours of labor were required to operate 2,560 acres which amounts to 1.67 hours of labor per acre.

The labor requirements increased during some years even though the acreage operated remained constant. For example, the labor requirements under combination B55 increased by 220 hours from year 1 to year 2 although the same acreage (320 acres) was operated both years. The increase resulted because the livestock enterprises initiated during year 1 were not expanded for the duration of a year until year 2.

<u>Capital Requirements</u>. Investment capital requirements were considerably higher under combination RB87 than under any other combination because of land investment. The investment capital requirements are presented in Table XII. A total of $598,960 was invested in land over the 25 years under combination RB87. Combinations B87, RB35, and RB55 allowed $155,920, $151,920, and $443,040,

TABLE XI

CROP AND LIVESTOCK LABOR REQUIREMENTS OVER 25 YEARS WHEN LAND WAS ACQUIRED THROUGH RENTING AND/OR PURCHASE UNDER VARIOUS LEVELS OF BEGINNING EQUITY IN LAND

	Land Acquisition Through Purchase Under Equity Levels		Land Acquisition Through Renting and Purchase Under Equity Levels		
Year	55	87	35	55	87
1	541	863	1,030	2,362	2,337
2	761	1,451	1,742	4,065	4,267
3	761	1,451	1,742	4,065	4,267
4	761	1,451	1,742	4,065	4,267
5	761	1,451	1,742	4,065	4,267
6	761	1,619	2,581	4,024	4,267
7	761	1,742	3,193	4,267	4,267
8	761	1,742	3,193	4,267	4,267
9	761	1,742	3,193	4,267	4,267
10	761	1,742	3,193	4,267	4,267
11	761	1,742	3,660	4,267	4,267
12	761	1,742	4,267	4,267	4,267
13	761	1,742	4,267	4,267	4,267
14	761	1,742	4,267	4,267	4,267
15	761	1,742	4,267	4,267	4,267
16	761	1,742	4,267	4,267	4,267
17	761	1,742	4,267	4,267	4,267
18	761	1,742	4,267	4,267	4,267
19	761	1,742	4,267	4,267	4,267
20	761	1,742	4,267	4,267	4,267
21	761	1,742	4,267	4,267	4,267
22	761	1,742	4,267	4,267	4,267
23	761	1,742	4,267	4,267	4,267
24	761	1,742	4,267	4,267	4,267
25	761	1,742	4,267	4,267	4,267

TABLE XII

NEW INVESTMENT CAPITAL REQUIREMENTS OVER 25 YEARS WHEN LAND WAS ACQUIRED THROUGH RENTING AND/OR PURCHASE UNDER VARIOUS LEVELS OF BEGINNING EQUITY IN LAND

	Land Acquisition Through Renting Under Equity Levels			Land Acquisition Through Purchase Under Equity Levels		Land Acquisition Through Renting and Purchase Under Equity Levels		
Year	35	55	87	55	87	35	55	87
	-Dollars-							
1	19,469	35,166	43,538	1,915	130,054	19,469	35,166	119,378
2								
3								
4		446	876				446	876
5		444					444	
6	16,778	25,093	2,869	7,050	48,534	16,778	109,413	129,349
7			697					697
8		361	5,879				361	5,879
9	902	347			902	902	347	
10	638		12,168			638		12,168
11	27,314		3,066		10,320	73,714	92,799	142,265
12		1,058	709				1,058	709
13		5,518	697				5,518	697
14								
15	709	12,168	5,170		907	709	12,168	5,170
16	2,869	6,297	3,578	7,050	3,735	53,509	107,576	206,138
17	697	347				697	347	
18	5,170	697				5,170	697	
19	709		12,865			709		12,865
20	12,168	5,532	709			12,168	5,532	709
21	3,066	347	3,066		10,320	57,946	164,987	57,946
22			5,170					5,170
23	1,406				865	1,406		
24		13,226	709		907		13,226	709
25	5,170	347	697			5,170	347	697

respectively, to be invested in land over the 25 years.

Land investment represented the difference in investment capital requirements between the rent and rent-purchase methods of land acquisition. During year 6, for example, investment capital requirements were $25,093 and $109,413 under combinations R55 and RB55, respectively. The difference of $84,320 between the two combinations was the amount of investment required for 320 acres.

Investment capital was required only three times under combination B55. During year 1, an investment of $1,915 was required for breeding stock. An investment of $7,050 was required for machinery during years 6 and 16.

Operating capital requirements were considerably higher than investment capital requirements over the 25 years even under those methods of land acquisition that allowed land investment. The operating capital requirements are presented in Table XIII. Over the 25 years, operating capital requirements constituted 83 percent of total (investment plus operating) capital requirements under combination RB87. Operating capital requirements under combinations R87 and B87 were 97 and 86 percent, respectively, of total capital requirements. Total capital requirements were obtained by summing the investment capital requirements in Table XII and the operating capital capital requirements in Table XIII.

Operating capital requirements under combinations R35 and RB35 were the same during the years 1-10. They were also the same under combinations R55 and RB55 during the years 1-5. During years 6 and 11, land was purchased under combinations RB55 and RB35, respectively. Thereafter, operating capital requirements were higher under

TABLE XIII

AVERAGE OPERATING CAPITAL REQUIREMENTS OVER 25 YEARS WHEN LAND WAS ACQUIRED THROUGH RENTING AND/OR PURCHASE UNDER VARIOUS LEVELS OF BEGINNING EQUITY IN LAND[a]

Year	Land Acquisition Through Renting Under Equity Levels			Land Acquisition Through Purchase Under Equity Levels		Land Acquisition Through Renting and Purchase Under Equity Levels		
	35	55	87	55	87	35	55	87
	Dollars							
1	33,729	75,273	85,352	13,399	29,301	33,729	75,273	85,870
2	49,244	111,676	125,886	16,536	42,703	49,244	111,676	128,694
3	48,863	110,764	124,716	16,438	42,379	48,863	110,764	127,576
4	47,369	107,140	120,384	15,932	41,108	47,369	107,140	123,295
5	45,877	103,700	116,380	15,926	39,857	45,877	103,700	119,263
6	67,517	108,385	113,426	15,049	43,867	67,517	109,017	117,123
7	82,133	115,861	113,174	15,745	48,163	82,133	118,878	120,518
8	82,295	116,098	112,896	15,849	48,352	82,295	119,152	120,134
9	86,922	122,730	120,628	16,761	50,901	86,922	125,724	127,702
10	89,832	127,527	124,171	17,233	52,665	89,832	130,474	131,102
11	119,307	132,754	130,563	17,894	53,927	119,671	136,529	138,445
12	137,950	134,194	132,296	18,117	55,594	139,614	139,823	143,494
13	134,756	130,569	129,278	17,763	54,463	136,457	135,993	140,167
14	133,040	129,805	128,016	17,599	53,864	134,753	135,004	138,478
15	126,261	123,475	122,419	17,017	51,744	129,000	128,421	132,501
16	125,129	122,305	120,569	16,699	51,060	127,309	128,045	131,822
17	126,719	124,103	122,339	17,692	52,087	130,176	132,428	139,511
18	127,304	125,151	123,723	17,979	52,674	130,808	133,410	140,901
19	132,901	130,404	127,694	18,741	54,679	136,402	138,459	144,561
20	137,875	136,033	134,382	19,476	56,962	141,338	143,844	151,894
21	143,091	140,408	138,781	20,074	57,800	147,160	149,330	156,234
22	143,919	141,351	139,201	20,261	59,186	148,966	154,462	157,926
23	142,256	140,318	138,425	20,202	58,668	147,282	153,074	157,074
24	139,335	136,239	135,928	19,974	57,608	144,326	148,595	154,168
25	135,336	133,505	132,934	19,718	56,569	140,275	146,543	150,776

[a]Standard deviations ranged from $277 to $4,430.

combinations RB35 and RB55 than under combinations R35 and R55, respectively, by the amount of interest paid on the debt resulting from land investment.

Operating capital requirements were not subject to much annual variation. The standard deviations under all combinations were less than $4,430 during each of the 25 years. The higher the averages, the higher the standard deviations. Thus, the standard deviations ranged from $277 to $866 under combination B55 while under combination RB87, the standard deviations ranged from $2,106 to $4,430.

Financial Condition of the Firm

Assets. The greater the beginning land equity level, the greater the 25 year accumulation of assets, regardless of the land acquisition method. The assets accumulated over 25 years when land was acquired through renting and/or purchase under various levels of beginning equity in land are presented in Table XIV. Almost a million dollars ($962,231) in assets was accumulated under combination RB87 by the end of year 25. The accumulation of assets under combinations RB35 and RB55 at the end of year 25 was $381,320 and $731,549, respectively. The 25 year accumulation of assets under combination B87 was 301 percent greater than under combination B55. The 25 year accumulation of assets under combination R87 was $330,713 while under combinations R35 and R55 the 25 year accumulation of assets was $220,822 and $286,366, respectively.

The rent-purchase method of land acquisition was more conducive to asset accumulation than any other method of land acquisition. For example, the 25 year accumulation of assets under combination RB35 was

TABLE XIV

ASSET AVERAGES OVER 25 YEARS WHEN LAND WAS ACQUIRED THROUGH RENTING AND/OR PURCHASE UNDER VARIOUS LEVELS OF BEGINNING EQUITY IN LAND

	Land Acquisition Through Renting Under Equity Levels			Land Acquisition Through Purchase Under Equity Levels		Land Acquisition Through Renting and Purchase Under Equity Levels		
Year	35	55	87	55	87	35	55	87
	Dollars							
1	115,366	156,443	169,645	88,863	222,315	115,366	156,443	245,485
2	116,437	157,668	170,639	90,362	226,002	116,437	157,668	248,175
3	115,788	157,121	169,622	91,622	229,095	116,788	157,121	248,854
4	116,123	154,341	166,251	92,542	231,346	116,123	154,341	247,179
5	115,577	151,751	162,645	93,502	233,701	115,577	151,751	245,268
6	142,105	168,892	161,971	98,376	286,120	142,105	253,212	372,381
7	142,052	167,943	162,248	99,432	290,117	142,052	253,951	376,593
8	142,766	168,305	168,957	100,660	294,547	142,766	255,957	384,268
9	148,403	175,667	179,494	102,730	301,878	148,403	264,463	395,396
10	152,400	180,551	194,025	104,557	307,920	152,400	270,695	410,752
11	191,801	187,237	204,250	106,433	319,603	238,201	369,945	560,346
12	192,962	193,438	213,716	107,957	324,158	240,210	375,578	568,800
13	190,050	203,005	223,957	108,984	327,216	238,146	379,181	573,179
14	188,017	208,032	231,376	110,129	330,631	236,961	380,783	578,071
15	183,460	213,601	233,684	110,934	333,493	233,252	386,079	582,628
16	183,174	218,937	240,069	115,863	338,829	284,106	491,473	791,488
17	184,396	220,623	245,919	117,085	343,296	287,090	497,278	802,508
18	189,246	227,204	256,042	118,385	347,920	292,530	503,624	813,883
19	195,064	238,283	264,960	120,181	353,959	299,211	513,349	835,652
20	209,141	248,709	279,227	122,197	360,595	313,536	527,235	852,079
21	214,702	259,873	292,360	123,950	371,937	375,270	700,729	922,454
22	217,246	269,253	302,419	125,379	376,228	378,446	709,251	936,713
23	218,847	277,909	314,287	126,558	380,177	380,094	715,649	946,127
24	218,559	279,030	322,083	127,548	383,572	379,501	727,249	954,222
25	220,822	286,366	330,713	128,535	386,438	381,320	731,549	962,231
	Standard Deviation Range ($1,000)							
1-25	1-17	2-24	2-25	0-1	1-2	1-4	2-5	2-5

higher than under combination R87 and almost as high as under combination B87.

Assets under combination B55 were greater during year 25 than during year 1 only because of land value appreciation. Over the 25 years, the 320 acres of land owned under combination B55 (additional land was not purchased) increased in value from $75,840 to $116,544, an increase of $40,704. Without land value appreciation, assets under combination B55 would have decreased from $88,863 during year 1 to $87,831 during year 25.

The most annual variation in assets occurred when land was acquired through renting. The range in standard deviations under each combination over the 25 years is denoted toward the bottom of Table XIV. Asset variability was the highest under the rent method of land acquisition because of the variability of cash savings. Savings through land investment were emphasized when land was acquired under the purchase and rent-purchase methods of land acquisition and land investment savings were much less variable than cash savings. Some variation existed in cash downpayments on land. But, annual payments always had to be made on the loans used to purchase land.

Liabilities. The greater the level of land investment, the greater the level of liabilities that existed at the end of each year. Table XV presents the liabilities that existed during each of the 25 years. For any given level of beginning land equity, liabilities were the highest under the rent-purchase method of land acquisition. The second highest level of liabilities existed under the purchase method of land acquisition. The lowest level of liabilities existed under the rent method of land acquisition. Liabilities totaled only $6,691 during year 25 under combination R87.

TABLE XV

LIABILITY AVERAGES OVER 25 YEARS WHEN LAND WAS ACQUIRED THROUGH RENTING AND/OR PURCHASE UNDER VARIOUS LEVELS OF BEGINNING EQUITY IN LAND

Year	Land Acquisition Through Renting Under Equity Levels			Land Acquisition Through Purchase Under Equity Levels		Land Acquisition Through Renting and Purchase Under Equity Levels		
	35	55	87	55	87	35	55	87
	Dollars							
1	86,306	117,713	109,130	38,580	154,523	86,306	117,713	185,488
2	80,199	96,451	82,627	38,235	151,365	80,199	96,451	161,802
3	77,358	86,681	69,955	38,328	149,940	77,358	86,681	150,468
4	74,547	77,181	57,874	38,377	148,633	74,547	77,181	139,760
5	71,762	67,528	44,764	38,535	147,551	71,762	67,528	127,997
6	102,653	88,620	36,811	45,859	199,285	102,653	173,606	248,426
7	96,551	78,679	28,689	46,958	200,586	96,551	166,352	245,454
8	89,480	65,139	23,768	47,551	200,453	89,480	154,627	240,984
9	87,083	57,828	19,648	48,508	202,451	87,083	148,228	236,645
10	84,898	51,592	27,138	49,340	203,784	84,898	142,934	243,741
11	126,370	44,162	23,512	49,928	213,700	173,144	228,738	379,649
12	111,736	38,763	19,348	50,384	213,362	160,010	223,092	374,825
13	96,948	38,665	16,152	50,505	211,266	146,090	216,069	364,309
14	86,905	35,357	13,571	59,921	210,624	136,867	208,328	357,398
15	78,843	41,024	12,455	51,835	211,874	129,725	212,688	356,939
16	72,816	40,489	11,079	59,833	216,407	175,363	312,450	558,023
17	70,478	35,964	10,119	62,193	219,701	175,480	313,898	564,561
18	69,584	32,286	9,145	64,337	222,061	175,734	309,839	567,141
19	64,114	29,196	8,489	66,390	223,914	171,364	305,350	579,594
20	71,275	28,728	8,228	68,354	225,954	178,847	307,536	581,746
21	66,506	26,855	7,950	69,999	236,679	231,014	468,359	638,275
22	58,730	25,169	7,654	71,586	237,276	224,199	466,972	641,542
23	51,245	23,416	7,354	73,105	237,938	216,799	462,078	638,377
24	44,854	22,886	7,034	75,062	239,684	210,111	470,905	638,220
25	42,288	21,370	6,691	77,283	240,923	207,370	467,393	638,227
	Standard Deviation Range (1,000)							
1-25	2-20	1-13	0-13	1-11	2-28	2-29	7-34	5-44

Liabilities generally decreased between years of land acquisition except when land was acquired through purchase. Liabilities increased every year but one under combination B55. The net returns from 320 acres were insufficient to repay the $34,100 of land debt that existed at the beginning of year 1. Under combination B87, liabilities decreased every year during the first five years of the 25 year planning horizon. Thereafter, liabilities increased during all but four years. During those four years, livestock net returns were nearly at a peak. Liabilities would have continued to decrease after year 5 if an additional 160 acres had not been purchased during year 6.

The most annual variation in liabilities occurred when land was acquired through renting and purchase. The standard deviations ranged from $5,000 to $44,000 under combination RB87. In contrast, the standard deviations ranged from $1,000 to $11,000 under combination B55. The range in standard deviations under each combination over the 25 years is presented in Table XV.

When land was acquired through purchase or renting and purchase, the liabilities were less variable during the first half of the planning horizon than during the last one-half. When land was acquired through renting, however, liabilities were more variable during the first half of the planning horizon than during the last half. Most of the liability variation resulted from the variability of short term debt. Short term debt generally increased over time when land was acquired through purchase or renting and purchase. When land was acquired through renting, however, short term debt generally decreased over time.

Net Worth. The net worth achieved during each of the 25 years under each of the eight combinations is presented in Figure 9. The figure contains two graphs. The net worth averages are compared in one graph and the net worth standard deviations are compared in the other graph.

Average net worth was about the same under the rent and rent-purchase methods of land acquisition during each of the 25 years. Although the rent-purchase method of land acquisition was the most conducive to asset accumulation, the liabilities associated with land investment prevented net worth from being any higher under the rent-purchase method than under the rent method of land acquisition. The rent method of land acquisition required rental payments but allowed net worth to increase through cash savings. The rent-purchase method required interest payments on the loans used to purchase land but allowed net worth to increase through principal payments and land value appreciation.

Land acquisition through purchase was much less conducive to net worth growth than the rent and rent-purchase methods of land acquisition. During every year except year 1, net worth was lower under combination B87 than under combinations R87 and RB87. Likewise, net worth was lower under combination B55 than under combinations R55 and RB55 during every year except year 1. During year 25, the net worth averages under combinations B55 and B87 were lower by 81 and 55 percent, respectively, than under combinations RB55 and RB87.

The beginning level of equity in land also had a strong effect on net worth growth. The greater the beginning land equity level, the greater the level of net worth during each of the 25 years, regardless

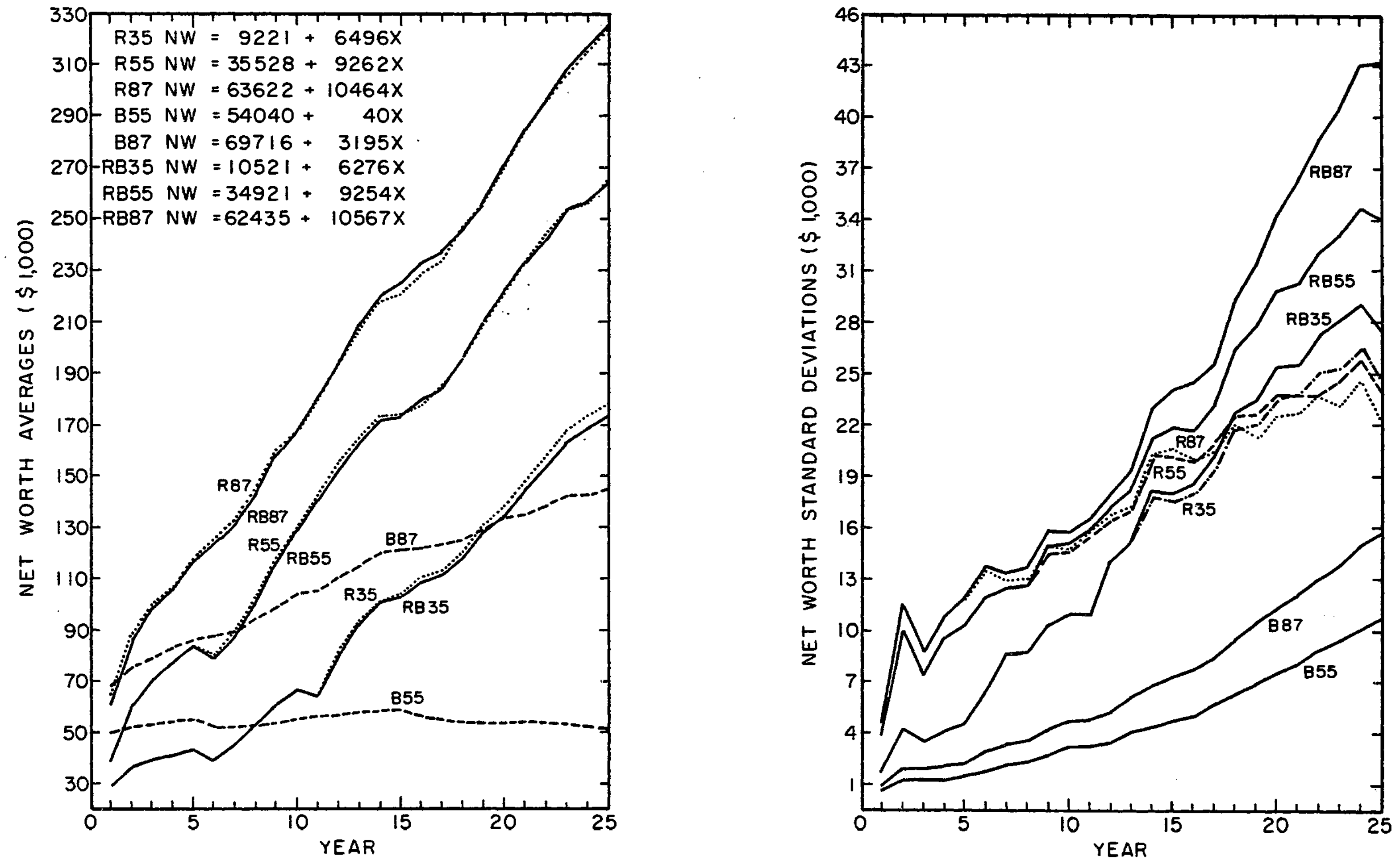

Figure 9. Net Worth Over 25 Years When Land was Acquired Through Renting and/or Purchase Under Various Levels of Beginning Equity in Land

of the land acquisition method. When the beginning levels of land equity were 35 and 55 percent instead of 87 percent, the net worth averages during year 25 were lower by 45 and 18 percent, respectively, under both the rent and rent-purchase methods of land acquisition. During year 25, the net worth average under combination B55 was lower than under combination B87 by 65 percent.

The net worth averages under combination B87 increased every year even though the liability averages under combination B87 also increased during the majority of the 25 years (land value appreciation offset increasing liabilities). Under combination B55, however, the net worth averages declined after year 15 because land value appreciation could not offset increasing liabilities.

Although the net worth averages under the rent method of land acquisition were about the same as under the rent-purchase method during each of the 25 years, net worth was less variable under the rent method than under the rent-purchase method of land acquisition during each year the maximum acreage was operated. During year 25, for example, the net worth standard deviations under combinations R35, R55, and R87 were lower by 12, 30, and 48 percent, respectively, than under combinations RB35, RB55, and RB87, respectively. Once the maximum acreage was operated under the rent method of land acquisition, cash savings generally existed during a greater number of each year's replications. Cash savings generally existed during the majority of each year's replications toward the end of the planning horizon. Under the rent-purchase method of land acquisition, short term debt generally existed during each year's replications. Cash savings had a less variable effect on net worth than did short term debt. The interest rate for cash savings was 2.5 percent while it was 7.5 percent for short term debt. Thus, the range in cash savings during any given year did not diverge as much as the range in short term debt. Short term debt during each of the 25 years was the highest under combination RB87. Hence, the highest net worth standard deviation during each of the 25 years existed under combination RB87.

Standard of Family Living Maintained

Consumption levels during each of the 25 years when land was acquired through renting and/or purchase under various levels of beginning equity in land are presented in Figure 10. The figure is divided into four graphs. The consumption averages are compared in one graph. The consumption standard deviations under each land acquisition method are compared in the other three graphs.

The consumption averages were the highest under the rent method of land acquisition and the lowest under the purchase method of land acquisition. Under the rent-purchase method of land acquisition, the consumption averages were the same as under the rent method until land was purchased. After land was purchased, the consumption averages were lower under the rent-purchase method than under the rent method of land acquisition. The consumption averages also trended downward under the rent-purchase method of land acquisition after land was purchased.

The consumption averages were low or decreased under the methods of land acquisition that permitted land investment because interest payments on capital borrowed to purchase land decreased after-tax income and consumption. Land investments were primarily externally financed. For example, 81, 86, and 92 percent of all land investments

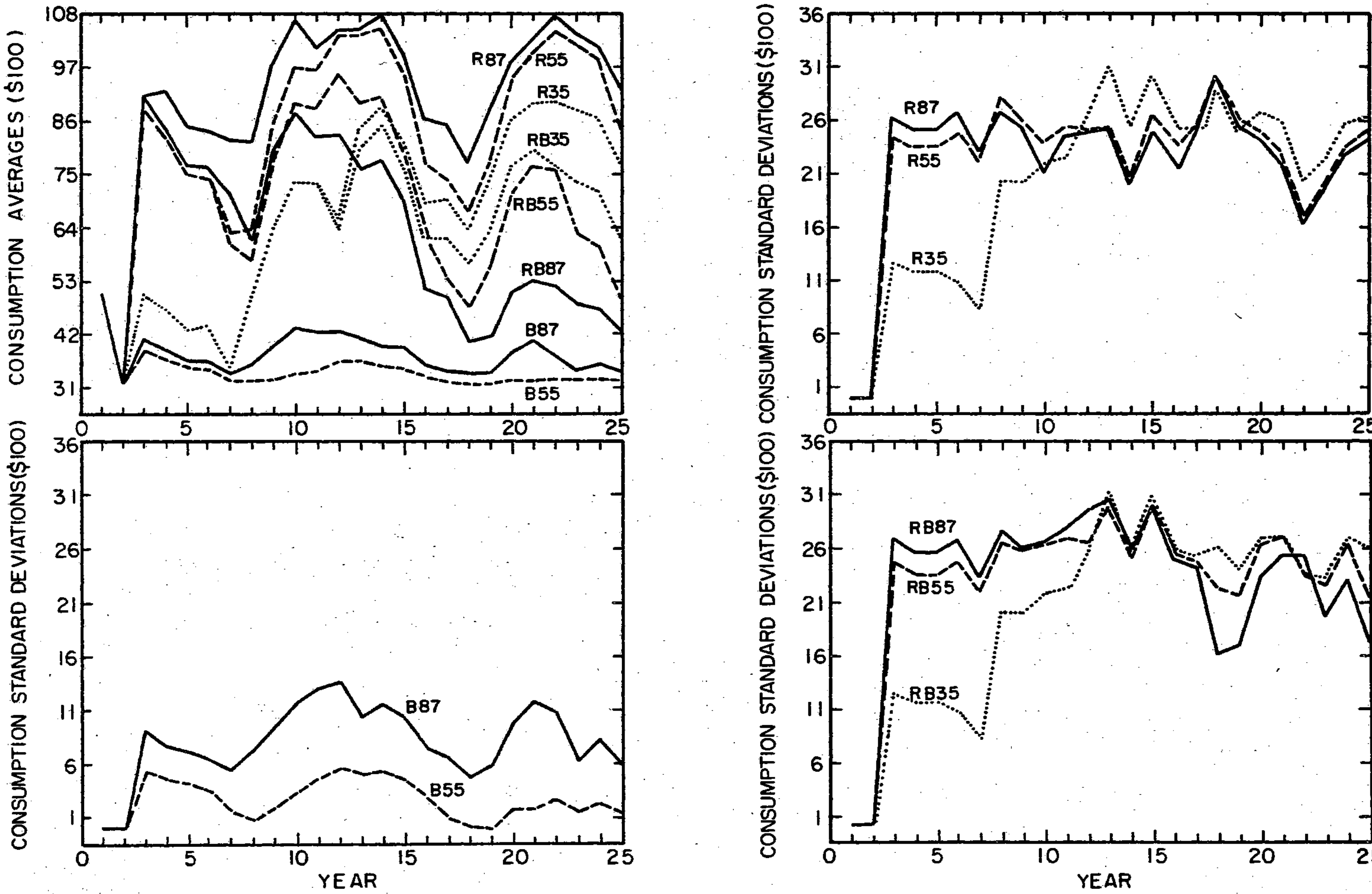

Figure 10. Consumption Over 25 Years When Land was Acquired Through Renting and/or Purchase Under Various Levels of Beginning Equity in Land

were externally financed on the average under combinations RB35, RB55, and RB87, respectively.

The consumption standard deviations under the rent method of land acquisition were generally about the same as under the rent-purchase method of land acquisition. The lowest consumption standard deviations occurred under the purchase method of land acquisition. Consumption varied the least under the purchase method of land acquisition primarily because the majority of capital withdrawals for consumption were relatively close to the minimum level allowed ($3,196).

CHAPTER V

APPLICATION AND EVALUATION OF THE SIMULATION MODEL AND RESULTS

Previous chapters have discussed the simulation model structure, the data requirements of the model, and the results obtained when the effects of selected variables on firm growth were simulated. The purpose of this chapter is to:

1. Discuss implications of the results from the simulation experiments to credit agencies and farm operators
2. Evaluate potential use of the model in simulating the growth of an individual firm situation
3. Suggest model refinements.

Application of the Results

The simulation results presented in Chapter IV indicate which financial arrangements, production plans, and land acquisition methods are most conducive to firm growth. They also indicate the extent to which a firm with a low level of equity in land can grow. Such results can be used as a guide by credit agencies involved in constructing financial arrangements with farm operators in north central Oklahoma. Farm operators in the study area can also use the results as a guide when planning firm growth. The results are to be regarded as a guide since the results are unique to the firm growth situations formulated for this study.

Usefulness of the Results to Credit Agencies

Firm growth requires a considerable amount of credit. Liabilities in the neighborhood of one-half million dollars were not uncommon in the simulation experiments conducted (see Chapter IV, Tables VI, IX, and XV). Such credit needs could not be met by lending agencies under most prevailing financial arrangements.

Credit Situations. The amount of credit that can be obtained on various assets appears to be the most important aspect of a financial arrangement. Under a liberal credit situation, 533 percent more land was operated by the end of year 21, net worth was 324 percent greater on the average by the end of year 25, and average consumption over the 25 years was 175 percent higher than under a typical credit situation (see Chapter IV, Table IV, and Figures 5 and 6.)[1]

A credit agency may regard a financial arrangement that allows liberal credit as risky. However, the firm extended liberal credit may be able to achieve a better debt-paying position than the firm restricted to typical credit limitations (see Chapter IV, Tables IV and VI). Under a typical credit situation, 160 acres were rented.

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[1]A typical credit situation was represented by financial strategy 1 in the simulation experiments conducted. Credit was limited to 48, 66, 50, and 75 percent of current real estate, new machinery, used machinery, and livestock market values, respectively. A liberal credit situation was represented by financial strategy 4. Credit was limited to 75, 80, 75, and 90 percent of current real estate, new machinery, used machinery and livestock market values, respectively.

But, liabilities generally increased on the average over the 25 years because a 480 acre unit was not large enough to take advantage of size economies. The firm solvency test was passed because land appreciated in value and because family labor was externally employed. In contrast, a liberal credit situation allowed the firm to expand rapidly through renting and to eventually purchase substantial acreages. Although the level of average liabilities was almost one-half million dollars during one year, that high level of debt was reduced.

A farm lender must be able to evaluate whether a firm has potential growth. Liberal credit may not always lead to firm growth. Under certain conditions, the firm may not be able to grow regardless of the financial arrangements between the farm operator and lender. The firm solvency test could not be passed when the production plan was void of livestock (beginning land equity level of 55 percent) nor could it be passed when the beginning land equity level was 30 percent (production plan included livestock). The firm with a beginning land equity level of 55 percent passed the solvency test but could not acquire land through purchase. Land could not be acquired through purchase until the beginning land equity level was 87 percent. Land could be acquired only through renting or renting and purchase when the beginning land equity level was as low as 35 percent.

Farm lenders must be prepared to extend credit to farm operators for more than investment purposes. Investment capital requirements were generally less than 20 percent of average total capital requirements in the simulation experiments conducted.

Payment Plans. Most of the simulation experiments involved 35 year Standard payment plans for loans used to purchase real estate, and three year Springfield payment plans for loans used to purchase machinery and cows. Several experiments, however, involved different payment plans.[2]

Non-amortization (completely or for 10 years) of a loan used to purchase land was not any more conducive to firm growth in this study than a 35 year amortized loan. Real estate liabilities were larger, non-real estate liabilities (primarily short term debt) were smaller, and cash savings were higher each year when the real estate loans were non-amortized instead of amortized. Cash savings usually existed during about four months each year. Short term debt replaced cash savings during the other months. Because the real estate debt existed during every month each year while the non-real estate debt did not exist during every month each year, the annual total interest payments were slightly higher when the real estate loans were non-amortized instead of amortized. The higher interest payments, however, were partially offset by the greater returns from cash savings when the real estate loans were non-amortized instead of amortized. Consequently, the same acreages were rented and purchased over the 25 years under the different payment plans for real estate loans. Net worth and consumption varied only slightly among the different payment plans.

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[2]The effects of various payment plans on firm growth were simulated under average prices and yields.

Amortizing loans used to purchase machinery and cows on a five year Standard payment plan instead of a three year Springfield payment plan had a negligible effect on firm growth in this study. Although, total interest payments over the 25 years were higher under the five year plan than under the three year plan, the difference in interest payments between the two payment plans was not sufficient to have an effect on land acquisition, net worth, or consumption. The same acreages were rented and purchased over the 25 years under both payment plans. Likewise, the net worth achieved and the consumption maintained over the 25 years when the machinery and cow debts were amortized on a five year Standard plan were about the same as when the machinery and cow debts were amortized on a three year Springfield plan.

Firm Survival. A third factor in financial arrangements must be considered. That factor is the probability of the firm surviving over 25 years. If a firm growth plan is initiated for which the probability of firm survival over 25 years is 85 percent, the probability of the firm surviving over 25 years is 85 percent only at the time the plan is initiated. After the plan has been initiated, the probability of the firm surviving until the end of the 25 year period changes. For example, suppose the firm almost becomes insolvent during year 10. At that time, the probability of the firm surviving over the remaining 15 years is considerably less than 85 percent. In all but one of the simulation experiments conducted, the probability of the firm surviving over 25 years was required to be at least 85 percent.[3] In the

[3]The solvency criteria was discussed in Chapter II.

one experiment, the minimum required probability was reduced from 85 to 50 percent.

Average net worth was considerably greater at the end of 25 years when the minimum required probability of the firm surviving over 25 years was 50 instead of 85 percent (see Chapter IV, Table IV, and Figures 5 and 6). Average net worth at the end of 25 years was greater even though average capital withdrawals for consumption were also higher because the firm was able to rent many more acres over the 25 years when the minimum required survival probability was 50 instead of 85 percent.

Whether a firm growth plan should be initiated when the minimum probability is only 50 percent that firm solvency can be maintained is perhaps a decision more important to the farm operator than the farm lender. Insolvency of the firm is not likely to result in a loss to the credit agency. In the event of firm insolvency, the total outstanding principal on loans as well as foreclosure and resale costs should not exceed the value of security available when credit is limited to 48, 66, 50 and 75 percent of current real estate, new machinery, used machinery, and livestock market values, respectively. The farm operator, however, could lose a substantial amount of his original capital if the firm should become insolvent.

Usefulness of the Results to Farm Operators

The simulation model constructed for this study emphasizes growth through land acquisition. Therefore, the results of this study would be most useful to farm operators who can or desire to achieve firm growth through land acquisition.

Land Acquisition Methods. Suppose the goal of the farm operator is to achieve ownership of a larger firm. The simulation results suggest that if the farm operator rents land until a desired acreage is operated and then purchases the land, more land can be purchased over a 25 year period than if land is acquired only through purchase (see Chapter IV, Table X). The rent-purchase method of land acquisition was particularly important to firm growth when the beginning land equity level was low. When the beginning land equity level was 35 percent, the firm solvency test could not be passed under the purchase method of land acquisition, whereas, 2,560 acres were operated by the end of year 11 and 800 of those 2,560 acres were owned by the end of year 21 under the rent-purchase method of land acquisition. When the beginning land equity level was 55 percent, land could not be purchased under the purchase method of land acquisition. The firm solvency test was passed because family labor was externally employed and because land appreciated in value. In contrast, 2,560 acres were operated by the end of year 6 and 1,760 of those 2,560 acres were owned by the end of year 21 under the rent-purchase method of land acquisition. When the beginning land equity level was 87 percent, the firm was able to acquire ownership of 960 acres by the end of year 6 under the purchase method of land acquisition. But, additional land could not be purchased after year 6. Under the rent-purchase method of land acquisition, 1,120 acres were owned by the end of year 6 and 2,400 acres were owned by the end of year 21.

Net worth and consumption during each of the 25 years were also considerably higher on the average under the rent-purchase method of land acquisition than under the purchase method, regardless of the beginning land equity level (see Chapter IV, Figures 9 and 10). When the beginning land equity level was 87 percent, for example, average net worth at the end of year 25 was 223 percent greater and average consumption over the 25 years was 163 percent higher under the rent-purchase method than under the purchase method of land acquisition.

If maintaining a high standard of family living is more important to the farm operator than farm ownership, the simulation experiments indicate that continual renting might be the best alternative. About the same average net worth was achieved during each of the 25 years under the rent method of land acquisition as under the rent-purchase method. Yet, the standard of family living maintained over the 25 years was considerably greater on the average under the rent method of land acquisition than under the rent-purchase method. In addition, total capital requirements (investment plus operating capital) over the 25 years were lower on the average under the rent method of land acquisition than under the rent-purchase method (see Chapter IV, Tables XII and XIII). When the beginning land equity level was 55 percent, for example, average consumption and average total capital requirements over the 25 years were 120 percent higher and 15 percent lower, respectively, under the rent method of land acquisition than under the rent-purchase method. The average level of consumption under the rent method was the same each year as under the rent-purchase method until land was purchased under the rent-purchase method of land acquisition. Land investment emphasizes savings rather than consumption. Thus, the average level of consumption declined after land was purchased under the rent-purchase method of land acquisition.

The farm operator concerned about keeping net worth variability as low as possible might also desire to acquire land through renting. Although the net worth averages under the rent method of land acquisition were about the same as under the rent-purchase method during each of the 25 years, net worth was less variable under the rent method than under the rent-purchase method of land acquisition during each year the maximum acreage was operated. During year 25, for example, the net worth standard deviations under the rent method were lower by 12, 30, and 48 percent than under the rent-purchase method of land acquisition when the beginning land equity levels were 35, 55, and 87 percent, respectively.

Production Plans. The simulation results discussed so far in this section of the chapter were obtained while following the production plan that included crops, cows, and feeders. Several simulation experiments, however, involved different production plans.

The farm operator whose objectives include owning as much of the land operated as possible by the end of 25 years and/or achieving the highest possible level of net worth by the end of 25 years should probably consider following the crops-cows-feeders production plan (see Chapter IV, Table VII, and Figures 7 and 8). Although the crops-cows-feeders plan did not allow the maximum acreage (2,560 acres) to be operated until year 6, it did allow the most land to be purchased over the 25 year planning horizon. In addition, average net worth at the end of 25 years was $68,178 higher under this plan than under any other plan. However, the second highest average level of consumption ($6,973) was maintained over the 25 years under the plan that included crops, cows, and feeders.

The farm operator who desires to maintain the highest possible standard of family living over 25 years would probably be the most interested in following the crops-feeders production plan. Average consumption over the 25 years under the crops-feeders plan was $168 higher than under any other plan. To maintain this high standard of family living, however, land investment and net worth growth would probably have to be sacrificed. The acreage of land owned was the smallest and the average net worth achieved was the lowest during the first 21 years of the 25 year simulation period under the plan that included crops and feeders.

The farm operator whose planning horizon is shorter than 25 years might want to follow the crops-cows production plan. The most land was acquired (additional land was rented) during the first five years of the 25 year simulation period under the crops-cows plan. In addition, capital withdrawals for consumption and net worth were the highest on the average during the years 1-6 and 1-8, respectively. Although a smaller percentage of the land operated was owned over the 25 years under the crop-cows plan than under the crops-cows-feeders plan, a greater percentage of the land operated was owned under the crops-cows plan during the years 1-20. Average net worth was also higher during the years 1-20 under the crops-cows plan.

The relatively low labor and operating capital requirements under the crops-cows production plan might also be attractive to farm operators (see Chapter IV, Tables VII and VIII). Under the crops-cows-feeders, crops-feeders, and crops-cows plans, the labor requirements were 4,267, 4,556, and 2,846 hours, respectively, when 2,560 acres of land were operated. Average operating capital requirements over the 25 years under the crops-cows-feeders, crops-feeders, and crops-cows plans totaled $3,215,758, $3,534,885, and $1,666,792, respectively.

It is not likely that a farm operator in the study area would choose to follow the crops only production plan. Under the production plan void of livestock, the firm could not rent additional land and pass the solvency test nor could it continue operating the 320 acres of owned land over 25 years and pass the solvency test.

Beginning Land Equity Levels. Regardless of the land acquisition method and production plan a farm operator chooses to follow, the extent to which a firm can be expected to grow depends considerably on the initial level of equity in the firm (see Chapter IV, Table X and Figure 9). The firm solvency test could not be passed when the beginning land equity level was only 30 percent (100 percent equity in all other assets). When the beginning land equity level was 35 percent, firm growth was possible under the rent and rent-purchase methods of land acquisition but not under the purchase method.

Under the purchase method of land acquisition, the firm solvency test could not be passed until the beginning land equity level was at least 55 percent. However, even when the beginning land equity level was 55 percent, the net worth averages declined after year 15. Additional land was not purchased. Under the purchase method of land acquisition, average net worth at the end of year 25 was $51,251 and

$145,514 when the beginning land equity levels were 55 and 87 percent, respectively. In contrast, under the rent-purchase method of land acquisition, average net worth at the end of year 25 was $173,949, $264,157, and $324,005 when the beginning land equity levels were 35, 55, and 87 percent, respectively. Under the rent method of land acquisition, average net worth at the end of year 25 was $178,534, $264,995, and $324,022 when the beginning land equity levels were 35, 55, and 87 percent, respectively.

The simulation experiments have shown that relatively small firms with rather low levels of beginning equity in land can grow. The experiments have also shown that under certain conditions a farm operator's best alternative might be to find employment elsewhere. However, the individual firm situation must be considered when applying the results of the simulation experiments conducted for this study.

Application of the Model

The farm operator whose situation is similar to one of the firm situations formulated for this study could make direct application of the results presented in this study. However, it is not likely that many farmers own approximately 320 acres and have a land equity level about equal to one of the levels (35, 55, and 87 percent) assumed for this study. Furthermore, it is not likely that many farmers have the machinery inventory, machinery debt, liquid assets, production coefficients, and overhead expenses specified as data for this study. In addition, a farm family may feel that its standard of living can be better represented by the function which permits a "certain" level of consumption plus some percentage of after-tax income (percentage can be set equal to zero). Since all these variables and many more may significantly affect firm growth, a model with the capability of simulating a firm situation is needed.

Input tables for the simulation model constructed for this study can be adjusted to meet the requirements of individual firm situations in the Southern Plains. In situations where the specified production plans have application, it would only be necessary to evaluate the coefficients in the various input tables. Where the specified production plans do not have application, different enterprises can be substituted for those specified. Cotton is about the only major enterprise which cannot be represented in the model without modifying the program. Cotton could replace grain sorghum. But, in Oklahoma, grain sorghum is almost always included in the production plan with cotton. In substituting, a summer crop must replace a summer crop and a winter crop must replace a winter crop. For example, oats can replace barley. A feeder enterprise can replace any feeder enterprise. A different cow-calf enterprise must replace the cow-calf enterprise specified. Any new enterprise must be located in exactly the same row or column in all twelve input tables as the enterprise replaced. The input tables can contain fewer enterprises than they are currently constructed to contain with no problem. Locations in each table are assigned a value of zero by the model unless otherwise specified. So, it should be possible to simulate the growth of an individual firm situation without much difficulty.

Simulating the growth of an individual firm situation could become a part of farm management extension efforts. Also, credit agencies might be interested in offering a simulation service to their customers.

The credit agency that offers a simulation service would probably be more appealing to farm operators than the credit agency that does not. Also, the credit agency that offers a simulation service should be in a better position to evaluate a firm's repayment capacity. Hence, the agency that offers the service should have fewer loan repayment problems.

Simulating the growth of an individual firm situation would be relatively inexpensive. On the basis of $100 per hour of computer processing time, the cost of each simulation experiment conducted for this study was about $80. Each experiment required about five computer runs. The one run in which the model determined when and how much land could be acquired under average prices and yields cost about $20. The four runs which involved determining when and how much land could be acquired under variable prices and yields cost about $12 each for a total of $60. An $80 cost would amount to only one-half percent of a $16,000 loan. Considering that one feasible simulation solution would be applicable over many time periods and many loans, the cost per dollar of loan volume per individual would be minute.

Model Refinement

The preceding analysis has demonstrated that the model as it is currently constructed generates a substantial amount of information potentially useful to farm operators and lenders. Also, the model as it is currently constructed can be used economically to simulate the growth of an individual firm situation. However, there are several aspects of the model that could be refined.

The arrangement of data on cards could perhaps be simplified. The current arrangement is illustrated in Appendix A, Table XIX. Input tables are constructed by the simulation model according to the location of data on cards. The cards must be sequenced. An alternative arrangement might be to code all coefficients by table number, row, and column (one coefficient and code per card). Input tables could then be constructed by the model according to the code attached to each coefficient. The cards would not have to be sequenced. While data coding would offer flexibility, additional clerical time would be required to code the data and additional computer processing time would be required to input the data into table form.

Additional enterprises such as cotton and peanuts could be added to the input tables. Since the technique for representing enterprises in the model has been established, it would be relatively easy to write the Fortran IV statements necessary to represent additional enterprises in the model. Additional enterprises would be represented in the same manner as comparable enterprises presently represented in the model. To represent an additional enterprise, six subroutines would have to be modified (INPUT, STNMDV, PRODUC, MCHNRY, WANDR, and OUTPUT). Comment cards in each subroutine identify all operations performed by the simulation program.

Several refinements in data and relationships might be considered. There is a general belief that cows are able to absorb forage shortages without much of a sacrifice in the cow's ability to produce a calf. As a result, less production variability is believed to be associated with a cow-calf enterprise than with a feeder enterprise. In the model constructed for this study, if there is a forage shortage, the shortage is met by forage purchases. Likewise, if there is a forage surplus, the surplus is sold. As a result, the production variability associated with a cow-calf enterprise may be overestimated in the model.

The renting of some machinery, particularly a tractor, as opposed to the purchase of all machinery needs further investigation. Least-cost machinery inventories are selected by the simulation model (MCHNRY subroutine) without regard to the possibility of renting machinery. In some of the inventories selected, a third tractor was used very few hours. The third tractor could perhaps be rented for a cost much lower than the cost of ownership.

The simulation model can be used as a farm management and credit evaluation device. The information generated by the model should aid the farm manager in choosing the land acquisition method, production plan, financial arrangement, equity level, and consumption level which will provide the desired rate of firm growth. The information should aid the credit agency in evaluating a firm's repayment capacity, hence, in constructing financial arrangements conducive to firm growth. The model could also serve as a foundation for the development of a more comprehensive model. Its capabilities could be broadened in several ways. A procedure could be devised which would consider alternative methods of depreciation. The aggregate aspects of firm expansion could be represented. The model's capabilities could also be extended to include the disposition stage of the firm's life cycle.

CHAPTER VI

SUMMARY AND CONCLUSIONS

Farm operators have been consolidating their farms into larger units over the past several decades. The trend towards larger farms has resulted primarily from the biological and mechanical innovations which continue to influence agricultural production. Thus, farmers are likely to continue expansion of their farming operations in order to maintain or increase net farm income.

The objectives of this study were concerned with constructing a firm growth simulation model and with estimating the effects of selected variables on firm growth. Data for the simulation model were based on previous farm management research conducted in the north central Oklahoma economic farming area.

The Simulation Model

The model is capable of simulating the growth of a firm producing small grain crops, forages, and beef cattle in a dynamic and uncertain environment. Growth through land acquisition is emphasized. Land procurement, investment, production, consumption, and credit "decisions" are governed by built-in rules and data specifications. Monthly cash flows are generated to portray linkage of the firm's financial transactions throughout the year as well as over the years. Resources and products are assumed to be purchased and sold in purely competitive markets.

The simulation procedure begins by inputing data. These data contain the initial resource situation. Alternative production plans, enterprise coefficients, coefficients of variation, information on machinery, and the growth determinant variables. The following paragraphs briefly describe other steps in the model.

The model simulates the firm's operations over one year for a specified production plan. The acreages owned and rented are examined by the model first. If land is purchased, the amount of investment capital required is determined. Overhead and related expenses, such as land rental payments, are calculated. Since enterprises in the production plan are land based, the level of each enterprise is adjusted to the acreage of land operated. If the cow-calf enterprise is expanded, an investment in additional breeding stock is made.

A machinery inventory analysis is conducted. This analysis involves selecting a least-cost complement of machinery for the acreage operated and determining if machinery investment is needed. Also, depreciation, annual costs, and hours of machinery usage are calculated.

The labor situation is evaluated. Labor is hired on a hourly basis if labor requirements exceed the amount of family labor available. An option is provided by the model whereby unused family labor can find employment external to the firm.

Enterprise net returns and government payments are computed. Crop prices and yields and livestock prices are subject to variation. Prices and yields were assumed to be normally distributed.

Cash is withdrawn for consumption, Federal and state income taxes, and social security. Two consumption functions are available. The function used in this study allowed consumption to vary according to family size and the level of after-tax income from the previous year.

Capital for investment, operating, consumption, and tax paying purposes is obtained from sources external to the firm if the amount required exceeds the amount available. Individual repayment schedules are constructed by the model for the machinery debt, cow debt, and real estate debt. The payment can be scheduled on a Standard or Springfield plan and they can be non-amortized and/or amortized for any reasonable length of time. Unused capital is placed in a savings account.

The financial condition of the firm is summarized as a final step in simulating the firm's operations over one year. Assets, liabilities, net worth, and a net worth ratio are computed. Also, two ratios for later use in testing the firm's solvency are calculated. These two solvency ratios are the ratio of real estate debt to the real estate debt limitation and the ratio of non-real estate debt to the non-real estate debt limitation.

The model then proceeds to simulate the firm's operations over 25 years to depict the expansionary and increasing equity stages of the firm's life cycle. To obtain a distribution of outcomes, the model can provide 50 different replications of the firm's operations over 25 years. The firm's operations over 25 years were replicated 35 times in this study.

After the firm's operations have been simulated over 25 years and replicated the specified number of times, a firm solvency test is performed. Under variable prices and yields, the solvency test involves determining if the probability of the firm surviving over 25 years is as great as a required probability specified as data.

The simulation solution is printed after the solvency test has been performed if the acreages owned and rented are specified as data. When land acquisition is determined by the model, however, the simulation solution is not printed until the maximum acreage has been acquired.

Three land acquisition options are provided by the model. They are (1) purchase, (2) rent, and (3) rent and purchase. Each time the acreages owned and rented are adjusted by the model, the firm's annual operations are examined (simulated over 25 years and replicated the specified number of times), and the firm solvency test is performed. Only after the model has determined that additional land cannot be acquired is the simulation solution printed.

Firm growth in a dynamic but "certain" environment can also be simulated by the model. The simulation procedure and computations performed are only slightly different than when firm growth in an uncertain environment is simulated. Since prices and yields are invariant, the firm's operations over 25 years are not replicated. In regard to the firm solvency test, the firm is required to maintain solvency during each of the 25 years.

The Simulation Experiments Conducted

Simulation experiments were conducted to determine the effects of four variables on firm growth. These variables included methods of land acquisition, different production plans, alternative financial arrangements, and levels of beginning equity in land. The beginning farm resource situation consisted of 320 acres of owned land, a complement of machinery, $5,000 of liquid assets and 2,240 hours of family labor available annually. The resource situation represented a class III commerical farm.

The simulation experiments were generally conducted by making a series of computer runs. The first run involved letting the model determine when and how much land could be acquired under average prices and yields. On the basis of the results obtained from the first run, the acreages owned and rented during each of the 25 years were specified as data and a second run was made. The second and subsequent runs involved variable prices and yields. If the second run gave an infeasible solution, the acreages were adjusted and a third run was made. This process of adjusting acreages and making runs continued until a feasible solution was obtained or until it became obvious that a feasible solution could not be obtained.

Results of the Simulation Experiments

Alternative Financial Arrangements

The method of land acquisition, the beginning level of equity in land, and the production plan were held constant while conducting the simulation experiments that involved alternative financial arrangements. Land was acquired through renting and purchase, the beginning level of equity in land was 55 percent, and the production plan included crops, cows, and feeders.

The amount of credit that could be obtained on various assets appeared to be the most important aspect of a financial arrangement. Under a liberal credit situation, 533 percent more land was operated by the end of year 21, net worth was 324 percent greater on the average by the end of year 25, and average consumption over the 25 years was 175 percent higher than under a typical credit situation. Under a typical credit situation, credit was limited to 48, 66, 50, and 75 percent of current real estate, new machinery, used machinery, and livestock market values, respectively. Under a liberal credit situation, credit was limited to 75, 80, 75, and 90 percent of current real estate, new machinery, used machinery, and livestock market values, respectively.

The probability of the firm surviving over 25 years was required to be at least 85 percent in all but one of the simulation experiments conducted. In the one experiment, the minimum required probability was reduced from 85 to 50 percent.

Average net worth was considerably greater at the end of 25 years when the minimum required probability of the firm surviving over 25 years was 50 instead of 85 percent. Average net worth at the end of 25 years was greater even though average capital withdrawals for consumption were also higher over the 25 years. Net worth and consumption were higher because the firm was able to rent many more acres over the 25 years when the minimum required probability was 50 instead of 85 percent.

Most of the simulation experiments involved 35 year Standard payment plans for loans used to purchase real estate, and three year Springfield payment plans for loans used to purchase machinery and cows. Several experiments, however, involved different payment plans.

Loans used to purchase real estate were completely non-amortized in one experiment. In another experiment, real estate loans were non-amortized 10 years and then amortized over 25 years. Loans used to purchase machinery and cows were amortized on five year Standard payment plans in a third experiment. However, the same acreages were rented and purchased over the 25 years under the different payment plans. Net worth and consumption varied only slightly.

Different Production Plans

A second set of experiments involved different production plans. While conducting these experiments, land was acquired through renting and purchase, the beginning land equity level was 55 percent, and the financial arrangement featured a liberal credit situation.

The production plan that included crops, cows, and feeders was the most conducive to land purchase and net worth growth. At the end of the 25 year planning horizon, more than two-thirds of the land operated was owned and average net worth was $68,178 higher than under any other production plan. The second highest level of consumption was maintained over the 25 years ($6,973 on the average) under the crops-cows-feeders plan.

The production plan that included crops and feeders allowed the highest level of consumption over the 25 years ($7,141 on the average). But, the least amount of land was owned under this plan during the majority of the 25 years. Not until year 21 was as much land owned under the crops-feeders plan as under the crops-cows plan. Consequently, not until year 21 was average net worth under the crops-feeders plan higher than under the plan that included crops and cows. Less than one-half the land operated was owned at the end of the 25 year planning horizon under both the crops-feeders and crops-cows plans. Average net worth was $195,979 under the crops-feeders plan and $175,561 under the crops-cows plan during the twenty-fifth year.

The firm solvency test could not be passed under the production plan that included only crops. The firm could not rent additional land and pass the solvency test nor could it continue operating the 320 acres of owned land and pass the solvency test.

Methods of Land Acquisition and Beginning Land Equity Levels

The third set of experiments involved methods of land acquisition and levels of beginning equity in land. While conducting these experiments, the financial strategy featured a liberal credit situation and the production plan included crops, cows, and feeders.

The firm solvency test could not be passed when the beginning land equity level was only 30 percent regardless of the land acquisition method. When the beginning land equity level was 35 percent, firm growth was possible under the rent and rent-purchase methods of land acquisition but not under the purchase method of land acquisition.

Under the purchase method of land acquisition, the firm solvency test could not be passed until the beginning land equity level was at least 55 percent. However, even when the beginning land equity level was 55 percent, the net worth averages declined after year 15. Additional land was not purchased.

Average net worth during each of the 25 years under the rent method of land acquisition was approximately the same as under the rent-purchase method. When land was acquired through renting and purchase, average net worth at the end of 25 years was $173,949, $264,157, and $324,005 under beginning land equity levels of 35, 55, and 87 percent, respectively. When land was acquired through renting, average net worth at the end of 25 years was $178,534, $264,995, and $324,022 under beginning land equity levels of 35, 55, and 87 percent, respectively. Land acquisition through purchase was much less conducive to net worth growth than the rent and rent-purchase methods of land acquisition. When land was acquired through purchase, average net worth at the end of 25 years was $51,251 and $145,514 under beginning land equity levels of 55 and 87 percent, respectively.

Although the net worth averages under the rent method of land acquisition were about the same as under the rent-purchase method during each of the 25 years, net worth was less variable under the rent method than under the rent-purchase method of land acquisition during each year the maximum acreage was operated. During year 25, for example, the net worth standard deviations under the rent method were lower by 12, 30, and 48 percent than under the rent-purchase method of land acquisition when the beginning land equity levels were 35, 55, and 87 percent, respectively.

The consumption averages over the 25 years were also higher under the rent method than under the rent-purchase method of land acquisition.

When the beginning land equity level was 55 percent, for example, consumption over the 25 years was 120 percent greater on the average under the rent method of land acquisition than under the rent-purchase method.

Potential Use and Limitations of the Simulation Model

The simulation experiments have indicated that relatively small firms with rather low levels of beginning equity in land can grow. The experiments have also indicated that under certain conditions a farm operator's best alternative might be to find employment elsewhere. However, the individual firm situation must be considered when applying the results of the simulation experiments conducted for this study. Unless an individual firm situation approximates one of the firm situations formulated for this study, growth of the individual firm situation needs to be simulated.

Simulating the growth of an individual firm situation would be relatively inexpensive. On the basis of $100 per hour of computer processing time, the cost of each simulation experiment conducted for this study was about $80. Each experiment required about five computer runs. The one run in which the model determined when and how much land could be acquired under average prices and yields cost about $20. The four other runs which involved determining when and how much land could be acquired under variable prices and yields cost about $12 each for a total of $60.

Those who use the simulation model might consider several model refinements. The arrangement of data on cards could perhaps be simplified. As more data on cow-calf production variability becomes available, this aspect of the model might be revised. Also, the renting of some machinery, as opposed to the purchase of all machinery, needs further investigation.

The simulation model can be used as a farm management and credit evaluation device. The information generated by the model should aid the farm manager in choosing the land acquisition method, production plan, financial arrangement, equity level, and consumption level which will provide the desired rate of firm growth. The information should aid the credit agency in evaluating a firm's repayment capacity, hence, in constructing financial arrangements conducive to firm growth. The model could also serve as a foundation for the development of a more comprehensive model. Its capabilities could be broadened in several ways. A procedure could be devised which would consider alternative methods of depreciation. The aggregate aspect of firm expansion could be represented. The model's capabilities could also be extended to include the disposition stage of the firm's life cycle.

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APPENDIX A

SIMULATION PROGRAM, SAMPLE OUTPUT, AND ARRANGEMENT OF DATA IN TABLE FORM AND ON CARDS

TABLE XVI

SIMULATION PROGRAM

```
      REAL*8  SFNC2,DPS
      COMMON  SFNC2(25,29)
      COMMON  L2(35),PC(61,7),E(49,13),W(5,13),JFP(25,31),NR,TWEL(25),R,
     1MO(27,8),CI(6,2),SCL(10,15),MCOMB(1200),CPGP(15,2),LP(5),PL(25,5),
     2CV(17,2),PPA(59,6),V(230),TX1EXP,TX2EXP,SCOWS,NPP,RET(13),EXP(13),
     3WORK(13),P1,P2,P3,P4,P5,P6,TL1(26),TL2(26),TL1LPP(59),TL1NPP(59),
     4TL2LPP(59),TL2NPP(59),CROP1(8),CROP2(8),YEAR,NYEAR,SND(26,14),IX,
     5N,OWN(26),RENT2(26),BEGLND,BEGCAP,BEGLD,BEGMD,PERMIT,UNOFAC,AC25,
     6ACANY,BONLY,RONLY,BANDR,PCTBL,CLOOPS,RENT,LACYR,PASS,DONE,VALLND,
     7ACDYR,ACD25,PAY(150),TIN(150),PAYL(150),TINL(150),PRINL(150),
     8DPL(150),PAYM(80),PAYC(80),TINM(80),TINC(80),PRINM(80),PRINC(80),
     9OPM(80),OPC(80),BEGDM,XINTM,AMM,AMNOM,CODEM,XINTC,AMC,AMNOC,CODEC,
     /BEGDL,XINTL,AML,AMNOL,CODEL,DM,DC,DL,SC,PROF,DEPEN,DEPTOT,WK(12),
     1CHGLAB(12),CREDIT,FITAX(25),SITAX(25),SST(25),OUTINC,SSTWP(25),
     2TOTTAX,HLDSST,HLDFIT,HLDSIT,TIME,RINT,COPY,BUYMO,MCHSAV(25,10,5),
     3AGESAV(25,10,5),SAVHRS(25,12),SAVEXP(25,12),TMCOST(25),TVMI(25),
     4TMDEP(25),TMCRED(25),THRS(10,5),THREE(25,12),FOUR(25,12),FNC(29),
     5ELEVEN(25,12),SFNC(25,29),FNCL(25,29),FNCH(25,29),NVPAY,ISIY,
     6XVNM(25),XVUM(25),CROP(25,8),SVTHAC(25,10,5)
      DIMENSION  FS(25),DSCHED(35),CDN(13),SHORT(13),SVPROD(25,69),
     1NAY(25),NOSOL(50),NOROW(50),COEF(50),NSVEC(25),XSVEC(25)
C     ****************************************************************
C     READ AND WRITE DATA
C     ****************************************************************
      CALL INPUT
  220 FORMAT(1H1)
  221 FORMAT(1H1,T48,'OBTAINING MORE THAN ONE SIMULATION'/T49,'SOLUTION
     1PER COMPUTING OPERATION'//T25,'NEW COEFFIENTS FOR THE PROGRAMMING
     2VARIABLES IN TABLE 12 CAN BE SPECIFIED FOR'/T25,'SUBSEQUENT SIMULA
     3TION SOLUTIONS IN ONE CONTINUDUS COMPUTING OPERATION BY ADDING'/
     4T25,'ADDITIONAL INPUT CARDS.  THESE CARDS MUST SPECIFY (1) THE SOL
     5UTION NUMBER FOR'/T25,'WHICH THE NEW COEFFICIENTS ARE TO APPLY, (2
     6) THE ROW NUMBER OF THE NEW'/T25,'COEFFICIENT, AND (3) THE NEW COE
     7FFICIENT.  COEFFICIENT CHANGES ARE CUMULATIVE.'/T25,'FOR EXAMPLE,
     8NEW COEFFICIENTS SPECIFIED FOR SOLOTION TWD APPLY ALSO TO SOLUTION
     9'/T25,'THREE.  IF THE ORIGINAL COEFFICIENT IS WANTED FOR SOLUTION
     /THREE, TT MUST BE'/T25,'SPECIFIED AS A NEW COEFFICIENT FOR SOLUTIO
     1N THREE.  ONE INPUT CARD IS REQUIRED'/T25,'FOR EACH NEW COEFFICIEN
     2T.  ITS FORMAT IS AS FOLLOWS')
  222 FORMAT(1H0,T35,'COLUMN(S)',20X,'CONTENT'/T35,'----------',5X,'-----
     1-----------------------------'/T39,'1',9X,'SOLUTION NUMBER (>
     21)'/T38,'3-5',8X,'ROW NUMBER'/T38,'7-15',7X,'NEW COEFFICIENT (DECI
     3MAL IN COLUMN 12)'//T25,'THE LAST CARD OF THE DATA DECK MUST CONTA
     4IN THE NUMBER 9 IN THE FIRST COLUMN.'////T39,'THE FOLLOWING IS A L
     5ISTING OF ADDITIONAL INPUT CARDS'/)
  223 FORMAT(I1,I4,F10.3)
  224 FORMAT(1H ,T56,I1,I4,F10.3)
      WRITE(6,221)
      WRITE(6,222)
      NCARDS=0
      DO 225 J=1,50
      NOSOL(J)=0
      NOROW(J)=0
  225 COEF(J)=0.0
      DO 226 J=1,50
      READ(5,223)NOSOL(J),NOROW(J),COEF(J)
      NCARDS=NCARDS+1
      IF(NOSOL(J).EQ.9) GO TO 227
  226 WRITE(6,224)NOSOL(J),NOROW(J),COEF(J)
  227 WRITE(6,220)
      DO 9999 JNGE=1,5
      NCTZ=0
      IF(JNGE.EQ.1) GO TO 2222
      DO 229 J=1,NCARDS
      IF(NOSOL(J).NE.JNGE) GO TO 228
      NOROWX=NOROW(J)
      V(NOROWX)=COEF(J)
      GO TO 229
  228 NCTZ=NCTZ+1
  229 CONTINUE
      IF(NCTZ.EQ.NCARDS) GO TO 999
C     ****************************************************************
C     INITIALIZE ONLY BEFORE SIMULATION
C     ****************************************************************
 2222 BEGLND=V(2)
      NXTI=V(211)
      NXFT=V(212)
      NVPAY=V(224)
      IF(NVPAY.EQ.1) GO TO 2224
      DO 2223 J=1,17
      CV(J,1)=0.0
 2223 CV(J,2)=0.0
 2224 BEGCAP=V(3)
      BEGMD=V(5)
      BEGLD=V(4)
      PERMIT=V(140)
      NXPM=V(140)
      UNOFAC=V(141)
      AC25=V(142)
      ACANY=V(143)
      BONLY=V(145)
      RONLY=V(146)
      BANDR=V(147)
      PCTBL=V(179)
      CLOOPS=0.0
      VALLND=CI(5,2)
      R=V(204)
      NR=R
      NRUNS=25.0*R
      P1=V(134)
      P2=V(135)
      P3=V(136)
      P4=V(137)
      P5=V(138)
      P6=V(139)
      TIME=V(206)
      RINT=V(156)
      COPY=V(205)
      BUYMO=CI(3,1)
      BEGDM=V(5)
```

```
      IF(NYEAR.EQ.16) TL2X=1920.0
      IF(NYEAR.EQ.21) TL2X=2560.0
      TL1(NYEAR)=TL1X
      TL2(NYEAR)=TL2X
      DO 25 I=1,47
      TL1NPP(I)=XXXNPP(I)*TL1X
   25 TL2NPP(I)=XXXNPP(I)*TL2X
      DO 400 I=1,8
      CROP(NYEAR,I)=0.0
      CROP1(I)=0.0
  400 CROP2(I)=0.0
      DO 41 I=1,7
      CROP(NYEAR,1)=CROP(NYEAR,1)+TL2NPP(I)
      CROP1(1)=CROP1(1)+TL1NPP(I)
   41 CROP2(1)=CROP2(1)+TL2NPP(I)
      DO 42 I=8,14
      CROP(NYEAR,2)=CROP(NYEAR,2)+TL2NPP(I)
      CROP1(2)=CROP1(2)+TL1NPP(I)
   42 CROP2(2)=CROP2(2)+TL2NPP(I)
      DO 43 I=15,21
      CROP(NYEAR,3)=CROP(NYEAR,3)+TL2NPP(I)
      CROP1(3)=CROP1(3)+TL1NPP(I)
   43 CROP2(3)=CROP2(3)+TL2NPP(I)
      DO 44 I=22,28
      CROP(NYEAR,4)=CROP(NYEAR,4)+TL2NPP(I)
      CROP1(4)=CROP1(4)+TL1NPP(I)
   44 CROP2(4)=CROP2(4)+TL2NPP(I)
      DO 45 I=29,35
      CROP(NYEAR,5)=CROP(NYEAR,5)+TL2NPP(I)
      CROP1(5)=CROP1(5)+TL1NPP(I)
   45 CROP2(5)=CROP2(5)+TL2NPP(I)
      DO 46 I=36,42
      CROP(NYEAR,6)=CROP(NYEAR,6)+TL2NPP(I)
      CROP1(6)=CROP1(6)+TL1NPP(I)
   46 CROP2(6)=CROP2(6)+TL2NPP(I)
      DO 47 I=43,47
      CROP(NYEAR,7)=CROP(NYEAR,7)+TL2NPP(I)*.25
      CROP(NYEAR,8)=CROP(NYEAR,8)+TL2NPP(I)*.75
      CROP1(7)=CROP1(7)+TL1NPP(I)*.25
      CROP1(8)=CROP1(8)+TL1NPP(I)*.75
      CROP2(7)=CROP2(7)+TL2NPP(I)*.25
   47 CROP2(8)=CROP2(8)+TL2NPP(I)*.75
      TC1=0.0
      TC2=0.0
      DO 48 I=1,8
      TC1=TC1+CROP1(I)
   48 TC2=TC2+CROP2(I)
      CALL MCHNRY
   92 FORMAT(1H1,10X,'YEAR = ',I2,10X,'TL1 = ',F7.2,10X,'TL2 = ',F7.2,
     110X,'TC1 = ',F7.2, 10X,'TC2 = ',F7.2,/)
      WRITE(6,92)NYEAR,TL1X,TL2X,TC1,TC2
   93 FORMAT(1H0,28X,22HMACHINERY COMBINATIONS/28X,2H 1,4X,1H2,4X,1H3,
     14X,1H4,4X,1H5)
      WRITE(6,93)
   94 FORMAT(1H0,10X,17HPLOW             ,1X,I1,4(4X,I1))
   95 FORMAT(1H ,10X,17HDISC             ,1X,I1,4(4X,I1))
   96 FORMAT(1H ,10X,17HSPRING TOOTH     ,1X,I1,4(4X,I1))
   97 FORMAT(1H ,10X,17HROTARY HOE       ,1X,I1,4(4X,I1))
   98 FORMAT(1H ,10X,17HSPIKE TOOTH      ,1X,I1,4(4X,I1))
   99 FORMAT(1H ,10X,17HDRILL            ,1X,I1,4(4X,I1))
  100 FORMAT(1H ,10X,17HMOWER            ,1X,I1,4(4X,I1))
  101 FORMAT(1H ,10X,17HRAKE             ,1X,I1,4(4X,I1))
  102 FORMAT(1H ,10X,17HTRACTOR          ,1X,I1,4(4X,I1))
  104 FORMAT(1H1)
      WRITE(6,94) (MCHSAV(NYEAR,1,J),J=1,5)
      WRITE(6,95) (MCHSAV(NYEAR,2,J),J=1,5)
      WRITE(6,96) (MCHSAV(NYEAR,3,J),J=1,5)
      WRITE(6,97) (MCHSAV(NYEAR,4,J),J=1,5)
      WRITE(6,98) (MCHSAV(NYEAR,5,J),J=1,5)
      WRITE(6,99) (MCHSAV(NYEAR,6,J),J=1,5)
      WRITE(6,100)(MCHSAV(NYEAR,7,J),J=1,5)
      WRITE(6,101)(MCHSAV(NYEAR,8,J),J=1,5)
      WRITE(6,102)(MCHSAV(NYEAR,10,J),J=1,5)
   51 FORMAT(1H0,10X,'TOTAL NET INVESTMENT = $',F9.2)
   52 FORMAT(1H ,10X,'VALUE OF NEW MACHINERY AT END OF YEAR = $',F10.2)
   53 FORMAT(1H ,10X,'VALUE OF USED MACHINERY AT END OF YEAR = $',F9.2)
   54 FORMAT(1H ,10X,'VALUE OF ALL MACHINERY AT END OF YEAR = $',F10.2)
   55 FORMAT(1H ,10X,'DEPRECIATION = $',F9.2)
   56 FORMAT(1H ,10X,'INVESTMENT CREDIT = $',F9.2)
   57 FORMAT(1H ,10X,'ANNUAL LEAST-COST MACHINERY INVENTORY = $',F9.2)
      WRITE(6,51)TMCOST(NYEAR)
      WRITE(6,52)XVNM(NYEAR)
      WRITE(6,53)XVUM(NYEAR)
      WRITE(6,54)TVMI(NYEAR)
      WRITE(6,55)TMDEP(NYEAR)
      WRITE(6,56)TMCRED(NYEAR)
      WRITE(6,57)TMNCST
   74 FORMAT(1H ,10X,15HPLOW           ,5F5.0)
   75 FORMAT(1H ,10X,15HDISC           ,5F5.0)
   76 FORMAT(1H ,10X,15HSPRING TOOTH   ,5F5.0)
   77 FORMAT(1H ,10X,15HROTARY HOE     ,5F5.0)
   78 FORMAT(1H ,10X,15HSPIKE TOOTH    ,5F5.0)
   79 FORMAT(1H ,10X,15HDRILL          ,5F5.0)
   80 FORMAT(1H ,10X,15HMOWER          ,5F5.0)
   81 FORMAT(1H ,10X,15HRAKE           ,5F5.0)
   82 FORMAT(1H ,10X,15HFERTILIZE      ,5F5.0)
   83 FORMAT(1H ,10X,15HTRACTOR        ,5F5.0)
  105 FORMAT(1H0,/29X,3HAGE/)
      WRITE(6,105)
      WRITE(6,74) (AGESAV(NYEAR,1,J),J=1,5)
      WRITE(6,75) (AGESAV(NYEAR,2,J),J=1,5)
      WRITE(6,76) (AGESAV(NYEAR,3,J),J=1,5)
      WRITE(6,77) (AGESAV(NYEAR,4,J),J=1,5)
      WRITE(6,78) (AGESAV(NYEAR,5,J),J=1,5)
      WRITE(6,79) (AGESAV(NYEAR,6,J),J=1,5)
      WRITE(6,80) (AGESAV(NYEAR,7,J),J=1,5)
      WRITE(6,81) (AGESAV(NYEAR,8,J),J=1,5)
      WRITE(6,83) (AGESAV(NYEAR,10,J),J=1,5)
  107 FORMAT(1H0,28X,'ANNUAL HOURS',20X,'ACCUMULATED HOURS',
     111X,'TRADE HOURS'/)
```

```
      PRINL(J)=0.0
   12 OPL(J)=0.0
      DO 13 J=1,80
      PAYM(J)=0.0
      PAYC(J)=0.0
      TINM(J)=0.0
      TINC(J)=0.0
      PRINM(J)=0.0
      PRINC(J)=0.0
      OPM(J)=0.0
   13 OPC(J)=0.0
C     *****************************************************************
C     DRAW STANDARD NORMAL DEVIATES FOR 25 YEARS
C     *****************************************************************
C     BEGIN TAPE INPUT
      IF(NXTI.NE.1) GO TO 15
      IF(IREPS.EQ.1) REWIND 8
      IF(NXFT.NE.1) GO TO 14
      CALL STNMDV
      WRITE(8)SND
      GO TO 20
   14 READ(8)SND
      GO TO 20
C     END TAPE INPUT
   15 IF(IREPS.EQ.1) REWIND 3
      IF(CLOOPS.NE.1.0) GO TO 16
      CALL STNMDV
      WRITE(3)SND
      GO TO 20
   16 READ(3)SND
C     *****************************************************************
C     INITIALIZE EVERY YEAR
C     *****************************************************************
   20 OUTINC=0.0
      EL=0.0
      RRTA=0.0
      PROF=0.0
      OPCAP=0.0
      TAXACT=0.0
      DO 21 J=1,13
      RET(J)=0.0
      EXP(J)=0.0
      WORK(J)=0.0
      CON(J)=0.0
   21 SHORT(J)=0.0
C     *****************************************************************
C     COMPUTE PRIMARILY PRODUCTION RETURNS AND EXPENSES AND
C     LIVESTOCK LABOR REQUIREMENTS
C     *****************************************************************
C     BEGIN TAPE INPUT
      IF(NXTI.NE.1) GO TO 208
      IF(NXFT.NE.1) GO TO 203
      CALL PRODUC
      DO 200 J=1,12
      SVPROD(NYEAR,J)=RET(J)
      SVPROD(NYEAR,J+12)=EXP(J)
  200 SVPROD(NYEAR,J+24)=WORK(J)
      DO 201 J=1,8
      SVPROD(NYEAR,J+36)=CROP1(J)
  201 SVPROD(NYEAR,J+44)=CROP2(J)
      SVPROD(NYEAR,53)=TX1EXP
      SVPROD(NYEAR,54)=TX2EXP
      SVPROD(NYEAR,55)=SCOWS
      SVPROD(NYEAR,56)=TL1LPP(53)
      DO 202 J=57,60
  202 SVPROD(NYEAR,J)=TL2NPP(J-7)
      DO 2020 J=61,68
 2020 SVPROD(NYEAR,J)=CROP(NYEAR,J-60)
      SVPROD(NYEAR,69)=TL1(NYEAR)
      IF(NYEAR.EQ.25) WRITE(8)SVPROD
      GO TO 218
  203 IF(NYEAR.EQ.1) READ(8)SVPROD
      IF(TL2(NYEAR).LE.TL1(NYEAR)+10.0) GO TO 213
      CALL PRODUC
      GO TO 218
C     END TAPE INPUT
  208 IF(CLOOPS.EQ.1.0) GO TO 209
      IF(NYEAR.EQ.1) READ(3)SVPROD
      IF(TL2(NYEAR).LE.TL1(NYEAR)+10.0) GO TO 213
  209 CALL PRODUC
      IF(CLOOPS.NE.1.0) GO TO 218
      DO 210 J=1,12
      SVPROD(NYEAR,J)=RET(J)
      SVPROD(NYEAR,J+12)=EXP(J)
  210 SVPROD(NYEAR,J+24)=WORK(J)
      DO 211 J=1,8
      SVPROD(NYEAR,J+36)=CROP1(J)
  211 SVPROD(NYEAR,J+44)=CROP2(J)
      SVPROD(NYEAR,53)=TX1EXP
      SVPROD(NYEAR,54)=TX2EXP
      SVPROD(NYEAR,55)=SCOWS
      SVPROD(NYEAR,56)=TL1LPP(53)
      DO 212 J=57,60
  212 SVPROD(NYEAR,J)=TL2NPP(J-7)
      DO 2120 J=61,68
 2120 SVPROD(NYEAR,J)=CROP(NYEAR,J-60)
      SVPROD(NYEAR,69)=TL1(NYEAR)
      IF(NYEAR.EQ.25) WRITE(3)SVPROD
      GO TO 218
  213 XMULT=TL1(NYEAR)/SVPROD(NYEAR,69)
      DO 214 J=1,68
  214 SVPROD(NYEAR,J)=SVPROD(NYEAR,J)*XMULT
      DO 215 J=1,12
      RET(J)=SVPROD(NYEAR,J)
      EXP(J)=SVPROD(NYEAR,J+12)
  215 WORK(J)=SVPROD(NYEAR,J+24)
      DO 216 J=1,8
      CROP1(J)=SVPROD(NYEAR,J+36)
  216 CROP2(J)=SVPROD(NYEAR,J+44)
      TX1EXP=SVPROD(NYEAR,53)
```

TABLE XVI (Continued)

```
      TX2EXP=SVPROD(NYEAR,54)
      SCOWS=SVPROD(NYEAR,55)
      TL1LPP(53)=SVPROD(NYEAR,56)
      DO 217 J=57,60
  217 TL2NPP(J-7)=SVPROD(NYEAR,J)
      DO 2170 J=61,68
 2170 CROP(NYEAR,J-60)=SVPROD(NYEAR,J)
  218 XY=NYEAR-1
      DO 300 J=1,12
  300 EXP(J)=EXP(J)+E(47,J)
      MONTH=CI(6,1)
      MONTHF=MONTH-1
      OWN1=OWN(NYEAR)
      IF(NYEAR.GT.1) OWN1=TL2(NYEAR-1)-RENT2(NYEAR-1)
      OWN2=TL2(NYEAR)-RENT2(NYEAR)
      RENTFH=0.0
      IF(NYEAR.GT.1) RENTFH=RENT2(NYEAR-1)
      DO 301 J=1,MONTHF
  301 EXP(J)=EXP(J)+OWN1*E(48,J)+RENTFH*E(49,J)
      DO 302 J=MONTH,12
  302 EXP(J)=EXP(J)+OWN2*E(48,J)+RENT2(NYEAR)*E(49,J)
      IF(NYEAR.NE.1) GO TO 23
      VLRENT=RENT2(NYEAR)*(CI(5,2)+CI(6,2)*XY)
      DO 22 J=7,12
   22 EXP(J)=EXP(J)+E(45,J)*(VLRENT/1000.0)
      GO TO 24
   23 VLR1=RENT2(NYEAR-1)*(CI(5,2)+CI(6,2)*(XY-1.0))
      VLR2=RENT2(NYEAR)*(CI(5,2)+CI(6,2)*XY)
      DO 230 J=1,6
      EXP(J)=EXP(J)+E(45,J)*(VLR1/1000.0)
  230 EXP(J+6)=EXP(J+6)+E(45,J+6)*(VLR2/1000.0)
   24 DO 25 J=1,12
   25 OPCAP=OPCAP+EXP(J)
   27 TLV1=OWN1*(CI(5,2)+CI(6,2)*XY)
      TLV2=OWN2*(CI(5,2)+CI(6,2)*XY)
      DO 28 J=1,12
      RLE=(TLV1+((TLV2-TLV1)*((12.0-CI(5,1))/12.0)))*(E(44,J)/1000.0)
      EXP(J)=EXP(J)+RLE
   28 OPCAP=OPCAP+RLE
      TAXACT=TAXACT+TX2EXP-TX1EXP
      DO 29 J=1,12
   29 TAXACT=TAXACT+RET(J)-EXP(J)
      IF(V(135).EQ.0.0) GO TO 290
      IF(V(135).LT.V(137)) GO TO 30
  290 STARTC=V(137)
      GO TO 31
   30 STARTC=V(135)
   31 BEGCT=STARTC+7.0
      NNBEG=BEGCT
      IF(NYEAR.GE.NNBEG) TAXACT=TAXACT+.50*.80*SCOWS
      TAXACT=TAXACT-SCOWS
C     ******************************************************************
C     CONSUMPTION, OUTSIDE THE FARM INCOME, AND TAXES PAYABLE IN THE
C     CURRENT YEAR
C     ******************************************************************
      IF(NYEAR.GT.1) ATI=ATI+SITTAX(NYEAR-1)+SSTWP(NYEAR-1)+HLOSIT
      IF(V(126).NE.1.0) GO TO 33
      C=ATI
      IF(C.LE.0.0) C=0.0
      DO 32 J=1,12
   32 CON(J)=CON(J)+(1.0/12.0)*(V(128)+V(129)*C)
      GO TO 35
   33 XATI=ATI
      IF(ATI.LT.2500.0) ATI=2500.0
      DO 34 J=1,12
   34 CON(J)=CON(J)+(1.0/12.0)*24.32*ATI**.590*FS(NYEAR)**.163
      ATI=XATI
   35 DO 36 J=1,12
      EXP(J)=EXP(J)+CON(J)
      RET(J)=RET(J)+V(J+97)
      IF(V(J+97).GT.0.0) RET(J)=RET(J)-V(110)-V(111)-V(112)
   36 CONTINUE
      IF(NYEAR.EQ.1) GO TO 37
      EXP(2)=EXP(2)+FITAX(NYEAR-1)+SITAX(NYEAR-1)+SST(NYEAR-1)
      EXP(1)=EXP(1)+SSTWP(NYEAR-1)
      OPCAP=OPCAP+SSTWP(NYEAR-1)
   37 HLOFIT=0.0
      HLDSIT=0.0
      HLDSST=0.0
C     ******************************************************************
C     INVESTMENTS - MACHINERY, BREEDING STOCK, AND LAND
C     ******************************************************************
      JXTL2=0
      IF(LACYR.GT.1) JXTL2=TL2(LACYR-1)
      JXMAX=V(2)+V(142)
      MONTH=CI(3,1)
      IF(IREPS.GT.1) GO TO 50
      IF(NYEAR.LT.LACYR) GO TO 50
      IF(JXTL2.EQ.JXMAX) GO TO 50
      IF(NYEAR.GT.1) GO TO 49
      II=15
      DO 38 I=1,8
      DO 38 J=1,5
      II=II+2
      MCHSAV(1,I,J)=V(II)
   38 AGESAV(1,I,J)=V(II+1)
      II=5
      DO 39 J=1,5
      II=II+2
      MCHSAV(1,10,J)=V(II)
   39 AGESAV(1,10,J)=V(II+1)
   49 CALL MCHNRY
   50 DO 51 J=1,12
      WXXXXX=W(5,J)*.75
      WXX=.50
      WORK(J)=WORK(J)+SAVHRS(NYEAR,J)
      ELX=(WORK(J)-W(5,J))*E(46,J)
      IF(ELX.GE.0.0) GO TO 510
      ELX=0.0
      IF(TL2(NYEAR).GT.V(97)) GO TO 510
```

```
      IF(WORK(J)/W(5,J).GT.WXX) GO TO 510
      OUTMTH=(WXXXXX-WORK(J))*E(46,J)
      HLDMTH=OUTMTH*.044
      OUTINC=OUTINC+OUTMTH
      HLDSST=HLDSST+HLDMTH
      RET(J)=RET(J)+OUTMTH-HLDMTH
  510 EXPEN=SAVEXP(NYEAR,J)+ELX
      EXP(J)=EXP(J)+EXPEN-ELX*.044
      TAXACT=TAXACT-EXPEN
   51 OPCAP=OPCAP+EXPEN-ELX*.044
      CAFP=CA-PAY(NYEAR)
      DO 52 J=1,MONTH
   52 CAFP=CAFP+RET(J)-EXP(J)
      IF(CAFP.LE.0.0) CAFP=0.0
      CIM=TMCOST(NYEAR)
      CIMT=TVMI(NYEAR)
      DM=CIM
      IF(CAFP.LE.0.0) GO TO 55
      DMZ=DM
      DM=DM-CAFP
      IF(DM.GT.0.0) GO TO 54
      EXP(MONTH)=EXP(MONTH)+DMZ
      DM=0.0
      GO TO 56
   54 EXP(MONTH)=EXP(MONTH)+CAFP
   55 DM=DM+DM*((V(160)-CI(3,1))/12.0)*V(156)
      EXP(MONTH)=EXP(MONTH)+V(175)+V(177)
      TAXACT=TAXACT-V(175)-V(177)
      OPCAP=OPCAP+V(175)+V(177)
   56 MONTH=CI(1,1)
      CAFP=CA-PAY(NYEAR)
      DO 57 J=1,MONTH
   57 CAFP=CAFP+RET(J)-EXP(J)
      IF(CAFP.LE.0.0) CAFP=0.0
      CIC=(TL2NPP(53)-TL1LPP(53))*CI(1,2)
      CICT=CICT+CIC
      IF(CIC.GE.0.0) GO TO 61
      RET(MONTH)=RET(MONTH)-CIC
      IF(CICT.GT.0.0) GO TO 59
      SC=ABS(CIC)
      DC=0.0
      GO TO 60
   59 SC=0.0
      DC=0.0
   60 IF(NYEAR.LT.NNBEG) GO TO 70
      TAXACT=TAXACT+.50*.80*ABS(CIC)
      GO TO 70
   61 SC=0.0
      DC=CIC
      IF(CAFP.LE.0.0) GO TO 69
      DCZ=DC
      DC=DC-CAFP
      IF(DC.GT.0.0) GO TO 68
      EXP(MONTH)=EXP(MONTH)+DCZ
      DC=0.0
      GO TO 70
   68 EXP(MONTH)=EXP(MONTH)+CAFP
   69 DC=DC+DC*((V(166)-CI(1,1))/12.0)*V(162)
      EXP(MONTH)=EXP(MONTH)+V(175)+V(177)
      TAXACT=TAXACT-V(175)-V(177)
      OPCAP=OPCAP+V(175)+V(177)
   70 MONTH=CI(2,1)
      CAFP=CA-PAY(NYEAR)
      IF(SC.GT.0.0) CAFP=CAFP-OPC(NYEAR-1)
      DO 71 J=1,MONTH
   71 CAFP=CAFP+RET(J)-EXP(J)
      IF(CAFP.LE.0.0) CAFP=0.0
      TINB=OPB*V(168)
      IB1=(TL1LPP(53)/25.1)+1.0
      IB2=(TL2NPP(53)/25.1)+1.0
      IF(TL1LPP(53).LE.1.0) IB1=0
      IF(TL2NPP(53).LE.1.0) IB2=0
      BB=IB2-IB1
      CIB=BB*CI(2,2)
      CIBT=CIBT+CIB
      IF(CIB.GE.0.0) GO TO 73
      RET(MONTH)=RET(MONTH)-CIB
      SB=ABS(CIB)
      DB=0.0
      TAXACT=TAXACT+.50*(CI(2,2)-SB*.766)
      GO TO 76
   73 SB=0.0
      DB=CIB
      IF(CAFP.LE.0.0) GO TO 76
      DBZ=DB
      DB=DB-CAFP
      IF(DB.GT.0.0) GO TO 74
      EXP(MONTH)=EXP(MONTH)+DBZ
      DB=0.0
      GO TO 76
   74 EXP(MONTH)=EXP(MONTH)+CAFP
   76 OPB=OPB+DB-SB
      IF(OPB.LE.0.0) OPB=0.0
      MONTH=CI(5,1)
      CAFP=CA-PAY(NYEAR)
      IF(SC.GT.0.0) CAFP=CAFP-OPC(NYEAR-1)
      DO 77 J=1,MONTH
   77 CAFP=CAFP+RET(J)-EXP(J)
      IF(CAFP.LE.0.0) CAFP=0.0
      BL=TL2(NYEAR)-OWN1-RENT2(NYEAR)
      IF(BL.GE.5.0) GO TO 79
      OL=0.0
      CIL=0.0
      GO TO 85
   79 CIL=(CI(5,2)+CI(6,2)*XY)*BL
      OL=CIL
      IF(CAFP.LE.0.0) GO TO 84
      OLZ=OL
      OL=OL-CAFP
      IF(OL.GT.0.0) GO TO 83
```

TABLE XVI (Continued)

```
      EXP(MONTH)=EXP(MONTH)+DLZ
      DL=0.0
      GO TO 85
   83 EXP(MONTH)=EXP(MONTH)+CAFP
   84 DL=DL+DL*((V(154)-CI(5,1))/12.0)*V(150)
      EXPEN=V(172)+(DL/100.0)*V(173)+V(174)+V(176)
      EXP(MONTH)=EXP(MONTH)+EXPEN
      TAXACT=TAXACT-EXPEN
      OPCAP=OPCAP+EXPEN
   85 CILT=(TL2(NYEAR)-RENT2(NYEAR))*(CI(5,2)+CI(6,2)*XY)
C     *******************************************************************
C     FINANCIAL ARRANGEMENTS - THE FINANCE SUBPROGRAM INCLUDES
C     OUTSTANDING PRINCIPAL FROM THE PREVIOUS YEAR IN THE CURRENT
C     PRINCIPAL AND TOTAL PAYMENT ACCOUNTS WHEN A LOAN IS REFINANCED.
C     THE FOLLOWING STATEMENTS, BEFORE SUBROUTINE FINANC IS CALLED,
C     ADJUSTS THE PRINCIPAL AND TOTAL PAYMENT ACCOUNTS SO AS TO EXCLUDE
C     THE OUTSTANDING PRINCIPAL FROM THE PREVIOUS YEAR.
C     *******************************************************************
      PRNLL=PRINL(NYEAR)
      PAYLL=PAYL(NYEAR)
      PRNMM=PRINM(NYEAR)
      PAYMM=PAYM(NYEAR)
      PRNCC=PRINC(NYEAR)
      PAYCC=PAYC(NYEAR)
      PAYXX=PAY(NYEAR)
      MONTH=CI(2,1)
      EXP(MONTH)=EXP(MONTH)+TINB
      TAXACT=TAXACT-TINB
      OPCAP=OPCAP+TINB
      MONTH=V(154)
      EXP(MONTH)=EXP(MONTH)+PAYL(NYEAR)
      MONTH=V(160)
      EXP(MONTH)=EXP(MONTH)+PAYM(NYEAR)
      MONTH=V(166)
      XPAYC=PAYC(NYEAR)
      TAXACT=TAXACT-TIN(NYEAR)
      OPCAP=OPCAP+TIN(NYEAR)
      CALL FINANC
      IF(SC.GT.0.0) GO TO 855
      EXP(MONTH)=EXP(MONTH)+XPAYC
      GO TO 856
  855 EXP(MONTH)=EXP(MONTH)+PAYC(NYEAR)
  856 DO 91 J=1,12
      IF(J.NE.1) GO TO 86
      RET(J)=RET(J)+SAVNY
      EXP(J)=EXP(J)+DBTNY
      TAXACT=TAXACT+SAVNY-DBTNY
      OPCAP=OPCAP+DBTNY
   86 CA=CA+RET(J)-EXP(J)
      SHORT(J)=CA
      IF(CA.LT.0.0) GO TO 88
      SAVMO=CA*V(170)*(1.0/12.0)
      IF(J.EQ.12) GO TO 87
      RET(J+1)=RET(J+1)+SAVMO
      TAXACT=TAXACT+SAVMO
      GO TO 91
   87 SAVNY=SAVMO
      DBTNY=0.0
      GO TO 91
   88 DBTMO=ABS(CA*V(168)*(1.0/12.0))
      IF(J.EQ.12) GO TO 89
      OPCAP=OPCAP+DBTMO
      EXP(J+1)=EXP(J+1)+DBTMO
      TAXACT=TAXACT-DBTMO
      GO TO 91
   89 DBTNY=DBTMO
      SAVNY=0.0
   91 CONTINUE
C     *******************************************************************
C     TAXES - FEDERAL, STATE, AND SOCIAL SECURITY
C     *******************************************************************
      PROF=TAXACT
      DO 92 J=1,12
      WK(J)=W(5,J)
      CHGLAB(J)=E(46,J)
      OUTINC=OUTINC+V(J+97)
      IF(V(J+97).LE.0.0) GO TO 92
      HLDFIT=HLDFIT+V(110)
      HLDSIT=HLDSIT+V(111)
      HLDSST=HLDSST+V(112)
   92 CONTINUE
      DEPEN=FS(NYEAR)
      CREDIT=TMCRED(NYEAR)
      BCM=CI(1,1)
      IF(CIC.LE.0.0) GO TO 95
      LAST=NYEAR+7
      DO 94 J=NYEAR,LAST
      IF(NYEAR.EQ.J) GO TO 93
      DCOW=VLEFT*.125*(10.0/12.0)*.12+VLEFT*.125*.88
      DSCHED(J)=DSCHED(J)+DCOW
      VLEFT=VLEFT-DCOW-CIC*.12
      GO TO 94
   93 DCOW=CIC*.125*(1.0-BCM/12.0)
      DSCHED(J)=DSCHED(J)+DCOW
      VLEFT=CIC*.88-DCOW
   94 CONTINUE
   95 BBM=CI(2,1)
      IF(CIB.LE.0.0) GO TO 97
      DO 96 J=NYEAR,25,2
      DB1=CIB*.125*(1.0-BBM/12.0)
      DB2=(CIB-DB1)*.125
      DB3=(CIB-DB1-DB2)*.125*(BBM/12.0)
      DSCHED(J)=DSCHED(J)+DB1
      DSCHED(J+1)=DSCHED(J+1)+DB2
   96 DSCHED(J+2)=DSCHED(J+2)+DB3
   97 IF(CICT.GT.0.0) GO TO 99
      DSCHED(NYEAR)=DSCHED(NYEAR)*(BCM/12.0)
      NYJ=NYEAR+1
      DO 98 J=NYJ,25
   98 DSCHED(J)=0.0
```

TABLE XVI (Continued)

```
   99 DEPTOT=DSCHED(NYEAR)+TMDEP(NYEAR)
      ROVC=PROF-DEPTOT
      PROF=PROF+OUTINC-DEPTOT
      CALL TAXES
C     ******************************************************************
C     AFTER-TAX INCOME (FARM AND NONFARM) AND TOTALS.
C     ROVC = NET FARM INCOME.
C     ******************************************************************
      ATI=PROF-TOTTAX
      TCINV=CIM+CIL+CIC+CIB
      DO 101 J=1,12
      RET(13)=RET(13)+RET(J)
      EXP(13)=EXP(13)+EXP(J)
      WORK(13)=WORK(13)+WORK(J)
  101 CON(13)=CON(13)+CON(J)
C     ******************************************************************
C     NET WORTH AND NET WORTH RATIO
C     ******************************************************************
      ASSETS=CILT+CIMT+CICT+CIBT+TX2EXP
      DEBTS=OPL(NYEAR)+OPM(NYEAR)+OPC(NYEAR)+OPB
      IF(CA.GE.0.0) GO TO 102
      DEBTS=DEBTS-CA
      GO TO 103
  102 ASSETS=ASSETS+CA
  103 WN=ASSETS-DEBTS
      RNW=WN/ASSETS
C     ******************************************************************
C     SECURITY CONDITIONS FOR R.E. AND NON-R.E. INVESTMENTS
C     ******************************************************************
 1030 SECLND=CILT*V(179)
      SLDLFT=SECLND-OPL(NYEAR)
      IF(SLDLFT.LT.0.0) SLDLFT=0.0
      SECCHT=SLDLFT         +XVUM(NYEAR)*V(181)+XVNM(NYEAR)*V(180)+
     1(CICT+CIBT+TX2EXP)*V(182)
      RDLSL=OPL(NYEAR)/SECLND
      RDCSC=(DEBTS-OPL(NYEAR))/SECCHT
C     ******************************************************************
C     STORAGE, SOLVENCY CRITERIA, AND OUTPUT
C     ******************************************************************
      IF(IREPS.NE.NR) GO TO 104
      DO 1031 I=1,6
 1031 JFP(NYEAR,I)=CROP2(I)
      JFP(NYEAR,7)=CROP2(7)+CROP2(8)
      DO 1032 I=8,11
 1032 JFP(NYEAR,I)=TL2NPP(I+42)
      DO 1033 I=12,24
 1033 JFP(NYEAR,I)=WORK(I-11)
      JFP(NYEAR,25)=CIL
      JFP(NYEAR,26)=CILT
      JFP(NYEAR,27)=CIM
      JFP(NYEAR,28)=CIMT
      JFP(NYEAR,29)=CIC+CIB
      JFP(NYEAR,30)=CICT+CIBT
      JFP(NYEAR,31)=TCINV
  104 DO 1035 J=1,12
      THREE(NYEAR,J)=THREE(NYEAR,J)+RET(J)
 1035 FOUR(NYEAR,J)=FOUR(NYEAR,J)+EXP(J)
      DO 1037 J=1,12
 1037 ELEVEN(NYEAR,J)=ELEVEN(NYEAR,J)+SHORT(J)
      TWEL(NYEAR)=TWEL(NYEAR)+ROVC+OUTINC
      FNC(1)=PAYLL
      FNC(2)=TINL(NYEAR)
      FNC(3)=PRNLL
      FNC(4)=OPL(NYEAR)
      FNC(5)=PAYMM
      FNC(6)=TINM(NYEAR)
      FNC(7)=PRNMM
      FNC(8)=OPM(NYEAR)
      FNC(9)=PAYCC
      FNC(10)=TINC(NYEAR)
      FNC(11)=PRNCC
      FNC(12)=OPC(NYEAR)
      FNC(13)=PAYXX
      FNC(14)=TIN(YEAR)
      FNC(15)=PRNLL+PRNMM+PRNCC
      FNC(16)=OPL(NYEAR)+OPM(NYEAR)+OPC(NYEAR)
      FNC(17)=RET(13)
      FNC(18)=EXP(13)
      FNC(19)=RDLSL
      FNC(20)=RDCSC
      FNC(21)=OPCAP
      FNC(22)=ROVC
      FNC(23)=ATI
      FNC(24)=CON(13)
      FNC(25)=ASSETS
      FNC(26)=DEBTS
      FNC(27)=WN
      FNC(28)=RNW
      FNC(29)=SHORT(12)
      IF(IREPS.GT.1.OR.NYEAR.GT.1) GO TO 1152
      DO 1151 J=1,25
 1151 XSVEC(J)=0.0
 1152 IF(NYEAR.NE.1) GO TO 1154
      DO 1153 J=1,25
 1153 NSVEC(J)=0
 1154 IF(RDLSL.GT.1.0.OR.RDCSC.GT.1.0) GO TO 1155
      NSVEC(NYEAR)=1
 1155 IF (NYEAR.NE.25) GO TO 1157
      DO 1156 J=1,25
      IF(NSVEC(J).NE.1) GO TO 1157
      XSVEC(J)=XSVEC(J)+1.0
 1156 CONTINUE
 1157 DO 1137 J=1,29
      SFNC(NYEAR,J)=SFNC(NYEAR,J)+FNC(J)
 1137 SFNC2(NYEAR,J)=SFNC2(NYEAR,J)+FNC(J)*FNC(J)
      IF(IREPS.NE.1) GO TO 1139
      DO 1138 J=1,29
      FNCL(NYEAR,J)=FNC(J)
 1138 FNCH(NYEAR,J)=FNC(J)
      GO TO 900
```

TABLE XVI (Continued)

```
 1139 DO 1140 J=1,29
      IF(FNC(J).LT.FNCL(NYEAR,J)) FNCL(NYEAR,J)=FNC(J)
      IF(FNC(J).GT.FNCH(NYEAR,J)) FNCH(NYEAR,J)=FNC(J)
 1140 CONTINUE
  900 CONTINUE
      IF(NVPAY.EQ.1) GO TO 1162
      DO 1161 J=1,25
      IF(XSVEC(J).GT..5) GO TO 1161
      GO TO 1163
 1161 CONTINUE
      GO TO 1165
 1162 ASLV=R/(R+2.69)
      BSLV=2.69/(2.0*R)
      CSLV=2.69/(4.0*R**2.0)
      PEST=XSVEC(25)/R
      ESLV=(PEST*(1.0-PEST))/R
      XPLOW=ASLV*(PEST+BSLV-1.64*(ESLV+CSLV)**.50)
      DO 1164 J=1,25
      PEST=XSVEC(J)/R
      ESLV=(PEST*(1.0-PEST))/R
      PLOW=ASLV*(PEST+BSLV-1.64*(ESLV+CSLV)**.50)
      IF(PLOW.GE.V(188)) GO TO 1164
 1163 ISIY=J
      PASS=2.0
      GO TO 100
 1164 CONTINUE
 1165 PASS=1.0
      IF(NXPM.EQ.2) GO TO 100
      CALL WANDR(I)
      GO TO 100
 1171 FORMAT(1H0,T5,'PROBABILITY OF THE FIRM SURVIVING OVER 25 YEARS IS
     1AT LEAST',F6.3,/)
 1000 IF(PASS.EQ.2.0.AND.V(224).EQ.1.0) WRITE(6,1171)XPLOW
      CALL OUTPUT
 9999 CONTINUE
  999 STOP
      END
      SUBROUTINE INPUT
C     ******************************************************************
C     ******************************************************************
      REAL*8  SFNC2,DPS
      COMMON  SFNC2(25,29)
      COMMON  L2(35),PC(61,7),E(49,13),W(5,13),JFP(25,31),NR,TWEL(25),R,
     1MO(27,8),CI(6,2),SCL(10,15),MCOMB(1200),CPGP(15,2),LP(5),PL(25,5),
     2CV(17,2),PPA(59,6),V(230),TX1EXP,TX2EXP,SCOWS,NPP,RET(13),EXP(13),
     3WORK(13),P1,P2,P3,P4,P5,P6,TL1(26),TL2(26),TL1LPP(59),TLINPP(59),
     4TL2LPP(59),TL2NPP(59),CROP1(8),CROP2(8),YEAR,NYEAR,SND(26,14),IX,
     5N,OWN(26),RENT2(26),BEGLND,BEGCAP,BEGLD,BEGMO,PERMIT,UNOFAC,AC25,
     6ACANY,BONLY,RONLY,BANDR,PCTBL,CLOOPS,RENT,LACYR,PASS,DONE,VALLND,
     7ACDYR,ACD25,PAY(150),TIN(150),PAYL(150),TINL(150),PRINL(150),
     8OPL(150),PAYM(80),PAYC(80),TINM(80),TINC(80),PRINM(80),PRINC(80),
     9OPM(80),OPC(80),BEGDM,XINTM,AMM,AMNOM,CODEM,XINTC,AMC,AMNOC,CODEC,
     /BEGDL,XINTL,AML,AMNOL,CODEL,DM,DC,OL,SC,PROF,DEPEN,DEPTOT,WK(12),
     1CHGLAB(12),CREDIT,FITAX(25),SITAX(25),SST(25),OUTINC,SSTWP(25),
     2TOTTAX,HLDSST,HLDFIT,HLDSIT,TIME,RINT,COPY,BUYMO,MCHSAV(25,10,5),
     3AGESAV(25,10,5),SAVHRS(25,12),SAVEXP(25,12),TMCOST(25),TVMI(25),
     4TMDEP(25),TMCRED(25),THRS(10,5),THREE(25,12),FOUR(25,12),FNC(29),
     5ELEVEN(25,12),SFNC(25,29),FNCL(25,29),FNCH(25,29),NVPAY,ISIY,
     6XVNM(25),XVUM(25),CROP(25,8),SVTHAC(25,10,5)
      DIMENSION  L3(6,31),L4(10,4)
C     ******************************************************************
C     TABLE 1.  PRODUCTION COEFFICIENTS (CODE = PC)
C     ******************************************************************
  111 FORMAT(1H1)
  112 FORMAT(1H0)
      WRITE(6,111)
      DO 113 J=1,32
  113 WRITE(6,112)
    1 FORMAT(20A4)
      READ(5,1) (L2(I),I=1,20)
    2 FORMAT(1H ,41X,12A4)
      WRITE(6,2) (L2(I),I=1,12)
    4 FORMAT(7A4,A2,7(A4,A2))
      READ(5,4) (L2(I),I=1,22)
    5 FORMAT(1H ,15X,7A4,A2,7(A4,A2,5X))
      WRITE(6,5) (L2(I),I=1,22)
      READ(5,4) (L2(I),I=1,22)
    6 FORMAT(1H ,15X,7A4,A2,7(A4,A2,5X))
      WRITE(6,6) (L2(I),I=1,22)
    7 FORMAT(7A4,A2,F6.3,2(A4,A2),4F6.3)
    8 FORMAT(1H ,15X,7A4,A2,F6.3,5X,2(A4,A2,5X),4(F6.3,5X))
      DO 9 J =1,7
      READ(5,7)(L2(I),I=1,8),PC(J,1),(L2(I),I=9,12),(PC(J,I),I=4,7)
    9 WRITE(6,8)(L2(I),I=1,8),PC(J,1),(L2(I),I=9,12),(PC(J,I),I=4,7)
   10 FORMAT(7A4,A2,7F6.3)
   11 FORMAT(1H ,15X,7A4,A2,7(F6.3,5X))
      DO 12 I=8,61
      READ(5,10) (L2(J),J=1,8),(PC(I,J),J=1,7)
   12 WRITE(6,11) (L2(J),J=1,8),(PC(I,J),J=1,7)
  122 FORMAT(1H ,15X,20A4)
      READ(5,1) (L2(I),I=1,20)
      WRITE(6,122)(L2(I),I=1,20)
C     ******************************************************************
C     TABLE 2.  EXPENSES (CODE = E)
C     ******************************************************************
      READ(5,1)(L2(I),I=1,20)
   13 FORMAT(1H1///50X,10A4/)
      WRITE(6,13) (L2(I),I=1,10)
   14 FORMAT(20A4/24X,12A4)
      READ(5,14)(L2(I),I=1,32)
   15 FORMAT(1H0,32A4/)
      WRITE(6,15)(L2(I),I=1,32)
   16 FORMAT(6A4,7F8.3/24X,6F8.3)
   17 FORMAT(1H ,6A4,12F8.3,F9.3)
      DO 18I=1,49
      READ(5,16) (L2(J),J=1,6),(E(I,J),J=1,13)
   18 WRITE(6,17)(L2(J),J=1,6),(E(I,J),J=1,13)
C     ******************************************************************
C     TABLE 3.  LABOR (CODE = W)
C     ******************************************************************
```

```
      READ(5,1) (L2(I),I=1,20)
   19 FORMAT(1H1,30X,20A4/)
      WRITE(6,19)(L2(I),I=1,20)
      READ(5,14) (L2(I),I=1,32)
      WRITE(6,15)(L2(I),I=1,32)
  200 FORMAT(1H ,6A4,12F8.3,F9.3)
      DO 21 I=1,5
      READ(5,16) (L2(J),J=1,6),(W(I,J),J=1,13)
   21 WRITE(6,200)(L2(J),J=1,6),(W(I,J),J=1,13)
  210 FORMAT(1H0,20A4)
      READ(5,1)(L2(I),I=1,20)
      WRITE(6,210)(L2(I),I=1,20)
C     ******************************************************************
C     TABLE 4.  MONTHLY OPERATIONS  (CODE = MO)
C     ******************************************************************
      READ(5,1) (L2(I),I=1,20)
   22 FORMAT(1H0////42X,20A4//)
      WRITE(6,22)(L2(I),I=1,20)
      READ(5,1) (L2(I),I=1,20)
   23 FORMAT(1H ,25X,20A4)
      WRITE(6,23)(L2(I),I=1,20)
      READ(5,1) (L2(I),I=1,20)
      WRITE(6,23) (L2(I),I=1,20)
      READ(5,1)   (L2(I),I=1,20)
   24 FORMAT(1H ,25X,20A4/)
      WRITE(6,24) (L2(I),I=1,20)
   25 FORMAT(4A4,8(I5,3X))
   26 FORMAT(1H ,25X,4A4,8(I5,3X))
      DO 27 I=1,27
      READ(5,25)  (L2(J),J=1,4),(MO(I,J),J=1,8)
   27 WRITE(6,26) (L2(J),J=1,4),(MO(I,J),J=1,8)
C     ******************************************************************
C     TABLE 5.  CAPITAL INVESTMENT (CODE = CI)
C     ******************************************************************
  191 FORMAT(1H1,45X,20A4/)
      READ(5,1)(L2(I),I=1,20)
      WRITE(6,191)(L2(I),I=1,12)
      READ(5,1)    (L2(I),I=1,20)
   28 FORMAT(1H0,32X,20A4)
      WRITE(6,28) (L2(I),I=1,20)
      READ(5,1)    (L2(I),I=1,20)
   29 FORMAT(1H ,32X,20A4/)
      WRITE(6,29)(L2(I),I=1,20)
   30 FORMAT(12A4,A2,F6.3,F10.3)
   31 FORMAT(1H ,32X,12A4,A2,I3,3X,F10.3)
      DO 32 I=1,6
      READ(5,30)(L2(J),J=1,13),(CI(I,J),J=1,2)
      MONTH=CI(I,1)
   32 WRITE(6,31)(L2(J),J=1,13),MONTH,CI(I,2)
C     ******************************************************************
C     TABLE 6.  MACHINERY - SIZE, COST, AND LABOR REQUIREMENTS(CODE=SCL)
C     ******************************************************************
      READ(5,1) (L2(I),I=1,20)
   33 FORMAT(1H0/// 35X,20A4//)
      WRITE(6,33) (L2(I),I=1,20)
      READ(5,1) ((L3(I,J),J=1,20),I=1,6)
   34 FORMAT(3A4,A2,F6.0,F10.2,F5.3,2(F7.0,F10.2,F5.3))
      DO 35 I=1,10
   35 READ(5,34)(L4(I,J),J=1,4),(SCL(I,J),J=1,9)
   36 FORMAT(14X,11A4)
      READ(5,36) ((L3(I,J),J=21,31),I=1,6)
   37 FORMAT(1H ,4X,31A4)
      WRITE(6,37) ((L3(I,J),J=1,31),I=1,6)
   38 FORMAT(14X,F6.0,F10.2,F5.3,F7.0,F10.2,F5.3)
   39 FORMAT(1H ,4X,3A4,A2,I6,I9,F7.3,4(I6,I9,F7.3))
   40 FORMAT(1H )
      WRITE(6,40)
      DO 41 I=1,10
      READ(5,38)(SCL(I,J),J=10,15)
      JF1=SCL(I,1)
      JF2=SCL(I,4)
      JF3=SCL(I,7)
      JF4=SCL(I,10)
      JF5=SCL(I,13)
      JF6=SCL(I,2)
      JF7=SCL(I,5)
      JF8=SCL(I,8)
      JF9=SCL(I,11)
      JF10=SCL(I,14)
   41 WRITE(6,39)(L4(I,J),J=1,4),JF1,JF6,SCL(I,3),JF2,JF7,SCL(I,6),JF3,
     1JF8,SCL(I,9),JF4,JF9,SCL(I,12),JF5,JF10,SCL(I,15)
      WRITE(6,40)
   42 FORMAT(1H ,4X,20A4)
      DO 422 I=1,4
      READ(5,1)  (L2(J),J=1,20)
  422 WRITE(6,42)(L2(J),J=1,20)
C     ******************************************************************
C     TABLE 7.  TRACTOR COMBINATIONS (CODE = MCOMB)
C     ******************************************************************
      READ(5,1)(L2(I),I=1,20)
   43 FORMAT(1H0/// 41X,20A4/)
      WRITE(6,43)(L2(I),I=1,20)
   44 FORMAT(80I1)
      READ(5,44)  (MCOMB(I),I=1,1200)
   45 FORMAT(1H ,3X,16(5I1,3X))
      DO 46 J=1,1121,80
      K=J+75
   46 WRITE(6,45)(MCOMB(I),MCOMB(I+1),MCOMB(I+2),MCOMB(I+3),MCOMB(I+4),
     1I=J,K,5)
C     ******************************************************************
C     TABLE 8.  CROP PRICES AND GOV. PAYMENTS (CODE = CPGP)
C     ******************************************************************
      READ(5,1)  (L2(I),I=1,20)
   47 FORMAT(1H1,35X,20A4//)
      WRITE(6,47) (L2(I),I=1,20)
      READ(5,1)   (L2(I),I=1,20)
   48 FORMAT(1H ,32X,20A4)
      WRITE(6,48) (L2(I),I=1,20)
      READ(5,1)  (L2(I),I=1,20)
      WRITE(6,48)(L2(I),I=1,20)
```

```
      WRITE(6,40)
   49 FORMAT(12A4,A2,F3.0,3X,F10.3)
   50 FORMAT(1H ,32X,12A4,A2,I3,3X,F10.3)
      DO 51 I=1,15
      READ(5,49)(L2(J),J=1,13),(CPGP(I,J),J=1,2)
      JF=CPGP(I,1)
   51 WRITE(6,50)(L2(J),J=1,13),JF,CPGP(I,2)
C     ********************************************************************
C     TABLE 9.  LIVESTOCK PRICES (CODE = LP AND PL)
C     ********************************************************************
      READ(5,1) (L2(I),I=1,20)
   52 FORMAT(1H0////43X,20A4//)
      WRITE(6,52)(L2(I),I=1,20)
   53 FORMAT(1H ,25X,20A4)
      DO 54 I=1,4
      READ(5,1)  (L2(J),J=1,20)
   54 WRITE(6,53)(L2(J),J=1,20)
   55 FORMAT(4A4,I2,4(13X,I2))
      READ(5,55)  (L2(I),I=1,4),(LP(I),I=1,5)
   56 FORMAT(1H0,25X,4A4,I2,4(13X,I2))
      WRITE(6,56) (L2(I),I=1,4),(LP(I),I=1,5)
   57 FORMAT(1H0,25X,20A4)
      READ(5,1)  (L2(I),I=1,20)
      WRITE(6,57)(L2(I),I=1,20)
   58 FORMAT(A4,A1,5(10X,F5.2))
   59 FORMAT(1H ,25X,A4,A1,5(10X,F5.2))
      DO 60 I=1,25
      READ(5,58)  (L2(J),J=1,2),(PL(I,J),J=1,5)
   60 WRITE(6,59) (L2(J),J=1,2),(PL(I,J),J=1,5)
C     ********************************************************************
C     TABLE 10.  COEFFICIENTS OF VARIATION (CODE = CV)
C     ********************************************************************
      READ(5,1)  (L2(I),I=1,20)
   61 FORMAT(1H1,42X,20A4//)
      WRITE(6,61) (L2(I),I=1,20)
   62 FORMAT(1H ,32X,20A4/)
      READ(5,1) (L2(I),I=1,20)
      WRITE(6,62)(L2(I),I=1,20)
   63 FORMAT(11A4,F9.4,8X,F7.4)
   64 FORMAT(1H ,32X,11A4,F9.4,8X,F7.4)
      DO 65 I=1,17
      READ(5,63) (L2(J),J=1,11),(CV(I,J),J=1,2)
   65 WRITE(6,64)(L2(J),J=1,11),(CV(I,J),J=1,2)
C     ********************************************************************
C     TABLE 11.  PROF. MAX. PROD. PLAN ALT. (CODE = PPA)
C     ********************************************************************
  655 FORMAT(1H0)
      DO 666 J=1,21
  666 WRITE(6,655)
   67 FORMAT(18A4/3A4,A1)
      READ(5,67) (L2(I),I=1,22)
   68 FORMAT(1H0,24X,21A4,A1)
      WRITE(6,68)(L2(I),I=1,22)
   69 FORMAT (7A4,A2,8A4)
   70 FORMAT(1H ,19X,7A4,A2,2X,4(2A4,10X))
      DO 71 I=1,5
      READ(5,69) (L2(J),J=1,16)
   71 WRITE(6,70)(L2(J),J=1,16)
   72 FORMAT(7A4,A2,6F8.6)
   73 FORMAT(1H ,19X,7A4,A2,2X,4(F8.6,10X))
      DO 74 I=1,59
      READ(5,72) (L2(J),J=1,8),(PPA(I,J),J=1,6)
   74 WRITE(6,73)(L2(J),J=1,8),(PPA(I,J),J=1,4)
C     ********************************************************************
C     TABLE 12.  VARIABLES (CODE = V)
C     ********************************************************************
      READ(5,1) (L2(I),I=1,20)
   75 FORMAT(1H1,43X,20A4//)
      WRITE(6,75) (L2(I),I=1,20)
  755 FORMAT(17A4,A1,2A4,A3)
   76 FORMAT(1H ,23X,17A4,A1,5X,2A4,A3/)
      READ(5,755)(L2(I),I=1,21)
      WRITE(6,76)(L2(I),I=1,21)
   77 FORMAT(17A4,A2,F10.3)
   78 FORMAT(1H ,23X,17A4,A2,5X,F10.3)
      DO 79 I=1,96
      IF(I.EQ.57) WRITE(6,87)
      READ (5,77)(L2(J),J=1,18),V(I)
   79 WRITE(6,78)(L2(J),J=1,18),V(I)
      WRITE(6,40)
      DO 80 I=97,226
      IF(I.EQ.113.OR.I.EQ.171) WRITE(6,87)
      IF(I.EQ.126.OR.I.EQ.133.OR.I.EQ.140.OR.I.EQ.148.OR.I.EQ.178.OR.
     1I.EQ.186.OR.I.EQ.203) WRITE(6,40)
      READ(5,77) (L2(J),J=1,18),V(I)
   80 WRITE(6,78) (L2(J),J=1,18),V(I)
   87 FORMAT(1H1)
      RETURN
      END
      SUBROUTINE LAND
C     ********************************************************************
C     ********************************************************************
      REAL*8  SFNC2,DPS
      COMMON  SFNC2(25,29)
      COMMON  L2(35),PC(61,7),E(49,13),W(5,13),JFP(25,31),NR,TWEL(25),R,
     1MO(27,8),CI(6,2),SCL(10,15),MCOMB(1200),CPGP(15,2),LP(5),PL(25,5),
     2CV(17,2),PPA(59,6),V(230),TX1EXP,TX2EXP,SCOWS,NPP,RET(13),EXP(13),
     3WORK(13),P1,P2,P3,P4,P5,P6,TL1(26),TL2(26),TL1LPP(59),TL1NPP(59),
     4TL2LPP(59),TL2NPP(59),CROP1(8),CROP2(8),YEAR,NYEAR,SND(26,14),IX,
     5N,OWN(26),RENT2(26),BEGLNO,BEGCAP,BEGLO,BEGMO,PERMIT,UNOFAC,AC25,
     6ACANY,BONLY,RONLY,BANOR,PCTBL,CLOOPS,RENT,LACYR,PASS,DONE,VALLND,
     7ACDYR,ACD25,PAY(150),TIN(150),PAYL(150),TINL(150),PRINL(150),
     8OPL(150),PAYM(80),PAYC(80),TINM(80),TINC(80),PRINM(80),PRINC(80),
     9OPM(80),OPC(80),BEGDM,XINTM,AMM,AMNOM,CODEM,XINTC,AMC,AMNOC,CODEC,
     /BEGDL,XINTL,AML,AMNOL,CODEL,DM,DC,DL,SC,PROF,DEPEN,DEPTOT,WK(12),
     1CHGLAB(12),CREDIT,FITAX(25),SITAX(25),SST(25),OUTINC,SSTWP(25),
     2TOTTAX,HLDSST,HLDFIT,HLDSIT,TIME,RINT,COPY,BUYMO,MCHSAV(25,10,5),
     3AGESAV(25,10,5),SAVHRS(25,12),SAVEXP(25,12),IMCOST(25),TVMI(25),
     4TMDEP(25),TMCRED(25),THRS(10,5),THREE(25,12),FOUR(25,12),FNC(29),
     5ELEVEN(25,12),SFNC(25,29),FNCL(25,29),FNCH(25,29),NVPAY,ISIY,
```

```
     6XVNM(25),XVUM(25),CROP(25,8),SVTHAC(25,10,5)
      LX=V(209)
      CODDON=0.0
      CLOOPS=CLOOPS+1.0
      IF(CLOOPS.NE.1.0) GO TO 65
      LACYR=1
      PASS=1.0
      RENT=0.0
      CTYRS=0.0
      CTINK=1.0
      ACDYR=0.0
      ACD25=0.0
      CODEF=0.0
      CTNO=0.0
      THATAL=0.0
      CTPASS=1.0
   65 IF(PASS.EQ.2.0) CTPASS=CTPASS+1.0
      IF(BONLY.EQ.1.0.AND.CLOOPS.EQ.3.0.AND.CTPASS.EQ.3.0.OR.CLOOPS.EQ.
     16.0.AND.CTPASS.EQ.6.0.OR.PERMIT.EQ.2.0.AND.CTPASS.EQ.2.0) GO TO 72
      IF(PASS.EQ.1.0.AND.CTYRS.EQ.2.0) GO TO 7
      IF(PERMIT.EQ.1.0) GO TO 8
      IF(CLOOPS.GT.1.0) LACYR=LACYR+25
      IF(LACYR.GT.LX) GO TO 7
      DONE=2.0
      RETURN
    7 DONE=1.0
      RETURN
   71 FORMAT(1H0,T5,'***********************************'/T5,'*INFEASIBLE
     1SOLUTION (YEAR = ',I2,')*'/T5,'***********************************')
   72 WRITE(6,71)IS1Y
      DONE=1.0
      RETURN
    8 IF(CTINK.EQ.1.0) GO TO 9
   88 ACDYR=0.0
      LACYR=LACYR+V(208)
      CTINK=1.0
      CTNO=0.0
    9 IF(LACYR.LE.LX) GO TO 11
      DONE=1.0
      RETURN
C     *********************************************************************
C     OPTION 3.  RENT AND BUY
C     *********************************************************************
   11 IF(BANDR.NE.1.0) GO TO 15
      IF(THATAL.NE.2.0) GO TO 17
      IF(CTNO.GT.0.0.AND.PASS.EQ.2.0) GO TO 17
      CTNO=0.0
      IF(PASS.NE.1.0) GO TO 13
      RENT=RENT-UNOFAC
      IF(RENT.GT.0.0) GO TO 26
      RENT=0.0
      CTYRS=2.0
      DO 12 I=LACYR,25
   12 OWN(I+1)=TL2(LACYR)
      GO TO 26
```

```
   13 RENT=RENT+UNOFAC
      DO 14 I=LACYR,25
      OWN(I+1)=TL2(LACYR)-RENT
   14 RENT2(I)=RENT
      CALL WANDR(2)
      PASS=1.0
      GO TO 88
C     *********************************************************************
C     OPTION 1.  BUY ONLY
C     *********************************************************************
   15 IF(BONLY.NE.1.0) GO TO 17
  151 IF(PASS.NE.1.0) GO TO 16
      ACLAND=UNOFAC
      GO TO 20
   16 ACLAND=(-UNOFAC)
      DO 161 J=LACYR,25
  161 OWN(J+1)=TL2(LACYR)-UNOFAC
      CTINK=2.0
      GO TO 20
C     *********************************************************************
C     OPTION 2.  RENT ONLY
C     *********************************************************************
   17 IF(PASS.NE.1.0) GO TO 18
      IF(CTNO.GT.0.0) GO TO 88
      ACLAND=UNOFAC*4.0
      RENT=RENT+UNOFAC*4.0
      CTNO=0.0
      GO TO 20
   18 CTNO=CTNO+1
      IF(CTNO.GE.4.0) GO TO 19
      ACLAND=(-UNOFAC)
      RENT=RENT-UNOFAC
      THATAL=0.0
      GO TO 20
   19 ACLAND=(-UNOFAC)
      RENT=RENT-UNOFAC
      CTINK=2.0
      THATAL=0.0
      CTNO=0.0
C     *********************************************************************
C     DETERMINE IF ACQUISITION EXCEEDS ANNUAL LIMITS
C     *********************************************************************
   20 ACDT=ACDYR
  200 IF(LACYR.EQ.1) GO TO 21
  201 ACDYR=TL2(LACYR)-TL2(LACYR-1)+ACLAND
      GO TO 22
   21 ACDYR=TL2(LACYR)-BEGLND+ACLAND
   22 IF(ACDYR.LE.ACANY) GO TO 23
      IF(AC25.LE.ACANY) GO TO 23
      IF(BONLY.EQ.1.0) GO TO 222
      ACLAND=ACLAND-UNOFAC
      RENT=RENT-UNOFAC
      CTNO=CTNO+1.0
      IF(CTNO.LT.4.0) GO TO 200
      GO TO 88
```

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  222 ACDYR=ACDYR-UNOFAC
      ACLAND=0.0
      CTINK=2.0
      CODEF=2.0
C     ***************************************************************
C     DETERMINE IF ACQUISITION EXCEEDS TOTAL LIMITS
C     ***************************************************************
   23 XACD25=ACD25
      ACD25=ACD25+ACDYR-ACDT
      IF(ACD25.LE.AC25) GO TO 24
      IF(BONLY.EQ.1.0) GO TO 239
      ACLAND=ACLAND-UNOFAC
      RENT=RENT-UNOFAC
      ACD25=XACD25
      THATAL=2.0
      CTNO=CTNO+1.0
      IF(CTNO.LT.4.0) GO TO 200
      IF(BANDR.NE.1.0) GO TO 231
      THATAL=2.0
      CTNO=0.0
      GO TO 11
  231 DONE=1.0
      RETURN
  239 ACD25=ACD25-UNOFAC
      ACLAND=0.0
      ACDYR=ACDYR-UNOFAC
      CODEF=2.0
      CODDON=2.0
C     ***************************************************************
C     ADJUSTMENTS
C     ***************************************************************
   24 IF(CODEF.NE.2.0) GO TO 241
      DO 240 J=LACYR,25
  240 OWN(J+1)=TL2(LACYR)-RENT
  241 CODEF=0.0
      NEXT=LACYR+1
      DO 25 I=NEXT,25
      TL2(I)=TL2(LACYR)+ACLAND
   25 TL1(I+1)=TL2(I)
      TL2(LACYR)=TL2(LACYR)+ACLAND
      TL1(LACYR+1)=TL2(LACYR)
   26 DO 27 I=LACYR,25
   27 RENT2(I)=RENT
      IF(CLOOPS.EQ.2.0.AND.CTPASS.EQ.2.0.OR.CLOOPS.EQ.5.0.AND.
     1CTPASS.EQ.5.0) GO TO 28
      IF(CTINK.NE.2.0) GO TO 28
      CALL WANDR(2)
      PASS=1.0
      GO TO 88
   28 DONE=2.0
      IF(CODDON.EQ.2.0) DONE=1.0
      RETURN
      END
      SUBROUTINE STNMDV
C     ***************************************************************
C     ***************************************************************
C     S.N.D. ARE LIMITED TO 3 EXCEPT FOR LOWER LIMITS ON BARLEY
C     PRODUCTION(-2.288) AND NATIVE PASTURE PRODUCTION(-2.597).
C     S.N.D. ARE GENERATED FOR (1) WHEAT PROD., (2) BARLEY PROD.,
C     (3) SGPMCH PROD., (4) SGPMAY PROD., (5) GS, FS, GSSP, ALFHAY,
C     ALFPAS, AND SUDGP PROD., (6) NATPAS PROD., (7) WHEAT PRICE,
C     (8) GS PRICE, (9) BARLEY PRICE, (10) ALFHAY PRICE, (11) SGPMCH
C     AND SGPMAY PRICE, (12) GSSP PRICE, (13) NATPAS PRICE, AND
C     (14) LVSTK PRICE.  WHEAT AND BARLEY PROD. SHARE THE SAME S.N.D.
C     EXCEPT FOR THE LOWER LIMIT ON BARLEY. PRICE S.N.D. FOR (11),
C     (12), AND (13) ARE GENERATED INDEPENDENTLY BUT THEIR SIGN IS
C     OPPOSITE OF (1), (5), AND (6), RESPECTIVELY.
C     ***************************************************************
      REAL*8  SFNC2,DPS
      COMMON  SFNC2(25,29)
      COMMON  L2(35),PC(61,7),E(49,13),W(5,13),JFP(25,31),NR,TWEL(25),R,
     1MD(27,8),CI(6,2),SCL(10,15),MCOMB(1200),CPGP(15,2),LP(5),PL(25,5),
     2CV(17,2),PPA(59,6),V(230),TX1EXP,TX2EXP,SCOWS,NPP,RET(13),EXP(13),
     3WORK(13),P1,P2,P3,P4,P5,P6,TL1(26),TL2(26),TL1LPP(59),TL1NPP(59),
     4TL2LPP(59),TL2NPP(59),CROP1(8),CROP2(8),YEAR,NYEAR,SND(26,14),IX,
     5N,OWN(26),RENT2(26),BEGLND,BEGCAP,BEGLD,BEGMD,PERMIT,UNOFAC,AC25,
     6ACANY,BONLY,RONLY,BANDR,PCTBL,CLOOPS,RENT,LACYR,PASS,DONE,VALLND,
     7ACDYR,ACD25,PAY(150),TIN(150),PAYL(150),TINL(150),PRINL(150),
     8OPL(150),PAYM(80),PAYC(80),TINM(80),TINC(80),PRINM(80),PRINC(80),
     9OPM(80),OPC(80),BEGDM,XINTM,AMM,AMNOM,CODEM,XINTC,AMC,AMNOC,CODEC,
     /BEGDL,XINTL,AML,AMNOL,CODEL,DM,DC,DL,SC,PROF,DEPEN,DEPTOT,WK(12),
     1CHGLAB(12),CREDIT,FITAX(25),SITAX(25),SST(25),OUTINC,SSTWP(25),
     2TOTTAX,HLDSST,HLDFIT,HLDSIT,TIME,RINT,COPY,BUYMO,MCHSAV(25,10,5),
     3AGESAV(25,10,5),SAVHRS(25,12),SAVEXP(25,12),TMCOST(25),TVMI(25),
     4TMDEP(25),TMCRED(25),THRS(10,5),THREE(25,12),FOUR(25,12),FNC(29),
     5ELEVEN(25,12),SFNC(25,29),FNCL(25,29),FNCH(25,29),NVPAY,ISIY,
     6XVNM(25),XVUM(25),CROP(25,8),SVTHAC(25,10,5)
      DIMENSION X(13)
      DO 25 I=1,26
      DO 11 J=1,13
      CALL GAUSS(IX,1.0,D.0,X(J))
      IF(X(J).LE.(-3.0))X(J)=(-3.0)
      IF(X(J).GE.3.0)X(J)=3.0
   11 CONTINUE
      SND(I,1)=X(1)
      IF(X(1).LE.(-2.288)) GO TO 12
      SND(I,2)=X(1)
      GO TO 13
   12 SND(I,2)=(-2.288)
   13 DO 14 J=3,5
   14 SND(I,J)=X(J-1)
      IF(X(5).LE.(-2.597))GO TO 15
      SND(I,6)=X(5)
      GO TO 16
   15 SND(I,6)=(-2.597)
   16 DO 17 J=7,10
   17 SND(I,J)=X(J-1)
      IF(X(10).LT.0.0.AND.X(1).LT.0.0.OR.X(10).GT.0.D.AND.
     1X(1).GT.0.0) GO TO 18
      SND(I,11)=X(10)
```

```
      GO TO 21
   18 SND(I,11)=X(10)*(-1.0)
   21 IF(X(11).LT.0.0.AND.X(4).LT.0.0.OR.X(11).GT.0.0.AND.
     1X(4).GT.0.0) GO TO 22
      SND(I,12)=X(11)
      GO TO 23
   22 SND(I,12)=X(11)*(-1.0)
   23 IF(X(12).LT.0.0.AND.X(5).LT.0.0.OR.X(12).GT.0.0.AND.
     1X(5).GT.0.0) GO TO 223
      SND(I,13)=X(12)
      GO TO 224
  223 SND(I,13)=X(12)*(-1.0)
  224 SND(I,14)=X(13)
   25 CONTINUE
      RETURN
      END
      SUBROUTINE PRODUC
C     *****************************************************************
C     *****************************************************************
      REAL*8  SFNC2,DPS
      COMMON  SFNC2(25,29)
      COMMON  L2(35),PC(61,7),E(49,13),W(5,13),JFP(25,31),NR,TWEL(25),R,
     1MO(27,8),CI(6,2),SCL(10,15),MCOMB(1200),CPGP(15,2),LP(5),PL(25,5),
     2CV(17,2),PPA(59,6),V(230),TX1EXP,TX2EXP,SCOWS,NPP,RET(13),EXP(13),
     3WORK(13),P1,P2,P3,P4,P5,P6,TL1(26),TL2(26),TL1LPP(59),TL1NPP(59),
     4TL2LPP(59),TL2NPP(59),CROP1(8),CROP2(8),YEAR,NYEAR,SND(26,14),IX,
     5N,OWN(26),RENT2(26),BEGLND,BEGCAP,BEGLD,BEGMD,PERMIT,UNOFAC,AC25,
     6ACANY,BONLY,RONLY,BANDR,PCTBL,CLOOPS,RENT,LACYR,PASS,DONE,VALLND,
     7ACDYR,ACD25,PAY(150),TIN(150),PAYL(150),TINL(150),PRINL(150),
     8OPL(150),PAYM(80),PAYC(80),TINM(80),TINC(80),PRINM(80),PRINC(80),
     9OPM(80),OPC(80),BEGDM,XINTM,AMM,AMNOM,CODEM,XINTC,AMC,AMNOC,CODEC,
     /BEGDL,XINTL,AML,AMNOL,CODEL,DM,DC,DL,SC,PROF,DEPEN,DEPTOT,WK(12),
     1CHGLAB(12),CREOIT,F1TAX(25),SITAX(25),SST(25),OUTINC,SSTWP(25),
     2TOTTAX,HLDSST,HLDF1T,HLDSIT,TIME,RINT,COPY,BUYMO,MCHSAV(25,10,5),
     3AGESAV(25,10,5),SAVHRS(25,12),SAVEXP(25,12),TMCOST(25),TVM1(25),
     4TMDEP(25),TMCRED(25),THRS(10,5),THREE(25,12),FOUR(25,12),FNC(29),
     5ELEVEN(25,12),SFNC(25,29),FNCL(25,29),FNCH(25,29),NVPAY,1SIY,
     6XVNM(25),XVUM(25),CROP(25,8),SVTHAC(25,10,5)
      SGPMCH=0.0
      SGPMAY=0.0
      GSSP=0.0
      ALFHAY=0.0
      PRARYH=0.0
      PASNAT=0.0
      DO 5 I=1,8
      CROP1(I)=0.0
    5 CROP2(I)=0.0
C     *****************************************************************
C     SELECTING THE FARM PLAN AND CROP TOTALS
C     *****************************************************************
      LPP=NPP
      IF(YEAR.EQ.P1) NPP=1
      IF(YEAR.EQ.P2) NPP=2
      IF(YEAR.EQ.P3) NPP=3
      IF(YEAR.EQ.P4) NPP=4
      IF(YEAR.EQ.P5) NPP=5
      IF(YEAR.EQ.P6) NPP=6
      DO 10 I=1,59
      TL1LPP(I)=PPA(I,LPP)*TL1(NYEAR)
      TL1NPP(I)=PPA(I,NPP)*TL1(NYEAR)
      TL2LPP(I)=PPA(I,LPP)*TL2(NYEAR)
   10 TL2NPP(I)=PPA(I,NPP)*TL2(NYEAR)
      DO 1111 I=8,14
      IF(TL2NPP(I).GE.TL2LPP(I)-1.0) GO TO 1111
      TL1LPP(I+21)=TL1LPP(I+21)+TL1LPP(I)-TL1NPP(I)
      TL2LPP(I+21)=TL2LPP(I+21)+TL2LPP(I)-TL2NPP(I)
 1111 CONTINUE
      DO 11 I=1,7
      CROP1(1)=CROP1(1)+TL1LPP(I)
   11 CROP2(1)=CROP2(1)+TL2NPP(I)
      ADDL=0.0
      ADDN=0.0
      DO 12 I=8,14
      ADDL=ADDL+TL2LPP(I)
   12 ADDN=ADDN+TL2NPP(I)
      IF(ADDL.GE.ADDN) GO TO 14
      DO 13 I=8,14
      CROP1(2)=CROP1(2)+TL1LPP(I)
   13 CROP2(2)=CROP2(2)+TL2LPP(I)
      GO TO 16
   14 DO 15 I=8,14
      CROP1(2)=CROP1(2)+TL1NPP(I)
   15 CROP2(2)=CROP2(2)+TL2NPP(I)
   16 DO 17 I=15,21
      CROP1(3)=CROP1(3)+TL1LPP(I)
   17 CROP2(3)=CROP2(3)+TL2NPP(I)
      DO 18 I=22,28
      CROP1(4)=CROP1(4)+TL1LPP(I)
   18 CROP2(4)=CROP2(4)+TL2NPP(I)
      ADDL=0.0
      ADDN=0.0
      DO 19 I=29,35
      ADDL=ADDL+TL2LPP(I)
   19 ADDN=ADDN+TL2NPP(I)
      IF(ADDL.GE.ADDN) GO TO 21
      DO 20 I=29,35
      CROP1(5)=CROP1(5)+TL1LPP(I)
   20 CROP2(5)=CROP2(5)+TL2LPP(I)
      GO TO 23
   21 DO 22 I=29,35
      CROP1(5)=CROP1(5)+TL1NPP(I)
   22 CROP2(5)=CROP2(5)+TL2NPP(I)
   23 ADDL=0.0
      ADDN=0.0
      DO 24 I=36,42
      ADDL=ADDL+TL2LPP(I)
   24 ADDN=ADDN+TL2NPP(I)
      IF(ADDL.GE.ADDN) GO TO 26
      DO 25 I=36,42
      CROP1(6)=CROP1(6)+TL1LPP(I)
```

```
   25 CROP2(6)=CROP2(6)+TL2LPP(I)
      GO TO 28
   26 DO 27 I=36,42
      CROP1(6)=CROP1(6)+TL1NPP(I)
   27 CROP2(6)=CROP2(6)+TL2NPP(I)
   28 DO 29 I=43,47
      CROP1(7)=CROP1(7)+TL1LPP(I)*.25
      CROP2(7)=CROP2(7)+TL2NPP(I)*.25
      CROP1(8)=CROP1(8)+TL1LPP(I)*.75
   29 CROP2(8)=CROP2(8)+TL2NPP(I)*.75
      DO 301 J=1,8
  301 CROP(NYEAR,J)=0.0
      DO 302 J=1,7
  302 CROP(NYEAR,1)=CROP(NYEAR,1)+TL2NPP(J)
      DO 303 J=8,14
  303 CROP(NYEAR,2)=CROP(NYEAR,2)+TL2NPP(J)
      DO 304 J=15,21
  304 CROP(NYEAR,3)=CROP(NYEAR,3)+TL2NPP(J)
      DO 305 J=22,28
  305 CROP(NYEAR,4)=CROP(NYEAR,4)+TL2NPP(J)
      DO 306 J=29,35
  306 CROP(NYEAR,5)=CROP(NYEAR,5)+TL2NPP(J)
      DO 307 J=36,42
  307 CROP(NYEAR,6)=CROP(NYEAR,6)+TL2NPP(J)
      DO 308 J=43,47
      CROP(NYEAR,7)=CROP(NYEAR,7)+TL2NPP(J)*.25
  308 CROP(NYEAR,8)=CROP(NYEAR,8)+TL2NPP(J)*.75
C     *******************************************************************
C     PASTURE AND HAY - YIELDS
C     *******************************************************************
      DO 30 I=1,7
      SGPLPP=.437998+.009519*(PC(I,1)+CV(1,1)*PC(I,1)*SND(N,1))
      SGPNPP=.437998+.009519*(PC(I,1)+CV(1,1)*PC(I,1)*SND(N+1,1))
   30 SGPMCH=SGPMCH+TL1LPP(I)*(SGPLPP+CV(4,1)*SGPLPP*SND(N,3))*.40+
     1TL2NPP(I)*(SGPNPP+CV(4,1)*SGPNPP*SND(N+1,3))*.60
      DO 31 I=15,28
      IJ=I-14
      IF(I.GT.21) IJ=I-21
      SGPLPP=.437998+.009519*(PC(IJ,1)+CV(1,1)*PC(IJ,1)*SND(N,1))
      SGPNPP=.437998+.009519*(PC(IJ,1)+CV(1,1)*PC(IJ,1)*SND(N+1,1))
      SGPMCH=SGPMCH+TL1LPP(I)*(SGPLPP+CV(4,1)*SGPLPP*SND(N,3))*.40+
     1TL2NPP(I)*(SGPNPP+CV(4,1)*SGPNPP*SND(N+1,3))*.60
      IF(I.LE.21) GO TO 31
      SGPMAY=SGPMAY+TL1LPP(I)*(SGPLPP+CV(5,1)*SGPLPP*SND(N,4))*2.0
   31 CONTINUE
      DO 33 I=29,47
      ALFHAY=ALFHAY+TL2NPP(I)*(PC(I,5)+CV(9,1)*PC(I,5)*SND(N+1,5))*.75
      IF(TL2LPP(I).GE.TL2NPP(I)) GO TO 32
      PRARYH=PRARYH+TL2LPP(I)*(PC(I,6)+CV(6,1)*PC(I,6)*SND(N+1,5))
      GO TO 33
   32 PRARYH=PRARYH+TL2NPP(I)*(PC(I,6)+CV(6,1)*PC(I,6)*SND(N+1,5))
   33 CONTINUE
      DO 35 I=36,42
      IF(TL2LPP(I).GE.TL2NPP(I)) GO TO 34
      PASNAT=PASNAT+TL2LPP(I)*(PC(I,7)+CV(8,1)*PC(I,7)*SND(N+1,5))
      GO TO 35
   34 PASNAT=PASNAT+TL2NPP(I)*(PC(I,7)+CV(8,1)*PC(I,7)*SND(N+1,5))
   35 CONTINUE
      DO 36 I=48,49
   36 PASNAT=PASNAT+TL1LPP(I)*(PC(I,7)+CV(11,1)*PC(I,7)*SND(N+1,6))*.50+
     1TL2NPP(I)*(PC(I,7)+CV(11,1)*PC(I,7)*SND(N+1,6))*.50
      DO 38 I=8,14
      IF(TL2LPP(I).GE.TL2NPP(I)) GO TO 37
      GSSP=GSSP+TL2LPP(I)*(PC(I,4)+CV(7,1)*PC(I,4)*SND(N+1,5))
      GO TO 38
   37 GSSP=GSSP+TL2NPP(I)*(PC(I,4)+CV(7,1)*PC(I,4)*SND(N+1,5))
   38 CONTINUE
      DO 40 I= 29,35
      IF(TL2LPP(I).GE.TL2NPP(I)) GO TO 39
      GSSP=GSSP+TL2LPP(I)*(PC(I,4)+CV(6,1)*PC(I,4)*SND(N+1,5))
      GO TO 40
   39 GSSP=GSSP+TL2NPP(I)*(PC(I,4)+CV(6,1)*PC(I,4)*SND(N+1,5))
   40 CONTINUE
      DO 41 I=43,47
   41 GSSP=GSSP+TL2NPP(I)*(PC(I,4)+CV(10,1)*PC(I,4)*SND(N+1,5))*.75
C     *******************************************************************
C     PASTURE AND HAY - USAGE
C     *******************************************************************
      SGPMCH=SGPMCH-TL1LPP(50)*PC(50,2)*.40-TL2NPP(50)*PC(50,2)*.60
     1-TL1LPP(51)*PC(53,2)*.40-TL2NPP(51)*PC(53,2)*.60
      SGPMAY=SGPMAY-TL1LPP(50)*PC(50,3)-TL1LPP(51)*PC(53,3)
      PRARYH=PRARYH-TL2NPP(50)*PC(50,6)-TL2NPP(51)*PC(53,6)
     1-TL2NPP(52)*PC(56,6)-TL2NPP(53)*PC(59,6)
      PASNAT=PASNAT-TL1LPP(50)*PC(50,7)*.57-TL2NPP(50)*PC(50,7)*.43
     1-TL1LPP(51)*PC(53,7)*.57-TL2NPP(51)*PC(53,7)*.43
     2-TL1LPP(52)*PC(56,7)*.75-TL2NPP(52)*PC(56,7)*.25
     3-TL1LPP(53)*PC(59,7)*.50-TL2NPP(53)*PC(59,7)*.50
       GSSP=GSSP-TL2NPP(51)*PC(53,4)
C     *******************************************************************
C     PASTURE AND HAY - RENT IN, RENT OUT, PURCHASE, OR SELL
C     *******************************************************************
      MONTH=CPGP(4,1)
      IF(SGPMCH.GE.0.0) GO TO 42
      EXP(MONTH)=EXP(MONTH)-SGPMCH*(CPGP(4,2)+CV(4,2)*CPGP(4,2)*
     1SND(N+1,11))
      GO TO 43
   42 RET(MONTH)=RET(MONTH)+SGPMCH*(CPGP(4,2)+CV(4,2)*CPGP(4,2)*
     1SND(N+1,11))
   43 MONTH=CPGP(5,1)
      IF(SGPMAY.GE.0.0) GO TO 44
      EXP(MONTH)=EXP(MONTH)-SGPMAY*(CPGP(5,2)+CV(5,2)*CPGP(5,2)*
     1SND(N,11))
      GO TO 45
   44 RET(MONTH)=RET(MONTH)+SGPMAY*(CPGP(5,2)+CV(5,2)*CPGP(5,2)*
     1SND(N,11))
   45 MONTH=CPGP(7,1)
      RET(MONTH)=RET(MONTH)+ALFHAY*(CPGP(7,2)+CV(9,2)*CPGP(7,2)*
     1SND(N+1,10))
      MONTH=CPGP(8,1)
      IF(PRARYH.GE.0.0) GO TO 46
```

TABLE XVI (Continued)

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      EXP(MONTH)=EXP(MONTH)-PRARYH*(CPGP(8,2)+CV(12,2)*CPGP(8,2)*
     1SND(N+1,12))
      GO TO 47
   46 RET(MONTH)=RET(MONTH)+PRARYH*(CPGP(8,2)+CV(12,2)*CPGP(8,2)*
     1SND(N+1,12))
   47 MONTH=CPGP(9,1)
      IF(PASNAT.GE.0.0) GO TO 48
      EXP(MONTH)=EXP(MONTH)-PASNAT*(CPGP(9,2)+CV(11,2)*CPGP(9,2)*
     1SND(N+1,13))
      GO TO 49
   48 RET(MONTH)=RET(MONTH)+PASNAT*(CPGP(9,2)+CV(11,2)*CPGP(9,2)*
     1SND(N+1,13))
   49 MONTH=CPGP(6,1)
      IF(GSSP.GE.0.0) GO TO 50
      EXP(MONTH)=EXP(MONTH)-GSSP*(CPGP(6,2)+CV(7,2)*CPGP(6,2)*
     1SND(N+1,12))
      GO TO 51
   50 RET(MONTH)=RET(MONTH)+GSSP*(CPGP(6,2)+CV(7,2)*CPGP(6,2)*
     1SND(N+1,12))
C     ******************************************************************
C     SMALL GRAIN CROP RETURNS
C     ******************************************************************
   51 MONTH=CPGP(1,1)
      DO 52 I=1,7
   52 RET(MONTH)=RET(MONTH)+TL1LPP(I)*(PC(I,1)+CV(1,1)*PC(I,1)*
     1SND(N,1))*(CPGP(1,2)+CV(1,2)*CPGP(1,2)*SND(N,7))
      MONTH=CPGP(2,1)
      DO 54 I=8,14
      IF(TL2LPP(I).GE.TL2NPP(I)) GO TO 53
      RET(MONTH)=RET(MONTH)+TL2LPP(I)*(PC(I,1)+CV(2,1)*PC(I,1)*
     1SND(N+1,5))*(CPGP(2,2)+CV(2,2)*CPGP(2,2)*SND(N+1,8))
      GO TO 54
   53 RET(MONTH)=RET(MONTH)+TL2NPP(I)*(PC(I,1)+CV(2,1)*PC(I,1)*
     1SND(N+1,5))*(CPGP(2,2)+CV(2,2)*CPGP(2,2)*SND(N+1,8))
   54 CONTINUE
      MONTH=CPGP(3,1)
      DO 55 I=15,21
   55 RET(MONTH)=RET(MONTH)+TL1LPP(I)*(PC(I,1)+CV(3,1)*PC(I,1)*
     1SND(N,2))*(CPGP(3,2)+CV(3,2)*CPGP(3,2)*SND(N,9))
C     ******************************************************************
C     GOVERNMENT PAYMENTS
C     ******************************************************************
      MONTH=CPGP(10,1)
      RET(MONTH)=RET(MONTH)+TL1LPP(54)*CPGP(10,2)
      MONTH=CPGP(11,1)
      IF(TL2LPP(55).GE.TL2NPP(55)) GO TO 56
      RET(MONTH)=RET(MONTH)+TL2LPP(55)*CPGP(11,2)
      GO TO 57
   56 RET(MONTH)=RET(MONTH)+TL2NPP(55)*CPGP(11,2)
   57 MONTH=CPGP(12,1)
      RET(MONTH)=RET(MONTH)+TL1LPP(56)*CPGP(12,2)
      MONTH=CPGP(13,1)
      RET(MONTH)=RET(MONTH)+TL1LPP(57)*CPGP(13,2)
      MONTH=CPGP(14,1)
      IF(TL2LPP(58).GE.TL2NPP(58)) GO TO 58
      RET(MONTH)=RET(MONTH)+TL2LPP(58)*CPGP(14,2)
      GO TO 59
   58 RET(MONTH)=RET(MONTH)+TL2NPP(58)*CPGP(14,2)
   59 MONTH=CPGP(15,1)
      RET(MONTH)=RET(MONTH)+TL1LPP(59)* CPGP(15,2)
C     ******************************************************************
C     LIVESTOCK RETURNS
C     ******************************************************************
      MONTH=LP(2)
      RET(MONTH)=RET(MONTH)+TL1LPP(50)*PC(52,1)*(PL(NYEAR,2)+CV(13,2)*
     1PL(NYEAR,2)*SND(N+1,14))+TL1LPP(51)*PC(55,1)*(PL(NYEAR,2)+CV(13,2)
     2*PL(NYEAR,2)*SND(N+1,14))
      MONTH=LP(3)
      RET(MONTH)=RET(MONTH)+TL1LPP(52)*PC(58,1)*(PL(NYEAR,3)+CV(14,2)*
     1PL(NYEAR,3)*SND(N+1,14))
      MONTH=LP(1)
      SCOWS =                TL2NPP(53)*PC(59,1)*(PL(NYEAR,1)+CV(15,2)*
     1PL(NYEAR,1)*SND(N+1,14))
      RET(MONTH)=RET(MONTH)+SCOWS
      MONTH=LP(4)
      RET(MONTH)=RET(MONTH)+TL2NPP(53)*PC(60,1)*(PL(NYEAR,4)+CV(16,2)*
     1PL(NYEAR,4)*SND(N+1,14))
      MONTH=LP(5)
      RET(MONTH)=RET(MONTH)+TL2NPP(53)*PC(61,1)*(PL(NYEAR,5)+CV(17,2)*
     1PL(NYEAR,5)*SND(N+1,14))
C     ******************************************************************
C     CROP MATERIAL EXPENSE
C     ******************************************************************
      DO 61 I=1,7
      DO 60 J=1,5
   60 EXP(J)=EXP(J)+TL1LPP(I)*E(I,J)
      DO 61 J=6,12
   61 EXP(J)=EXP(J)+TL2NPP(I)*E(I,J)
      DO 67 I=8,14
      IF(TL2LPP(I).GE.TL2NPP(I)) GO TO 64
      DO 62 J=1,5
   62 EXP(J)=EXP(J)+TL1LPP(I)*E(I,J)
      DO 63 J=6,12
   63 EXP(J)=EXP(J)+TL2LPP(I)*E(I,J)
      GO TO 67
   64 DO 65 J=1,5
   65 EXP(J)=EXP(J)+TL1NPP(I)*E(I,J)
      DO 66 J=6,12
   66 EXP(J)=EXP(J)+TL2NPP(I)*E(I,J)
   67 CONTINUE
      DO 69 I=15,21
      DO 68 J=1,5
   68 EXP(J)=EXP(J)+TL1LPP(I)*E(I,J)
      DO 69 J=6,12
   69 EXP(J)=EXP(J)+TL2NPP(I)*E(I,J)
      DO 71 I=22,28
      DO 70 J=1,5
   70 EXP(J)=EXP(J)+TL1LPP(I)*E(22,J)
      DO 71 J=6,12
   71 EXP(J)=EXP(J)+TL2NPP(I)*E(22,J)
```

```
      DO 77 I=29,35
      IF(TL2LPP(I).GE.TL2NPP(I)) GO TO 74
      DO 72 J=1,5
   72 EXP(J)=EXP(J)+TL1LPP(I)*E(I-6,J)
      DO 73 J=6,12
   73 EXP(J)=EXP(J)+TL2LPP(I)*E(I-6,J)
      GO TO 77
   74 DO 75 J=1,5
   75 EXP(J)=EXP(J)+TL1NPP(I)*E(I-6,J)
      DO 76 J=6,12
   76 EXP(J)=EXP(J)+TL2NPP(I)*E(I-6,J)
   77 CONTINUE
      DO 83 I=36,38
      IF(TL2LPP(I).GE.TL2NPP(I)) GO TO 80
      DO 78 J=1,5
   78 EXP(J)=EXP(J)+TL1LPP(I)*E(30,J)
      DO 79 J=6,12
   79 EXP(J)=EXP(J)+TL2LPP(I)*E(30,J)
      GO TO 83
   80 DO 81 J=1,5
   81 EXP(J)=EXP(J)+TL1NPP(I)*E(30,J)
      DO 82 J=6,12
   82 EXP(J)=EXP(J)+TL2NPP(I)*E(30,J)
   83 CONTINUE
      DO 89 I=39,42
      IF(TL2LPP(I).GE.TL2NPP(I)) GO TO 86
      DO 84 J=1,5
   84 EXP(J)=EXP(J)+TL1LPP(I)*E(31,J)
      DO 85 J=6,12
   85 EXP(J)=EXP(J)+TL2LPP(I)*E(31,J)
      GO TO 89
   86 DO 87 J=1,5
   87 EXP(J)=EXP(J)+TL1NPP(I)*E(31,J)
      DO 88 J=6,12
   88 EXP(J)=EXP(J)+TL2NPP(I)*E(31,J)
   89 CONTINUE
      DO 91 I=43,44
      DO 90 J=1,5
      EXP(J)=EXP(J)+TL1LPP(I)*E(32,J)*.25
   90 EXP(J)=EXP(J)+TL1LPP(I)*E(I-9,J)*.75
      DO 91 J=6,12
      EXP(J)=EXP(J)+TL2NPP(I)*E(32,J)*.25
   91 EXP(J)=EXP(J)+TL2NPP(I)*E(I-9,J)*.75
      DO 93 I=45,47
      DO 92 J=1,5
      EXP(J)=EXP(J)+TL1LPP(I)*E(33,J)*.25
   92 EXP(J)=EXP(J)+TL1LPP(I)*E(I-9,J)*.75
      DO 93 J=6,12
      EXP(J)=EXP(J)+TL2NPP(I)*E(33,J)*.25
   93 EXP(J)=EXP(J)+TL2NPP(I)*E(I-9,J)*.75
C     ******************************************************************
C     LIVESTOCK EXPENSE AND LABOR USAGE
C     ******************************************************************
      M9=LP(4)-1
      MB=LP(4)
      M1=LP(4)+1
      DO 95 I=50,51
      DO 94 J=1,M9
      EXP(J)=EXP(J)+TL1LPP(I)*E(I-11,J)
   94 WORK(J)=WORK(J)+TL1LPP(I)*W(I-49,J)
      DO 95 J=MB,12
      EXP(J)=EXP(J)+TL2NPP(I)*E(I-11,J)
   95 WORK(J)=WORK(J)+TL2NPP(I)*W(I-49,J)
      DO 96 J=1,M9
      EXP(J)=EXP(J)+TL1LPP(52)*E(41,J)
   96 WORK(J)=WORK(J)+TL1LPP(52)*W(3,J)
      EXP(MB)=EXP(MB)+TL1LPP(52)*E(41,MB)*.50+TL2NPP(52)*E(41,MB)*.50
      WORK(MB)=WORK(MB)+TL1LPP(52)*W(3,MB)*.50+TL2NPP(52)*W(3,MB)*.50
      DO 97 J=M1,12
      EXP(J)=EXP(J)+TL2NPP(52)*E(41,J)
   97 WORK(J)=WORK(J)+TL2NPP(52)*W(3,J)
      MC1=CI(1,1)-1
      MC2=CI(1,1)
      DO 98 J=1,MC1
      EXP(J)=EXP(J)+TL1LPP(53)*E(42,J)
   98 WORK(J)=WORK(J)+TL1LPP(53)*W(4,J)
      DO 99 J=MC2,12
      EXP(J)=EXP(J)+TL2NPP(53)*E(42,J)
   99 WORK(J)=WORK(J)+TL2NPP(53)*W(4,J)
      IF(YEAR.GT.1.0) GO TO 991
      TX1EXP=0.0
      GO TO 992
  991 TX1EXP=(TL1LPP(50)*PC(51,1)+TL1LPP(51)*PC(54,1)+TL1LPP(52)*
     1PC(57,1))*(PL(NYEAR-1,4)+CV(16,2)*PL(NYEAR-1,4)*SND(N,14))
  992 TX2EXP=(TL2NPP(50)*PC(51,1)+TL2NPP(51)*PC(54,1)+TL2NPP(52)*
     1PC(57,1))*(PL(NYEAR,4)+CV(16,2)*PL(NYEAR,4)*SND(N+1,14))
      EXP(MB)=EXP(MB)+TX2EXP
      RETURN
      END
      SUBROUTINE MCHNRY
C     ******************************************************************
C     ******************************************************************
      REAL*8  SFNC2,DPS
      COMMON  SFNC2(25,29)
      COMMON  L2(35),PC(61,7),E(49,13),W(5,13),JFP(25,31),NR,TWEL(25),R,
     1MO(27,8),CI(6,2),SCL(10,15),MCOMB(1200),CPGP(15,2),LP(5),PL(25,5),
     2CV(17,2),PPA(59,6),V(230),TX1EXP,TX2EXP,SCOWS,NPP,RET(13),EXP(13),
     3WORK(13),P1,P2,P3,P4,P5,P6,TL1(26),TL2(26),TL1LPP(59),TL1NPP(59),
     4TL2LPP(59),TL2NPP(59),CROP1(8),CROP2(8),YEAR,NYEAR,SND(26,14),IX,
     5N,OWN(26),RENT2(26),BEGLND,BEGCAP,BEGLD,BEGMD,PERMIT,UNOFAC,AC25,
     6ACANY,BONLY,RONLY,BANDR,PCTBL,CLOOPS,RENT,LACYR,PASS,DONE,VALLND,
     7ACDYR,ACD25,PAY(150),TIN(150),PAYL(150),TINL(150),PRINL(150),
     8OPL(150),PAYM(80),PAYC(80),TINM(80),TINC(80),PRINM(80),PRINC(80),
     9OPM(80),OPC(80),BEGDM,XINTM,AMM,AMNOM,CODEM,XINTC,AMC,AMNOC,CODEC,
     /BEGDL,XINTL,AML,AMNOL,CODEL,DM,DC,DL,SC,PROF,DEPEN,DEPTOT,WK(12),
     1CHGLAB(12),CREDIT,FITAX(25),SITAX(25),SST(25),OUTINC,SSTWP(25),
     2TOTTAX,HLDSST,HLDFIT,HLDSIT,TIME,RINT,COPY,BUYMO,MCHSAV(25,10,5),
     3AGESAV(25,10,5),SAVHRS(25,12),SAVEXP(25,12),TMCOST(25),TVMI(25),
     4TMDEP(25),TMCRED(25),THRS(10,5),THREE(25,12),FOUR(25,12),FNC(29),
     5ELEVEN(25,12),SFNC(25,29),FNCL(25,29),FNCH(25,29),NVPAY,ISIY,
```

```
     6XVNM(25),XVUM(25),CROP(25,8),SVTHAC(25,10,5)
      DIMENSION TLR1(5,9,12),TLR2(9,5),SAT(9),INV2(10,5),AGE2(10,5),
     1INV3(10,5),        HRS(6,10,12),THAC(10,5),INV(10,5),AGE(10,5),
     2RTHIFL(12),HOURS(10,5),SUMHRS(12),HAC(10,5),TLRT(5,9,12),AHT(10),
     3MACH(5),MCHN(5),CLBR(5),HLOAGE(5),HLDHRS(5)
C     *****************************************************************
C     INITIALIZATION
C     *****************************************************************
      IF(NYEAR.EQ.1) NFYCT=0
      NFYCT=NFYCT+1
      CINV=V(210)
      KMAX=V(207)
      IF(NYEAR.GT.1) GO TO 111
      AHT( 1)=1200.0
      AHT( 2)=1600.0
      AHT( 3)=1500.0
      AHT( 4)=1500.0
      AHT( 5)=1500.0
      AHT( 6)=800.0
      AHT( 7)=750.0
      AHT( 8)=750.0
      AHT( 9)=9999.0
      AHT(10)=7000.0
      DO 11 I=1,10
      DO 11 J=1,5
      INV(I,J)=MCHSAV(1,1,J)
      INV2(I,J)=INV(I,J)
      AGE(I,J)=AGESAV(1,I,J)
   11 AGE2(I,J)=AGE(I,J)
      GO TO 22
  111 DO 112 I=1,10
      DO 112 J=1,5
      THAC(I,J)=SVTHAC(NYEAR-1,I,J)
      INV(I,J)=MCHSAV(NYEAR-1,I,J)
      INV2(I,J)=INV(I,J)
      AGE(I,J)=AGESAV(NYEAR-1,I,J)
  112 AGE2(I,J)=AGE(I,J)
C     *****************************************************************
C     COMPUTE MONTHLY HOURS FOR DIFFERENT SIZE IMPLEMENTS
C     *****************************************************************
   22 DO 21 I = 1,5
      DO 21 J = 1,9
      DO 21 K = 1,12
      TLRT(I,J,K)=1.0
   21 TLR1(I,J,K) = 0.0
      II = 0
      DO 23 I = 3,15,3
      II=II+1
      JJJ=0
      DO 23 J = 1,9
      DO 23 JJ = 1,3
      JJJ=JJJ+1
      DO 23 KK = 1,8
      K=MO(JJJ,KK)
      IF(K.LE.0) GO TO 23
      TLRT(II,J,K)=TLRT(II,J,K)+CROP(NYEAR,KK)*SCL(J,I)
      IF(K.GE.6) GO TO 220
      TLR1(II,J,K)=TLR1(II,J,K)+CROP1(KK)*SCL(J,I)
      GO TO 23
  220 TLR1(II,J,K)=TLR1(II,J,K)+CROP2(KK)*SCL(J,I)
   23 CONTINUE
      IF(YEAR.EQ.1.0) GO TO 2200
      DO 149 I=1,8
      IF(CROP(NYEAR,I).LT.CROP(NYEAR-1,I)-5.0.OR.CROP(NYEAR,I).GT.
     1CROP(NYEAR-1,I)+5.0) GO TO 2200
  149 CONTINUE
      IF(CHANGE.EQ.2.0) GO TO 1490
      GO TO 9060
 1490 CHANGE=0.0
      GO TO 8021
 2200 CHANGE=2.0
C     *****************************************************************
C     COMPUTE ACCUMULATED MACHINE HOURS FOR INVENTORY EXISTING
C     PRIOR TO YEAR ONE - DONE ONLY ONCE IN YEAR ONE
C     *****************************************************************
      IF(NYEAR.EQ.1) GO TO 8021
C     *****************************************************************
C     DETERMINE LEAST-COST MACHINERY INVENTORY
C     *****************************************************************
C     DETERMINE MONTH WITH GREATEST LABOR REQUIREMENTS
 8750 DO 8751 K=1,12
 8751 SUMHRS(K)=0.0
      DO 8752 K=1,12
      DO 8752 J=1,9
 8752 SUMHRS(K)=SUMHRS(K)+TLRT(1,J,K)
      SUMMAX=0.0
      DO 8753 J=1,12
      IF(SUMHRS(J).LT.SUMMAX) GO TO 8753
      SUMMAX=SUMHRS(J)
      K=J
 8753 CONTINUE
C     BEGIN TRACTOR COMBINATION SELECTION - ONE COMBINATION AT A TIME.
C     NEGATE THOSE COMBINATIONS THAT CANNOT MEET THE TIME LIMITATION
      DO 999 L = 1,1196,5
      DO 241 I=1,10
      DO 241 J=1,5
  241 HOURS(I,J)=0.0
      DO 31 II = 1,5
      DO 31 JJ = 1,9
   31 TLR2(JJ,II)=TLRT(II,JJ,K)
      COST=0.0
      MCHN(1)=MCOMB(L)
      MCHN(2)=MCOMB(L+1)
      MCHN(3)=MCOMB(L+2)
      MCHN(4)=MCOMB(L+3)
      MCHN(5)=MCOMB(L+4)
      IF(MCHN(1).EQ.0) GO TO 1000
      DO 32 I = 1,9
   32 SAT(I) = 0.0
      DO 50 I = 1,5
```

```
      MTN=MCHN(1)
      IF (MTN .GT.    0) GO TO 41
      DO 321 J=1,9
      IF(SAT(J).EQ.2.0) GO TO 321
      COST=999932.0
      GO TO 900
  321 CONTINUE
      GO TO 500
   41 DO 49 J= 1,9
      IF (SAT(J) .EQ. 2.0) GO TO 49
      IF (TLR2(J,MTN).GT.0.0) GO TO 42
      SAT(J) = 2.0
      GO TO 49
   42 IF(TLR2(J,MTN).LE.TIME) GO TO 43
      GO TO 44
   43 HOURS(J,I)=TLR2(J,MTN)
      SAT(J)=2.0
      GO TO 49
   44 IF(I.NE.5) GO TO 45
      COST=999944.0
      GO TO 900
   45 HOURS(J,I)=TIME
      REDUC=(1.0-TIME/TLR2(J,MTN))
      DO 46 II=1,5
   46 TLR2(J,II)=TLR2(J,II)*REDUC
   49 CONTINUE
      DO 5000 J=1,9
      IF(SAT(J).EQ.2.0) GO TO 5000
      GO TO 50
 5000 CONTINUE
      GO TO 500
   50 CONTINUE
  500 DO 51 I=1,5
      DO 51 J=1,6
   51 HOURS(10,I)=HOURS(10,I)+HOURS(J,I)
      DO 62 I=1,4
      IF(HOURS(10,I).LE.TIME) GO TO 62
      IF(MCHN(I).EQ.MCHN(I+1)) GO TO 61
      COST=999951.0
      GO TO 900
   61 HOURS(10,I+1)=HOURS(10,I+1)+HOURS(10,I)-TIME
      HOURS(10,I)=TIME
   62 CONTINUE
      IF(HOURS(10,5).LE.TIME) GO TO 63
      COST=999962.0
      GO TO 900
   63 HMRF=0.0
      DO 501 I=1,5
      DO 501 J=7,9
  501 HMRF=HMRF+HOURS(J,I)
      DO 512 I=1,5
      IF(HMRF.LE.0.0) GO TO 53
      IF(MCHN(I).GT.0) GO TO 510
      COST=999501.0
      GO TO 900
  510 CANADD=TIME-HOURS(10,I)
      IF(CANADD.LE.0.0) GO TO 512
      IF(CANADD.GT.HMRF) GO TO 511
      HMRF=HMRF-CANADD
      HOURS(10,I)=HOURS(10,I)+CANADD
      GO TO 512
  511 HOURS(10,I)=HOURS(10,I)+HMRF
      HMRF=0.0
  512 CONTINUE
  513 IF(HMRF.LT.1.0) GO TO 53
      COST=999513.0
      GO TO 900
C     NEGATE COMBINATION IF HOURS ARE NOT ASSOCIATED WITH EACH TRACTOR
   53 DO 533 J=1,5
      IF(MCHN(J).EQ.0) GO TO 533
      IF(HOURS(10,J).GT.0.0) GO TO 533
      COST=999953.0
      GO TO 900
  533 CONTINUE
C     SELECT INVENTORY BY MONTH FOR NON-NEGATED TRACTOR COMBINATION
C     AND DETERMINE HOURS EACH MACHINE IS USED MONTHLY AND ANNUALLY
      DO 560 I=1,6
      DO 560 J=1,10
      DO 560 KK=1,12
  560 HRS(I,J,KK)=0.0
      DO 822 J=1,5
  822 INV(10,J)=MCHN(J)
      DO 831 I=1,9
      DO 831 J=1,5
  831 INV(I,J)=0
      DO 86 KK=1,12
      DO 834 II=1,5
      DO 834 JJ=1,9
  834 TLR2(JJ,II)=TLRT(II,JJ,KK)
      DO 832 J=1,9
  832 SAT(J)=0.0
      DO 85 I=1,5
      MTN=INV(10,I)
      IF(MTN.LE.0) GO TO 850
      DO 84 J=1,9
      IF(SAT(J).EQ.2.0) GO TO 84
      IF(TLR2(J,MTN).LE.0.0) GO TO 835
      GO TO 836
  835 SAT(J)=2.0
      GO TO 84
  836 IF(TLR2(J,MTN).LE.TIME) GO TO 837
      GO TO 838
  837 INV(J,I)=MTN
      HRS(I,10,KK)=HRS(I,10,KK)+TLR2(J,MTN)
      HRS(I,J,KK)=TLR2(J,MTN)
      SAT(J)=2.0
      GO TO 84
  838 INV(J,I)=MTN
      HRS(I,10,KK)=HRS(I,10,KK)+TIME
      HRS(I,J,KK)=TIME
```

TABLE XVI (Continued)

```
      REDUC=(1.0-TIME/TLR2(J,MTN))
      DO 839 II=1,5
  839 TLR2(J,II)=TLR2(J,II)*REDUC
   84 CONTINUE
      DO 840 J=1,9
      IF(SAT(J).EQ.2.0) GO TO 840
      GO TO 85
  840 CONTINUE
      GO TO 850
   85 CONTINUE
  850 DO 86 I=1,5
      IF(HRS(I,10,KK).LE.TIME) GO TO 86
      HRS(I+1,10,KK)=HRS(I+1,10,KK)+HRS(I,10,KK)-TIME
      HRS(I,10,KK)=TIME
   86 CONTINUE
C     AVERAGE LABOR REQUIREMENTS AMONG MACHINES
C     OF THE SAME SIZE - DONE BY MONTH
      DO 1115 KK=1,12
      DO 1115 II=1,10
      I=1
 1116 XTH=HRS(I,II,KK)
      XSAME=1.0
      IXX=I
      XI=I-1
      JX=I+1
      DO 1113 J=JX,5
      IF(INV(II,I).NE.INV(II,J)) GO TO 1111
      XTH=XTH+HRS(J,II,KK)
      XSAME=XSAME+1.0
      IF(J.EQ.5) GO TO 1111
      GO TO 1113
 1111 I=J
      IF(XSAME.EQ.1.0) GO TO 1114
      XAH=XTH/XSAME
      JJ=XSAME+XI
      DO 1112 III=IXX,JJ
 1112 HRS(III,II,KK)=XAH
      GO TO 1114
 1113 CONTINUE
 1114 IF(I.LE.4.AND.INV(II,I).GT.0) GO TO 1116
 1115 CONTINUE
      DO 1104 J=1,10
      DO 1104 I=1,5
 1104 THRS(J,I)=0.0
      DO 1105 JJ=1,10
      DO 1105 II=1,5
      DO 1105 KK=1,12
 1105 THRS(JJ,II)=THRS(JJ,II)+HRS(II,JJ,KK)
C     COMPUTE AVERAGE ANNUAL COST OF MACHINERY INVENTORY
      DO 412 J=1,5
      CLBR(J)=0.0
      DO 412 KK=1,12
  412 CLBR(J)=CLBR(J)+HRS(J,10,KK)*E(46,KK)
      DO 413 J=1,5
      HOURS(10,J)=THRS(10,J)*.90
      DO 413 I=1,9
  413 HOURS(I,J)=THRS(I,J)*.80
      DO 5555 J=1,5
      DO 5555 I=1,10
      IF(INV(I,J).EQ.0) GO TO 5555
      IF(I.EQ.9) GO TO 5555
      XXLBR=0.0
      XXREP=0.0
      XXXFL=0.0
      XTHII=0.0
      XXREL=0.0
      XXDEP=0.0
      XXCRD=0.0
      HAT=0.0
      DO 414 JTAGE=1,KMAX
      HAT=HAT+HOURS(I,J)
      IF(HAT.LT.AHT(I)) GO TO 414
      TAGE=JTAGE
      GO TO 415
  414 CONTINUE
      TAGE=KMAX
  415 III=0
      DO 416 JJ=2,14,3
      III=III+1
      IF(III.NE.INV(I,J)) GO TO 416
      XCASHP=SCL(I,JJ)
      XLISTP=XCASHP*1.143
      GO TO 417
  416 CONTINUE
      GO TO 5555
  417 TMH=HOURS(I,J)*TAGE
      IAGE=TAGE
      IF(I.NE.10) GO TO 419
      XXLBR=CLBR(J)*TAGE
      XXXFL=XLISTP*.000528*TMH*.13
      XXDEP=XLISTP-.675*.933**IAGE*XLISTP
      XXREP=.000913*TMH**1.5*XLISTP*.001
      DO 418 JJ=1,IAGE
      XTHII=XTHII+(RINT+.045)*.675*.933**JJ*XLISTP
      XJ=JJ-1
  418 XXREL=XXREL+XJ*COPY
      GO TO 421
  419 XXDEP=XLISTP-.618*.895**IAGE*XLISTP
      DO 420 JJ=1,IAGE
  420 XTHII=XTHII+(RINT+.040)*.618*.895**JJ*XLISTP
  421 IF(I.LE.5) XXREP=(1200.0/2500.0**1.5)*TMH**1.5*XLISTP*.001
      IF(I.EQ.6) XXREP=(1000.0/1200.0**1.5)*TMH**1.5*XLISTP*.001
      IF(I.EQ.7) XXREP=(1200.0/2000.0**1.5)*TMH**1.5*XLISTP*.001
      IF(I.EQ.8) XXREP=(1000.0/2500.0**1.5)*TMH**1.5*XLISTP*.001
      XXCRD=XCASHP*CINV
      COST=COST+(XXLBR+XXREP+XXXFL+XTHII+XXREL+XXDEP-XXCRD)/TAGE
 5555 CONTINUE
  900 CONTINUE
      IF(L.EQ.1) XTCOST = 999999.0
      IF(COST.GT.XTCOST) GO TO 999
```

TABLE XVI (Continued)

```
      XTCOST=COST
      TMNCST=COST
      DO 82 I=1,5
   82 MACH(I)=MCHN(I)
      DO 820 I=1,10
      DO 820 J=1,5
  820 INV3(I,J)=INV(I,J)
  999 CONTINUE
 1000 CONTINUE
      DO 821 I=1,10
      DO 821 J=1,5
  821 INV(I,J)=INV3(I,J)
C     ******************************************************************
C     DETERMINE HOURS EACH MACHINE IS USED MONTHLY AND ANNUALLY
C     ******************************************************************
 8021 DO 5560 I=1,6
      DO 5560 J=1,10
      DO 5560 K=1,12
 5560 HRS(I,J,K)=0.0
      DO 5590 K=1,12
      DO 5561 I=1,5
      DO 5561 J=1,9
      TLR2(J,I)=TLR1(I,J,K)
      IF(NFYCT.EQ.1) TLR2(J,I)=TLRT(I,J,K)*(TL1(I)/TL2(I))
 5561 CONTINUE
      DO 5562 J=1,9
 5562 SAT(J)=0.0
      DO 5580 I=1,5
      MTN=INV(10,I)
      IF(MTN.LE.0) GO TO 5585
      DO 5570 J=1,9
      IF(SAT(J).EQ.2.0) GO TO 5570
      IF(TLR2(J,MTN).LE.0.0) GO TO 5563
      GO TO 5564
 5563 SAT(J)=2.0
      GO TO 5570
 5564 IF(TLR2(J,MTN).LE.TIME) GO TO 5565
      GO TO 5566
 5565 HRS(I,10,K)=HRS(I,10,K)+TLR2(J,MTN)
      HRS(I,J,K)=TLR2(J,MTN)
      SAT(J)=2.0
      GO TO 5570
 5566 HRS(I,10,K)=HRS(I,10,K)+TIME
      HRS(I,J,K)=TIME
      REDUC=(1.0-TIME/TLR2(J,MTN))
      DO 5567 II=1,5
 5567 TLR2(J,II)=TLR2(J,II)*REDUC
 5570 CONTINUE
      DO 5568 J=1,9
      IF(SAT(J).EQ.2.0) GO TO 5568
      GO TO 5580
 5568 CONTINUE
      GO TO 5585
 5580 CONTINUE
 5585 DO 5590 I=1,5
      IF(HRS(I,10,K).LE.TIME) GO TO 5590
      HRS(I+1,10,K)=HRS(I+1,10,K)+HRS(I,10,K)-TIME
      HRS(I,10,K)=TIME
 5590 CONTINUE
 7000 CONTINUE
C     AVERAGE LABOR REQUIREMENTS AMONG MACHINES
C     OF THE SAME SIZE - DONE BY MONTH
      DO 6115 KK=1,12
      DO 6115 II=1,10
      I=1
 6116 XTH=HRS(I,II,KK)
      XSAME=1.0
      IXX=I
      X1=I-1
      JX=I+1
      DO 6113 J=JX,5
      IF(INV(II,I).NE.INV(II,J)) GO TO 6111
      XTH=XTH+HRS(J,II,KK)
      XSAME=XSAME+1.0
      IF(J.EQ.5) GO TO 6111
      GO TO 6113
 6111 I=J
      IF(XSAME.EQ.1.0) GO TO 6114
      XAH=XTH/XSAME
      JJ=XSAME+X1
      DO 6112 III=IXX,JJ
 6112 HRS(III,II,KK)=XAH
      GO TO 6114
 6113 CONTINUE
 6114 IF(I.LE.4.AND.INV(II,I).GT.0) GO TO 6116
 6115 CONTINUE
 7050 CONTINUE
C     TOTAL ANNUAL HOURS FOR EACH MACHINE
      DO 904 J=1,10
      DO 904 I=1,5
  904 THRS(J,I)=0.0
      DO 905 J=1,10
      DO 905 I=1,5
      DO 905 K=1,12
  905 THRS(J,I)=THRS(J,I)+HRS(I,J,K)
      TOTHRS=0.0
      DO 906 I=1,5
  906 TOTHRS=TOTHRS+THRS(10,I)
      DO 9051 K=1,12
 9051 SUMHRS(K)=0.0
      DO 9052 K=1,12
      DO 9052 I=1,5
 9052 SUMHRS(K)=SUMHRS(K)+HRS(I,10,K)
      IF(NFYCT.GT.1) GO TO 9060
      DO 871 I=1,10
      DO 871 J=1,5
      THAC(I,J)=THRS(I,J)*AGE2(I,J)*.80
      IF(I.EQ.9) THAC(I,J)=0.0
      IF(I.EQ.10) THAC(I,J)=THRS(I,J)*AGE2(I,J)*.90
  871 CONTINUE
```

```
      NFYCT=NFYCT+1
      GO TO 8750
C     *******************************************************************
C     DETERMINE WHAT EXISTING MACHINES MEET THE REQUIREMENTS AND IF
C     THOSE MACHINES SHOULD BE TRADED.  EXISTING MACHINES NOT
C     MEETING THE REQUIREMENTS ARE TRADED FOR THE NEEDED MACHINES.
C     DEPRECIATION, INVESTMENT CREDIT, AND INVESTMENT IS COMPUTED.
C     *******************************************************************
 9060 TCOST=0.0
      XXVNM=0.0
      XXVUM=0.0
      VMI=0.0
      VLEFT = 0.0
      DEPREC = 0.0
      CREDIT = 0.0
      DO 912 J=1,5
      DO 912 I=1,10
      IF(INV(I,J).EQ.  0) GO TO 912
      IF(I.EQ.9) GO TO 912
      III=0
      DO 907 II=2,14,3
      III=III+1
      IF(III.NE.INV(I,J)) GO TO 907
      XCASHP=SCL(I,II)
      XLISTP=XCASHP*1.143
      GO TO 908
  907 CONTINUE
      GO TO 912
  908 DO 911 IJ=1,5
      IF(I.EQ.7.AND.INV2(7,IJ).GT.0) GO TO 910
      IF(I.EQ.8.AND.INV2(8,IJ).GT.0) GO TO 910
      IF(INV2(I,IJ).EQ.0) GO TO 911
      IF(INV(I,J).NE.INV2(I,IJ)) GO TO 911
  910 IAGE=AGE2(I,IJ)
      INV2(I,IJ)=0
      THB=THAC(I,IJ)
      HAC(I,J)=THB
      THAC(I,J)=THB+THRS(I,J)*.80
      IF(I.EQ.10) THAC(I,J)=THB+THRS(I,J)*.90
      IF(THB.GE.AHT(I)) GO TO 909
      IF(IAGE.GE.KMAX) GO TO 909
C     MACHINES OF THE SAME SIZE - KEPT
      AGE(I,J)=AGE2(I,IJ)
      VLEFT=XCASHP
      DO 9181 LD = 1,IAGE
      IF(LD.GT.1) GO TO 9081
      VLEFT=VLEFT-VLEFT*.20*(1.0-BUYMO/12.0)
      GO TO 9181
 9081 VLEFT=VLEFT-VLEFT*.20
 9181 CONTINUE
      DEPREC=DEPREC+VLEFT*.20
      IAGE=IAGE+1
      IF(I.NE.10) GO TO 9082
      VMI=VMI+.675*.933**IAGE*XLISTP
      XXVUM=XXVUM+.675*.933**IAGE*XLISTP
      GO TO 912
 9082 VMI=VMI+.618*.895**IAGE*XLISTP
      XXVUM=XXVUM+.618*.895**IAGE*XLISTP
      GO TO 912
C     MACHINES OF THE SAME SIZE - TRADED
  909 IF(I.NE.10) GO TO 9083
      VALUE=.675*.933**IAGE*XLISTP
      VMI=VMI+.675*.933*XLISTP
      XXVNM=XXVNM+.675*.933*XLISTP
      GO TO 9085
 9083 VALUE=.618*.895**IAGE*XLISTP
      VMI=VMI+.618*.895*XLISTP
      XXVNM=XXVNM+.618*.895*XLISTP
 9085 TCOST=TCOST+XCASHP-VALUE*.875
      AGE(I,J)=0.0
      VLEFT=XCASHP
      DO 9191 LD=1,IAGE
      IF(LD.GT.1) GO TO 9091
      VLEFT=VLEFT-VLEFT*.20*(1.0-BUYMO/12.0)
      GO TO 9191
 9091 VLEFT=VLEFT-VLEFT*.20
 9191 CONTINUE
      DEPREC=DEPREC+VLEFT*.20*(BUYMO/12.0)
      DEPREC=DEPREC+XCASHP*.20*(1.0-BUYMO/12.0)
      CREDIT=CREDIT+XCASHP*CINV
      GO TO 912
  911 CONTINUE
C     MACHINES NOT OF THE SAME SIZE - TRADED
      TCOST=TCOST+XCASHP
      IF(I.NE.10) GO TO 902
      VMI=VMI+.675*.933*XLISTP
      XXVNM=XXVNM+.675*.933*XLISTP
      GO TO 903
  902 VMI=VMI+.618*.895*XLISTP
      XXVNM=XXVNM+.618*.895*XLISTP
  903 AGE(I,J)=0.0
      DEPREC=DEPREC+XCASHP*.20*(1.0-BUYMO/12.0)
      CREDIT=CREDIT+XCASHP*CINV
  912 CONTINUE
      DO 9124 I=1,10
      DO 9124 J=1,5
      IF(INV(I,J).GT.0) GO TO 9124
      AGE(I,J)=0.0
 9124 CONTINUE
      DO 9121 I=1,10
      DO 9121 J=1,5
      IF(AGE(I,J).NE.0.0) GO TO 9121
      THAC(I,J)=THRS(I,J)*.80
      IF(I.EQ.10) THAC(I,J)=THRS(I,J)*.90
 9121 CONTINUE
      DO 9122 J=1,5
 9122 THAC(9,J)=0.0
      DO 925 I=1,10
      DO 925 J=1,5
      IF(INV2(I,J).LE.0) GO TO 925
```

```
      IF(I.EQ.9) GO TO 925
      III=0
      DO 913 II=2,14,3
      III=III+1
      IF(III.NE.INV2(I,J)) GO TO 913
      XCASHP=SCL(I,II)
      XLISTP=XCASHP*1.143
      IAGE=AGE2(I,J)
      GO TO 914
  913 CONTINUE
      GO TO 925
  914 IF(I.NE.10) GO TO 915
      XXVAL=.675*.933**IAGE*XLISTP
      GO TO 916
  915 XXVAL=.618*.895**IAGE*XLISTP
  916 TCOST=TCOST-XXVAL*.875
      VLEFT=XCASHP
      DO 9162 LD=1,IAGE
      IF(LD.GT.1) GO TO 9161
      VLEFT=VLEFT-VLEFT*.20*(1.0-BUYMO/12.0)
      GO TO 9162
 9161 VLEFT=VLEFT-VLEFT*.20
 9162 CONTINUE
      DEPREC=DEPREC+VLEFT*.20*(BUYMO/12.0)
  925 CONTINUE
      IF(CREDIT.GT.25000.) CREDIT=25000.
C     *****************************************************************
C     COMPUTE TOTAL COSTS BY MONTH FOR REPAIRS, TAXES, HOUSING,
C     INSURANCE, FUEL, AND LUBRICANTS.
C     *****************************************************************
      DO 927 I=1,12
  927 RTHIFL(I)=0.0
      DO 949 J=1,5
      DO 949 I=1,10
      IF(I.EQ.9) GO TO 949
      IF(AGE(I,J).EQ.0.0) HAC(I,J)=0.0
      III=0
      DO 930 II=2,14,3
      III=III+1
      IF(III.NE.INV(I,J)) GO TO 930
      SAL=SCL(I,II)*1.143
      IAG=AGE(I,J)+1.0
      GO TO 931
  930 CONTINUE
      GO TO 949
  931 IF(I.EQ.10) GO TO 932
      IF(I.GE.1.AND.I.LE.5) GO TO 935
      IF(I.EQ.6) GO TO 938
      IF(I.EQ.7) GO TO 941
      GO TO 944
  932 DO 933 K=1,12
      HS=HRS(J,I,K)*.90
      HPAT=HAC(I,J)
      HAC(I,J)=HPAT+HS
      HNEW=HAC(I,J)
      RTHIFL(K)=RTHIFL(K)+.000913* HNEW **1.5*SAL*.001-.000913* HPAT
     1**1.5*SAL*.001+SAL*.00052B*HS*.13
      IF(K.NE.12) GO TO 933
      RTHIFL(K)=RTHIFL(K)+.045*.675*.933**IAG*SAL
  933 CONTINUE
      GO TO 949
  935 DO 936 K=1,12
      HS=HRS(J,I,K)*.80
      HPAT=HAC(I,J)
      HAC(I,J)=HPAT+HS
      HNEW=HAC(I,J)
      RTHIFL(K)=RTHIFL(K)+(1200.0/2500.0**1.5)* HNEW **1.5*SAL*.001-
     1(1200.0/2500.0**1.5)* HPAT **1.5*SAL*.001
      IF(K.NE.12) GO TO 936
      RTHIFL(K)=RTHIFL(K)+.040*.618*.895**IAG*SAL
  936 CONTINUE
      GO TO 949
  938 DO 939 K=1,12
      HS=HRS(J,I,K)*.80
      HPAT=HAC(I,J)
      HAC(I,J)=HPAT+HS
      HNEW=HAC(I,J)
      RTHIFL(K)=RTHIFL(K)+(1000.0/1200.0**1.5)* HNEW **1.5*SAL*.001-
     1(1000.0/1200.0**1.5)* HPAT **1.5*SAL*.001
      IF(K.NE.12) GO TO 939
      RTHIFL(K)=RTHIFL(K)+.040*.618*.895**IAG*SAL
  939 CONTINUE
      GO TO 949
  941 DO 942 K=1,12
      HS=HRS(J,I,K)*.80
      HPAT=HAC(I,J)
      HAC(I,J)=HPAT+HS
      HNEW=HAC(I,J)
      RTHIFL(K)=RTHIFL(K)+(1200.0/2000.0**1.5)* HNEW **1.5*SAL*.001-
     1(1200.0/2000.0**1.5)* HPAT **1.5*SAL*.001
      IF(K.NE.12) GO TO 942
      RTHIFL(K)=RTHIFL(K)+.040*.618*.895**IAG*SAL
  942 CONTINUE
      GO TO 949
  944 DO 945 K=1,12
      HS=HRS(J,I,K)*.80
      HPAT=HAC(I,J)
      HAC(I,J)=HPAT+HS
      HNEW=HAC(I,J)
      RTHIFL(K)=RTHIFL(K)+(1000.0/2500.0**1.5)* HNEW **1.5*SAL*.001-
     1(1000.0/2500.0**1.5)* HPAT **1.5*SAL*.001
      IF(K.NE.12) GO TO 945
      RTHIFL(K)=RTHIFL(K)+.040*.618*.895**IAG*SAL
  945 CONTINUE
  949 CONTINUE
C     *****************************************************************
C     ARRANGE INVENTORY SO YOUNGEST MACHINE OF SAME SIZES PLACED FIRST
C     ARRANGE ACCUMULATED HOURS ACCORDINGLY
C     SIZES REMAIN IN DESCENDING ORDER
C     *****************************************************************
```

```
      DO 615 I=1,10
      JJ=1
      IF(INV(I,JJ+1).EQ.0) GO TO 615
  608 IF(INV(I,JJ).EQ.0) GO TO 615
      IF(JJ.EQ.5) GO TO 615
      DO 609 JX=1,5
  609 HLDAGE(JX)=99.0
      DO 610 J=JJ,4
      KK=J+1
      HLDAGE(J)=AGE(I,J)
      HLDHRS(J)=THAC(I,J)
      IF(INV(I,J).NE.INV(I,J+1)) GO TO 611
      HLDAGE(J+1)=AGE(I,J+1)
      HLDHRS(J+1)=THAC(I,J+1)
  610 CONTINUE
  611 DO 612 J=1,5
      IF(HLDAGE(J).LT.88.0) GO TO 613
  612 CONTINUE
      JJ=KK
      GO TO 608
  613 XHLDA=98.0
      DO 614 J=1,5
      IF(HLDAGE(J).GE.XHLDA) GO TO 614
      XHLDA=HLDAGE(J)
      MJ=J
  614 CONTINUE
      AGE(I,JJ)=HLDAGE(MJ)
      THAC(I,JJ)=HLDHRS(MJ)
      HLDAGE(MJ)=99.0
      JJ=JJ+1
      GO TO 611
  615 CONTINUE
C     ******************************************************************
C     SAVE
C     ******************************************************************
      K = NYEAR
      DO 951 I=1,10
      DO 951 J=1,5
      SVTHAC(K,I,J)=THAC(I,J)
      MCHSAV(K,I,J)=INV(I,J)
      IF(INV(I,J).GT.0) GO TO 950
      AGESAV(K,I,J)=0.0
      GO TO 951
  950 AGESAV(K,I,J)=AGE(I,J)+1.0
  951 CONTINUE
      DO 952 J=1,12
      SAVHRS(NYEAR,J)=SUMHRS(J)
  952 SAVEXP(NYEAR,J)=RTHIFL(J)
      TMCOST(NYEAR)=TCOST
      TVMI(NYEAR)=VMI
      TMDEP(NYEAR)=DEPREC
      TMCRED(NYEAR)=CREDIT
      XVNM(NYEAR)=XXVNM
      XVUM(NYEAR)=XXVUM
      RETURN
      END
      SUBROUTINE FINANC
C     ******************************************************************
C     ******************************************************************
      REAL*8  SFNC2,DPS
      COMMON  SFNC2(25,29)
      COMMON  L2(35),PC(61,7),E(49,13),W(5,13),JFP(25,31),NR,TWEL(25),R,
     1MO(27,8),CI(6,2),SCL(10,15),MCOMB(1200),CPGP(15,2),LP(5),PL(25,5),
     2CV(17,2),PPA(59,6),V(230),TX1EXP,TX2EXP,SCOWS,NPP,RET(13),EXP(13),
     3WORK(13),P1,P2,P3,P4,P5,P6,TL1(26),TL2(26),TL1LPP(59),TL1NPP(59),
     4TL2LPP(59),TL2NPP(59),CROP1(8),CROP2(8),YEAR,NYEAR,SND(26,14),IX,
     5N,OWN(26),RENT2(26),BEGLND,BEGCAP,BEGLD,BEGMD,PERMIT,UNOFAC,AC25,
     6ACANY,BONLY,RONLY,BANDR,PCTBL,CLOOPS,RENT,LACYR,PASS,DONE,VALLND,
     7ACDYR,ACD25,PAY(150),TIN(150),PAYL(150),TINL(150),PRINL(150),
     8DPL(150),PAYM(80),PAYC(80),TINM(80),TINC(80),PRINM(80),PRINC(80),
     9DPM(80),DPC(80),BEGDM,XINTM,AMM,AMNOM,CODEM,XINTC,AMC,AMNOC,CODEC,
     /BEGDL,XINTL,AML,AMNOL,CODEL,DM,DC,DL,SC,PROF,DEPEN,DEPTOT,WK(12),
     1CHGLAB(12),CREDIT,FITAX(25),SITAX(25),SST(25),OUTINC,SSTWP(25),
     2TOTTAX,HLDSST,HLDFIT,HLDSIT,TIME,RINT,COPY,BUYMO,MCHSAV(25,10,5),
     3AGESAV(25,10,5),SAVHRS(25,12),SAVEXP(25,12),TMCOST(25),TVMI(25),
     4TMDEP(25),TMCRED(25),THRS(10,5),THREE(25,12),FOUR(25,12),FNC(29),
     5ELEVEN(25,12),SFNC(25,29),FNCL(25,29),FNCH(25,29),NVPAY,ISIY,
     6XVNM(25),XVUM(25),CROP(25,8),SVTHAC(25,10,5)
C     ******************************************************************
C     MACHINERY
C     ******************************************************************
      IF(DM.EQ.0.0.AND.BEGDM.EQ.0.0) GO TO 16
      IF(YEAR.EQ.1.0) DM=DM+BEGDM
      IF(DM.EQ.0.0) GO TO 16
      IF(NYEAR.EQ.1) GO TO 5
      PAYM(NYEAR)=PAYM(NYEAR)+DPM(NYEAR)
      PRINM(NYEAR)=DPM(NYEAR-1)
      PAY(NYEAR)=PAY(NYEAR)+DPM(NYEAR)
    5 DPM(NYEAR)=DPM(NYEAR)+DM
      LAST=NYEAR+49
      DO 6 J=NYEAR,LAST
      NYJ=J+1
      PAY(NYJ)=PAY(NYJ)-PAYM(NYJ)
      TIN(NYJ)=TIN(NYJ)-TINM(NYJ)
      PAYM(NYJ)=0.0
      TINM(NYJ)=0.0
      PRINM(NYJ)=0.0
    6 DPM(NYJ)=0.0
      XINT=XINTM
      MN=AMM
      NA=AMNOM
      IF(NA.LE.0) GO TO 11
      JK=NA+1
      DM=DPM(NYEAR)
      DO 10 J=1,NA
      NYJ=NYEAR+J
      PAY(NYJ)=PAY(NYJ)+DM*XINT
      PAYM(NYJ)=PAYM(NYJ)+DM*XINT
      TIN(NYJ)=TIN(NYJ)+DM*XINT
      TINM(NYJ)=TINM(NYJ)+DM*XINT
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TABLE XVI (Continued)

```
      PRINM(NYJ)=PAYM(NYJ)-TINM(NYJ)
   10 OPM(NYJ)=OPM(NYJ)+DM
      GO TO 12
   11 JK=1
   12 IF(CODEM.NE.2.0) GO TO 14
      DM=OPM(NYEAR)
      DBT=DM/AMM
      MN=MN+NA
      DO 13 J=JK,MN
      NYJ=NYEAR+J
      PAY(NYJ)=PAY(NYJ)+DBT+DM*XINT
      PAYM(NYJ)=PAYM(NYJ)+DBT+DM*XINT
      TIN(NYJ)=TIN(NYJ)+DM*XINT
      TINM(NYJ)=TINM(NYJ)+DM*XINT
      PRINM(NYJ)=PAYM(NYJ)-TINM(NYJ)
      OPM(NYJ)=OPM(NYJ)+DM-DBT
   13 DM=DM-DBT
      GO TO 16
   14 OP=OPM(NYEAR)
      AP=((XINT*(1.0+XINT)**MN)/((1.0+XINT)**MN-1.0))*OP
      MN=MN+NA
      DO 15 J=JK,MN
      NYJ=NYEAR+J
      PAY(NYJ)=PAY(NYJ)+AP
      PAYM(NYJ)=PAYM(NYJ)+AP
      TIN(NYJ)=TIN(NYJ)+OP*XINT
      TINM(NYJ)=TINM(NYJ)+OP*XINT
      PRINM(NYJ)=PAYM(NYJ)-TINM(NYJ)
      OP=OP-(AP-(OP*XINT))
   15 OPM(NYJ)=OPM(NYJ)+OP
C     *****************************************************************
C     LIVESTOCK
C     *****************************************************************
   16 IF(SC.EQ.0.0) GO TO 165
      PAYC(NYEAR)=PAYC(NYEAR)+OPC(NYEAR)
      PAY(NYEAR)=PAY(NYEAR)+OPC(NYEAR)
      PRINC(NYEAR)=OPC(NYEAR-1)
      OPC(NYEAR)=0.0
      GO TO 167
  165 IF(DC.EQ.0.0) GO TO 23
      IF(NYEAR.EQ.1) GO TO 166
      PRINC(NYEAR)=OPC(NYEAR-1)
      PAY(NYEAR)=PAY(NYEAR)+OPC(NYEAR)
  166 OPC(NYEAR)=OPC(NYEAR)+DC
  167 LAST=NYEAR+49
      DO 168 J=NYEAR,LAST
      NYJ=J+1
      PAY(NYJ)=PAY(NYJ)-PAYC(NYJ)
      TIN(NYJ)=TIN(NYJ)-TINC(NYJ)
      PAYC(NYJ)=0.0
      TINC(NYJ)=0.0
      PRINC(NYJ)=0.0
  168 OPC(NYJ)=0.0
      IF(SC.GT.0.0) GO TO 23
      XINT=XINTC
      MN=AMC
      NA=AMNOC
      IF(NA.LE.0) GO TO 18
      JK=NA+1
      DC=OPC(NYEAR)
      DO 17 J=1,NA
      NYJ=NYEAR+J
      PAY(NYJ)=PAY(NYJ)+DC*XINT
      PAYC(NYJ)=PAYC(NYJ)+DC*XINT
      TIN(NYJ)=TIN(NYJ)+DC*XINT
      TINC(NYJ)=TINC(NYJ)+DC*XINT
      PRINC(NYJ)=PAYC(NYJ)-TINC(NYJ)
   17 OPC(NYJ)=OPC(NYJ)+DC
      GO TO 19
   18 JK=1
   19 IF(CODEC.NE.2.0) GO TO 21
      DC=OPC(NYEAR)
      DBT=DC/AMC
      MN=MN+NA
      DO 20 J=JK,MN
      NYJ=NYEAR+J
      PAY(NYJ)=PAY(NYJ)+DBT+DC*XINT
      PAYC(NYJ)=PAYC(NYJ)+DBT+DC*XINT
      TIN(NYJ)=TIN(NYJ)+DC*XINT
      TINC(NYJ)=TINC(NYJ)+DC*XINT
      PRINC(NYJ)=PAYC(NYJ)-TINC(NYJ)
      OPC(NYJ)=OPC(NYJ)+DC-DBT
   20 DC=DC-DBT
      GO TO 23
   21 OP=OPC(NYEAR)
      AP=((XINT*(1.0+XINT)**MN)/((1.0+XINT)**MN-1.0))*OP
      MN=MN+NA
      DO 22 J=JK,MN
      NYJ=NYEAR+J
      PAY(NYJ)=PAY(NYJ)+AP
      PAYC(NYJ)=PAYC(NYJ)+AP
      TIN(NYJ)=TIN(NYJ)+OP*XINT
      TINC(NYJ)=TINC(NYJ)+OP*XINT
      PRINC(NYJ)=PAYC(NYJ)-TINC(NYJ)
      OP=OP-(AP-(OP*XINT))
   22 OPC(NYJ)=OPC(NYJ)+OP
C     *****************************************************************
C     LAND
C     *****************************************************************
   23 IF(DL.EQ.0.0.AND.BEGDL.EQ.0.0) RETURN
      IF(YEAR.EQ.1.0) DL=DL+BEGDL
      IF(DL.EQ.0.0) RETURN
      IF(NYEAR.EQ.1) GO TO 230
      PAYL(NYEAR)=PAYL(NYEAR)+OPL(NYEAR)
      PRINL(NYEAR)=OPL(NYEAR-1)
      PAY(NYEAR)=PAY(NYEAR)+OPL(NYEAR)
  230 OPL(NYEAR)=OPL(NYEAR)+DL
      LAST=NYEAR+124
      DO 231 J=NYEAR,LAST
      NYJ=J+1
```

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      PAY(NYJ)=PAY(NYJ)-PAYL(NYJ)
      TIN(NYJ)=TIN(NYJ)-TINL(NYJ)
      PAYL(NYJ)=0.0
      TINL(NYJ)=0.0
      PRINL(NYJ)=0.0
  231 OPL(NYJ)=0.0
      XINT=XINTL
      MN=AML
      NA=AMNOL
      IF(NA.LE.0) GO TO 25
      JK=NA+1
      DL=OPL(NYEAR)
      DO 24 J=1,NA
      NYJ=NYEAR+J
      PAY(NYJ)=PAY(NYJ)+DL*XINT
      PAYL(NYJ)=PAYL(NYJ)+DL*XINT
      TIN(NYJ)=TIN(NYJ)+DL*XINT
      TINL(NYJ)=TINL(NYJ)+DL*XINT
      PRINL(NYJ)=PAYL(NYJ)-TINL(NYJ)
   24 OPL(NYJ)=OPL(NYJ)+DL
      GO TO 26
   25 JK=1
   26 IF(CODEL.NE.2.0) GO TO 28
      DL=OPL(NYEAR)
      DBT=DL/AML
      MN=MN+NA
      DO 27 J=JK,MN
      NYJ=NYEAR+J
      PAY(NYJ)=PAY(NYJ)+DBT+DL*XINT
      PAYL(NYJ)=PAYL(NYJ)+DBT+DL*XINT
      TIN(NYJ)=TIN(NYJ)+DL*XINT
      TINL(NYJ)=TINL(NYJ)+DL*XINT
      PRINL(NYJ)=PAYL(NYJ)-TINL(NYJ)
      OPL(NYJ)=OPL(NYJ)+DL-DBT
   27 DL=DL-DBT
      RETURN
   28 OP=OPL(NYEAR)
      AP=((XINT*(1.0+XINT)**MN)/((1.0+XINT)**MN-1.0))*OP
      MN=MN+NA
      DO 29 J=JK,MN
      NYJ=NYEAR+J
      PAY(NYJ)=PAY(NYJ)+AP
      PAYL(NYJ)=PAYL(NYJ)+AP
      TIN(NYJ)=TIN(NYJ)+OP*XINT
      TINL(NYJ)=TINL(NYJ)+OP*XINT
      PRINL(NYJ)=PAYL(NYJ)-TINL(NYJ)
      OP=OP-(AP-(OP*XINT))
   29 OPL(NYJ)=OPL(NYJ)+OP
      RETURN
      END
      SUBROUTINE TAXES
C     ***********************************************************************
C     ***********************************************************************
      REAL*8 SFNC2,DPS
      COMMON  SFNC2(25,29)
      COMMON  L2(35),PC(61,7),E(49,13),W(5,13),JFP(25,31),NR,TWEL(25),R,
     1MO(27,8),CI(6,2),SCL(10,15),MCOMB(1200),CPGP(15,2),LP(5),PL(25,5),
     2CV(17,2),PPA(59,6),V(230),TX1EXP,TX2EXP,SCOWS,NPP,RET(13),EXP(13),
     3WORK(13),P1,P2,P3,P4,P5,P6,TL1(26),TL2(26),TL1LPP(59),TL1NPP(59),
     4TL2LPP(59),TL2NPP(59),CROP1(8),CROP2(8),YEAR,NYEAR,SND(26,14),IX,
     5N,OWN(26),RENT2(26),BEGLND,BEGCAP,BEGLD,BEGMD,PERMIT,UNDFAC,AC25,
     6ACANY,BONLY,RONLY,BANDR,PCTBL,CLOOPS,RENT,LACYR,PASS,DONE,VALLND,
     7ACDYR,ACD25,PAY(150),TIN(150),PAYL(150),TINL(150),PRINL(150),
     8OPL(150),PAYM(80),PAYC(80),TINM(80),TINC(80),PRINM(80),PRINC(80),
     9OPM(80),OPC(80),BEGDM,XINTM,AMM,AMNDM,CODEM,XINTC,AMC,AMNDC,CODEC,
     /BEGDL,XINTL,AML,AMNOL,CODEL,DM,DC,DL,SC,PROF,DEPEN,DEPTOT,WK(12),
     1CHGLAB(12),CREDIT,FITAX(25),SITAX(25),SST(25),OUTINC,SSTWP(25),
     2TOTTAX,HLDSST,HLDFIT,HLDSIT,TIME,RINT,COPY,BUYMO,MCHSAV(25,10,5),
     3AGESAV(25,10,5),SAVHRS(25,12),SAVEXP(25,12),TMCOST(25),TVMI(25),
     4TMDEP(25),TMCRED(25),THRS(10,5),THREE(25,12),FOUR(25,12),FNC(29),
     5ELEVEN(25,12),SFNC(25,29),FNCL(25,29),FNCH(25,29),NVPAY,ISIY,
     6XVNM(25),XVUM(25),CROP(25,8),SVTHAC(25,10,5)
      IF(YEAR.NE.1.0) GO TO 9
      DO  8 J=1,25
      FITAX(J)=0.0
      SITAX(J)=0.0
      SST(J)=0.0
    8 SSTWP(J)=0.0
C     ***********************************************************************
C     FEDERAL PERSONAL INCOME TAX
C     ***********************************************************************
    9 TI=PROF-DEPEN*600.0
      IF(PROF*.10.LE.1000.) GO TO 10
      TI=TI-1000.
      GO TO 15
   10 IF(PROF*.10.LE.DEPEN*100.+200.) GO TO 11
      TI=TI-PROF*.10
      GO TO 15
   11 TI = TI-(200.+100.*DEPEN)
   15 EL=0.0
      DO 16 J=1,12
      IF(WK(J).GE.WORK(J)) GO TO 16
      EL=EL+(WORK(J)-WK(J))*CHGLAB(J)
   16 CONTINUE
      TI=TI-EL*.044
      IF(TI.LE.0.0) TAX=0.0
      IF(TI.GT.0.0.AND.TI.LE.1000.) TAX=(.14+.14*.10)*TI
      IF(TI.GT.1000..AND.TI.LE.2000.) TAX=(140.+140.*.10)+
     1(.15+.15*.10)*(TI-1000.)
      IF(TI.GT.2000..AND.TI.LE.3000.) TAX=(290.+290.*.10)+
     1(.16+.16*.10)*(TI-2000.)
      IF(TI.GT.3000..AND.TI.LE.4000.) TAX=(450.+450.*.10)+
     1(.17+.17*.10)*(TI-3000.)
      IF(TI.GT.4000..AND.TI.LE.8000.) TAX=(620.+620.*.10)+
     1(.19+.19*.10)*(TI-4000.)
      IF(TI.GT.8000..AND.TI.LE.12000.) TAX=(1380.+1380.*.10)+
     1(.22+.22*.10)*(TI-8000.)
      IF(TI.GT.12000..AND.TI.LE.16000.) TAX=(2260.+2260.*.10)+
     1(.25+.25*.10)*(TI-12000.)
      IF(TI.GT.16000..AND.TI.LE.20000.) TAX=(3260.+3260.*.10)+
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     1(.28+.28*.10)*(TI-16000.)
      IF(TI.GT.20000..AND.TI.LE.24000.) TAX=(4380.+4380.*.10)+
     1(.32+.32*.10)*(TI-20000.)
      IF(TI.GT.24000..AND.TI.LE.28000.) TAX=(5660.+5660.*.10)+
     1(.36+.36*.10)*(TI-24000.)
      IF(TI.GT.28000..AND.TI.LE.32000.) TAX=(7100.+7100.*.10)+
     1(.39+.39*.10)*(TI-28000.)
      IF(TI.GT.32000..AND.TI.LE.36000.) TAX=(8660.+8660.*.10)+
     1(.42+.42*.10)*(TI-32000.)
      IF(TI.GT.36000..AND.TI.LE.40000.) TAX=(10340.+10340.*.10)+
     1(.45+.45*.10)*(TI-36000.)
      IF(TI.GT.40000..AND.TI.LE.44000.) TAX=(12140.+12140.*.10)+
     1(.48+.48*.10)*(TI-40000.)
      IF(TI.GT.44000..AND.TI.LE.52000.) TAX=(14060.+14060.*.10)+
     1(.50+.50*.10)*(TI-44000.)
      IF(TI.GT.52000..AND.TI.LE.64000.) TAX=(18060.+18060.*.10)+
     1(.53+.53*.10)*(TI-52000.)
      IF(TI.GT.64000..AND.TI.LE.76000.) TAX=(24420.+24420.*.10)+
     1(.55+.55*.10)*(TI-64000.)
      IF(TI.GT.76000..AND.TI.LE.88000.) TAX=(31020.+31020.*.10)+
     1(.58+.58*.10)*(TI-76000.)
      IF(TI.GT.88000.)TAX=(37980.+37980.*.10)+(.60+.60*.10)*(TI-88000.)
      TAX=TAX-CREDIT-HLDFIT
      IF(TAX.LE.0.0) TAX=0.0
      FITAX(NYEAR)=TAX
C     *****************************************************************
C     STATE PERSONAL INCOME TAX
C     *****************************************************************
      SITAX(NYEAR)=(FITAX(NYEAR)+HLDFIT)*.05-HLDSIT
      IF(SITAX(NYEAR).LE.0.0) SITAX(NYEAR)=0.0
C     *****************************************************************
C     SELF-EMPLOYMENT SOCIAL SECURITY TAX
C     *****************************************************************
      IF(TI.GE.6600.) GO TO 25
      SST(NYEAR)=(TI-OUTINC)*.064
      IF(SST(NYEAR).LE.0.0) SST(NYEAR)=0.0
      GO TO 26
   25 SST(NYEAR)=(6600.-OUTINC)*.064
      IF(SST(NYEAR).LE.0.0) SST(NYEAR)=0.0
C     *****************************************************************
C     SOCIAL SECURITY TAX ON WAGES PAID
C     *****************************************************************
   26 SSTWP(NYEAR)=EL*.088
C     *****************************************************************
C     TOTAL FEDERAL, STATE, AND SOCIAL SECURITY TAXES
C     *****************************************************************
   28 TOTTAX=FITAX(NYEAR)+SITAX(NYEAR)+SST(NYEAR)+SSTWP(NYEAR)+
     1HLDFIT+HLDSIT+HLDSST
      RETURN
      END
      SUBROUTINE WANDR(KODE)
C     *****************************************************************
C     *****************************************************************
      REAL*8  SFNC2,DPS
      COMMON  SFNC2(25,29)
      COMMON  L2(35),PC(61,7),E(49,13),W(5,13),JFP(25,31),NR,TWEL(25),R,
     1MD(27,8),CI(6,2),SCL(10,15),MCOMB(1200),CPGP(15,2),LP(5),PL(25,5),
     2CV(17,2),PPA(59,6),V(230),TX1EXP,TX2EXP,SCOWS,NPP,RET(13),EXP(13),
     3WORK(13),P1,P2,P3,P4,P5,P6,TL1(26),TL2(26),TL1LPP(59),TL1NPP(59),
     4TL2LPP(59),TL2NPP(59),CROP1(8),CROP2(8),YEAR,NYEAR,SND(26,14),IX,
     5N,OWN(26),RENT2(26),BEGLND,BEGCAP,BEGLD,BEGMD,PERMIT,UNOFAC,AC25,
     6ACANY,BONLY,RONLY,BANDR,PCTBL,CLOOPS,RENT,LACYR,PASS,DONE,VALLND,
     7ACDYR,ACD25,PAY(150),TIN(150),PAYL(150),TINL(150),PRINL(150),
     8OPL(150),PAYM(80),PAYC(80),TINM(80),TINC(80),PRINM(80),PRINC(80),
     9OPM(80),OPC(80),BEGDM,XINTM,AMM,AMNOM,CODEM,XINTC,AMC,AMNOC,CODEC,
     /BEGDL,XINTL,AML,AMNOL,CODEL,DM,DC,DL,SC,PROF,DEPEN,DEPTOT,WK(12),
     1CHGLAB(12),CREDIT,FITAX(25),SITAX(25),SST(25),OUTINC,SSTWP(25),
     2TOTTAX,HLDSST,HLDFIT,HLDSIT,TIME,RINT,COPY,BUYMO,MCHSAV(25,10,5),
     3AGESAV(25,10,5),SAVHRS(25,12),SAVEXP(25,12),TMCOST(25),TVMI(25),
     4TMDEP(25),TMCRED(25),THRS(10,5),THREE(25,12),FOUR(25,12),FNC(29),
     5ELEVEN(25,12),SFNC(25,29),FNCL(25,29),FNCH(25,29),NVPAY,ISIY,
     6XVNM(25),XVUM(25),CROP(25,8),SVTHAC(25,10,5)
      REWIND 2
      IF(KODE.EQ.2) GO TO 5
      WRITE(2) JFP
      WRITE(2) THREE
      WRITE(2) FOUR
      WRITE(2) ELEVEN
      WRITE(2) TWEL
      WRITE(2) SFNC
      WRITE(2) SFNC2
      WRITE(2) FNCL
      WRITE(2) FNCH
      WRITE(2) SAVHRS
      WRITE(2) SAVEXP
      WRITE(2) TMCOST
      WRITE(2) TVMI
      WRITE(2) TMDEP
      WRITE(2) TMCRED
      WRITE(2) XVNM
      WRITE(2) XVUM
      WRITE(2) SVTHAC
      WRITE(2) MCHSAV
      WRITE(2) AGESAV
      RETURN
    5 READ(2) JFP
      READ(2) THREE
      READ(2) FOUR
      READ(2) ELEVEN
      READ(2) TWEL
      READ(2) SFNC
      READ(2) SFNC2
      READ(2) FNCL
      READ(2) FNCH
      READ(2) SAVHRS
      READ(2) SAVEXP
      READ(2) TMCOST
      READ(2) TVMI
      READ(2) TMDEP
      READ(2) TMCRED
```

TABLE XVI (Continued)

```
      READ(2) XVNM
      READ(2) XVUM
      READ(2) SVTHAC
      READ(2) MCHSAV
      READ(2) AGESAV
      RETURN
      END
      SUBROUTINE OUTPUT
C     *****************************************************************
C     *****************************************************************
      REAL*8  SFNC2,DPS
      COMMON  SFNC2(25,29)
      COMMON  L2(35),PC(61,7),E(49,13),W(5,13),JFP(25,31),NR,TWEL(25),R,
     1MO(27,8),CI(6,2),SCL(1D,15),MCOMB(1200),CPGP(15,2),LP(5),PL(25,5),
     2CV(17,2),PPA(59,6),V(230),TX1EXP,TX2EXP,SCOWS,NPP,RET(13),EXP(13),
     3WORK(13),P1,P2,P3,P4,P5,P6,TL1(26),TL2(26),TL1LPP(59),TL1NPP(59),
     4TL2LPP(59),TL2NPP(59),CROP1(8),CROP2(8),YEAR,NYEAR,SND(26,14),IX,
     5N,OWN(26),RENT2(26),BEGLND,BEGCAP,BEGLD,BEGMD,PERMIT,UNOFAC,AC25,
     6ACANY,BONLY,RONLY,BANDR,PCTBL,CLOOPS,RENT,LACYR,PASS,DONE,VALLND,
     7ACDYR,ACD25,PAY(15D),TIN(150),PAYL(150),TINL(150),PRINL(150),
     8OPL(150),PAYM(80),PAYC(80),TINM(80),TINC(80),PRINM(80),PRINC(80),
     9OPM(80),OPC(80),BEGDM,XINTM,AMM,AMNOM,CODEM,XINTC,AMC,AMNOC,CODEC,
     /BEGDL,XINTL,AML,AMNOL,CODEL,DM,DC,DL,SC,PROF,DEPEN,DEPTOT,WK(12),
     1CHGLAB(12),CREDIT,FITAX(25),SITAX(25),SST(25),OUTINC,SSTWP(25),
     2TOTTAX,HLDSST,HLDFIT,HLDSIT,TIME,RINT,COPY,BUYMO,MCHSAV(25,10,5),
     3AGESAV(25,10,5),SAVHRS(25,12),SAVEXP(25,12),TMCOST(25),TVMI(25),
     4TMDEP(25),TMCRED(25),THRS(10,5),THREE(25,12),FOUR(25,12),FNC(29),
     5ELEVEN(25,12),SFNC(25,29),FNCL(25,29),FNCH(25,29),NVPAY,ISIY,
     6XVNM(25),XVUM(25),CROP(25,8),SVTHAC(25,10,5)
      REAL*8  SY,SXY,SY2
      DIMENSION FNCSD(25,29),FNCAV(25,29),FNCCV(25,29)
      DO 16 N=1,25
      DO 16 J=1,29
   16 FNCSD(N,J)=0.0
      DO 168 N=1,25
      DO 168 J=1,29
      IF(NVPAY.NE.1) GO TO 17
      DPS=SFNC(N,J)
      FNCSD(N,J)=DSQRT(DABS((SFNC2(N,J)-(DPS*DPS/R))/(R-1.)))
   17 FNCAV(N,J)=SFNC(N,J)/R
      IF(FNCAV(N,J).LT.(-.0001).OR.FNCAV(N,J).GT..0001) GO TO 167
      FNCCV(N,J)=0.0
      GO TO 168
  167 FNCCV(N,J)=FNCSD(N,J)/FNCAV(N,J)
  168 CONTINUE
  127 FORMAT(1H ,T54,'TABLE 1.  FARM PLANS *'//)
      WRITE(6,127)
  128 FORMAT(1H ,T66,'PRODUCTION PLAN INITIATED DURING THE CURRENT YEAR'
     1/T55,'-------------------------------------------------------------
     2-------------'/T8,'LAND OPERATED',4X,'LAND OWNED',6X,'LAND RENTED'
     3,T74,'SMALL',T87,'SUDAN',T106,'STEERS'/T7,'--------------- -------
     4-------- ----------------',T61,'GRAIN',T74,'GRAIN FORAGE GRASS',
     5T101,'------------------ COW-CALF'/T1,' YEAR JAN-MAY JUN-DEC JAN-MA
     6Y JUN-DEC JAN-MAY JUN-DEC WHEAT  SORG BARLEY  PAST  SORG   PAST AL
     7FALFA  (1)   (2)   (3)  OPERATION'/)
      WRITE(6,128)
  129 FORMAT(1H ,T2,I3,I8,5I8,3I6,2I7,I6,2I7,2I6,I8)
      DO 131 I=1,25
      IT1=TL1(I)
      IT2=TL2(I)
      IT3=OWN(I)
      IT4=TL2(I)-RENT2(I)
      IF(I.EQ.1) IT5=0
      IF(I.GT.1) IT5=RENT2(I-1)
      IT6=RENT2(I)
  131 WRITE(6,129)I,IT1,IT2,IT3,IT4,IT5,IT6,(JFP(I,J),J=1,11)
  132 FORMAT(1H0,'* STEERS (1) - BUY IN OCTOBER AND SELL IN MAY.  WINTER
     1ED ON SMALL GRAIN PASTURE, FORAGE SORGHUM, AND COTTON SEED CAKE.'/
     2T4,'STEERS (2) - BUY IN OCTOBER AND SELL IN MAY.  WINTERED ON SM.
     3GR. PAST., GR. SORG. STUBBLE, FORAGE SORG., AND COTTON SEED CAKE.'
     4/T4,'STEERS (3) - BUY IN OCT. AND SELL IN OCT.  WINTERED ON RANGE
     5AND COTTON SEED CAKE.'/T4,'COW-CALF OPERATION - CALVES BORN IN MAR
     6CH AND SOLD IN OCTOBER.')
      WRITE(6,132)
 1321 FORMAT(1H ,T4,'SIMULATED',I3,' LAND SITUATIONS FOR THE SOLUTION.')
      JAX=CLOOPS-1.0
      WRITE(6,1321)JAX
  133 FORMAT(1H1,T39,'TABLE 2.  MACHINERY - COMBINATIONS, SIZES, AND AGE
     1S *'//)
  134 FORMAT(1H1,T55,'TABLE 2.  (CONTINUED)'//)
  135 FORMAT(1H0,T24,'* COMBINATION NUMBERS AT THE TOP OF THE COLUMNS.'/
     1T26,'MACHINERY SIZES ARE ON THE SAME LINE AS THE YEAR.'/
     2T26,'MACHINERY SIZES CORRESPOND TO THE NUMBERED MACHINERY SETS IN
     3TABLE 6 OF INPUT.'/
     4T26,'UNDER THE SIZE IS THE AGE OF THE IMPLEMENT.')
 1133 FORMAT(1H ,T30,'---TRACTORS---  -----PLOWS----   -----DISCS----    S
     1PRING-TOOTHS  --ROTARY HOES-'/T24,'YEAR   1  2  3  4  5   1  2  3
     2 4  5   1  2  3  4  5   1  2  3  4  5   1  2  3  4  5'/)
 1134 FORMAT(1H ,T37,'-SPIKE-TOOTHS-  ----DRILLS----  -----RAKES----  --
     1--MOWERS----'/T31,'YEAR   1  2  3  4  5   1  2  3  4  5   1  2  3
     2 4  5   1  2  3  4  5'/)
 1135 FORMAT(1H ,T24,I3,1X,5(1X,5I3))
 1136 FORMAT(1H ,T31,I3,1X,5(1X,5I3))
 1137 FORMAT(1H ,T28,5(1X,5I3))
 1138 FORMAT(1H ,T35,5(1X,5I3))
      WRITE(6,133)
      WRITE(6,1133)
      DO 1139 I=1,25
      WRITE(6,1135)I,(MCHSAV(I,10,K),K=1,5),((MCHSAV(I,J,K),K=1,5),J=1,4
     1)
      DO 1238 K=1,5
 1238 L2(K)=AGESAV(I,10,K)
      M=5
      DO 1239 J=1,4
      DO 1239 K=1,5
      M=M+1
 1239 L2(M)=AGESAV(I,J,K)
 1139 WRITE(6,1137)(L2(M),M=1,25)
      WRITE(6,135)
      WRITE(6,134)
```

```
      WRITE(6,1134)
      DO 1140 I=1,25
      WRITE(6,1136)I,((MCHSAV(I,J,K),K=1,5),J=5,8)
      M=0
      DO 1240 J=5,8
      DO 1240 K=1,5
      M=M+1
 1240 L2(M)=AGESAV(I,J,K)
 1140 WRITE(6,1138)(L2(M),M=1,20)
 2261 FORMAT(1H1,T49,'TABLE 3.  CROP LABOR REQUIREMENTS'//)
      WRITE(6,2261)
      WRITE(6,157)
      DO 2263 I=1,25
      XSVH=0.0
      DO 2262 J=1,12
      XSVH=XSVH+SAVHRS(I,J)
 2262 L2(J)=SAVHRS(I,J)
      JSVH=XSVH
 2263 WRITE(6,158)I,(L2(J),J=1,12),JSVH
  156 FORMAT(1H1,T48,'TABLE 4.  TOTAL LABOR REQUIREMENTS'//)
      WRITE(6,156)
  157 FORMAT(1H ,T18,'YEAR     JAN      FEB      MAR      APR      MAY      JUN
     1JUL      AUG      SEP      OCT      NOV      DEC      TOTAL'/)
      WRITE(6,157)
  158 FORMAT(1H ,T19,I2,I8,11I7,I9)
      DO 159 I=1,25
  159 WRITE(6,158)I,(JFP(I,J),J=12,24)
  136 FORMAT(1H1,T56,'TABLE 5.  TOTAL RETURNS *'//)
      WRITE(6,136)
  137 FORMAT(1H ,T12,'JAN     FEB      MAR      APR      MAY      JUN      JUL      A
     1UG      SEP      OCT      NOV      DEC  -------------TOTAL---------------'
     2/T4,'YEAR  ----------------------------------------AVERAGE------------
     3---------------------------      LOW     HIGH     AVE      SD      CV'/)
      WRITE(6,137)
  138 FORMAT(1H ,T5,I2,I8,11I7,1X,4I7,F6.3)
      DO 145 N=1,25
      DO 141 J=1,12
  141 L2(J)=THREE(N,J)/R
      L2(13)=FNCL(N,17)
      L2(14)=FNCH(N,17)
      L2(15)=FNCAV(N,17)
      L2(16)=FNCSD(N,17)
  145 WRITE(6,138)N,(L2(J),J=1,16),FNCCV(N,17)
 1145 FORMAT(1H0,T4,'* TOTAL INFLOW OF FUNDS INCLUDING OUTSIDE INCOME AN
     1D COWS SOLD.  MONEY BORROWED IS EXCLUDED.')
      WRITE(6,1145)
 1552 FORMAT(1H1,T22,'TABLE 6.  MACHINERY EXPENSES - REPAIRS, TAXES, HOU
     1SING, INSURANCE, FUEL, AND LUBRICANTS'//)
      WRITE(6,1552)
      WRITE(6,157)
      DO 1555 I=1,25
      XSVE=0.0
      DO 1554 J=1,12
      XSVE=XSVE+SAVEXP(I,J)
 1554 L2(J)=SAVEXP(I,J)
      JSVE=XSVE
 1555 WRITE(6,158)I,(L2(J),J=1,12),JSVE
  146 FORMAT(1H1,T55,'TABLE 7.  TOTAL EXPENSES *'//)
      WRITE(6,146)
      WRITE(6,137)
      DO 155 N=1,25
      DO 153 J=1,12
  153 L2(J)=FOUR(N,J)/R
      L2(13)=FNCL(N,18)
      L2(14)=FNCH(N,18)
      L2(15)=FNCAV(N,18)
      L2(16)=FNCSD(N,18)
  155 WRITE(6,138)N,(L2(J),J=1,16),FNCCV(N,18)
 1551 FORMAT(1H0,T4,'* TOTAL OUTFLOW OF FUNDS INCLUDING CASH PAID ON INV
     1ESTMENTS, LOAN PAYMENTS, TAXES (FEDERAL, STATE, AND SOCIAL SECURIT
     2Y),'/T6,'AND CONSUMPTION.')
      WRITE(6,1551)
  185 FORMAT(1H1,T45,'TABLE 8.  SAVINGS AND SHORT TERM DEBTS *'//)
      WRITE(6,185)
  186 FORMAT(1H ,T12,'JAN     FEB      MAR      APR      MAY      JUN      JUL      A
     1UG      SEP      OCT      NOV      DEC  -------------DECEMBER------------'
     2/T4,'YEAR  ----------------------------------------AVERAGE-----------
     3---------------------------      LOW     HIGH     AVE      SD      CV'/)
      WRITE(6,186)
  188 FORMAT(1H0,T4,'* SAVINGS ARE POSITIVE AND DEBTS ARE NEGATIVE.'/
     1T6,'THE AMOUNTS ARE CUMULATIVE TO THE END OF THE MONTH.')
      DO 195 N=1,25
      DO 194 J=1,12
  194 L2(J)=ELEVEN(N,J)/R
      L2(13)=FNCL(N,29)
      L2(14)=FNCH(N,29)
      L2(15)=FNCAV(N,29)
      L2(16)=FNCSD(N,29)
  195 WRITE(6,138)N,(L2(J),J=1,16),FNCCV(N,29)
      WRITE(6,188)
  160 FORMAT(1H1,T25,     'TABLE 9.  INVESTMENTS AND CURRENT VALUES - LAN
     1D, MACHINERY, AND BREEDING STOCK *'//)
      WRITE(6,160)
  161 FORMAT(1H ,               T37,'CURRENT',               T68,'CURRENT',
     1       T98,'CURRENT',                 /T21,'INVESTMENT',T38,'VALUE',
     2T51,'INVESTMENT',T69,'VALUE',T81,'INVESTMENT',T99,'VALUE',T113,
     3' TOTAL '/T12,'YEAR',T24,'LAND',T39,'LAND',T52,'MACHINERY',T67,
     4'MACHINERY',T79,'BREEDING STOCK',T95,'BREEDING STOCK',T111,'INVEST
     5MENT'/)
      WRITE(6,161)
  162 FORMAT(1H ,T13,I2,I14,6I15)
      DO 163 I=1,25
  163 WRITE(6,162)I,(JFP(I,J),J=25,31)
 1631 FORMAT(1H0,T12,'* END OF THE YEAR VALUES')
      WRITE(6,1631)
  164 FORMAT(1H ,T9,'--------TOTAL PAYMENT-------  -----------INTEREST---
     1-------  -----------PRINCIPAL---------  -----OUTSTANDING PRINCIPAL-
     2-----'/T4,'YEAR  LOW  HIGH   AVE   SD     CV   LOW  HIGH   AVE   SD
     3     CV   LOW  HIGH   AVE   SD     CV   LOW   HIGH   AVE   SD
     4  CV'/)
```

TABLE XVI (Continued)

```
165 FORMAT(1H1,T45,'TABLE 10.  FINANCIAL ARRANGEMENTS - LAND'//)
    WRITE(6,165)
    WRITE(6,164)
166 FORMAT(1H ,T5,I2,3(3I6,I5,F7.3),3I7,I5,F7.3)
    DO 175 N=1,25
    JZL=FNCL(N,1)
    JZH=FNCH(N,1)
    JZA=FNCAV(N,1)
    JZS=FNCSD(N,1)
    ZC=FNCCV(N,1)
    JTL=FNCL(N,2)
    JTH=FNCH(N,2)
    JTA=FNCAV(N,2)
    JTS=FNCSD(N,2)
    TC=FNCCV(N,2)
    JRL=FNCL(N,3)
    JRH=FNCH(N,3)
    JRA=FNCAV(N,3)
    JRS=FNCSD(N,3)
    RC=FNCCV(N,3)
    JCL=FNCL(N,4)
    JCH=FNCH(N,4)
    JCA=FNCAV(N,4)
    JCS=FNCSD(N,4)
    CC=FNCCV(N,4)
175 WRITE(6,166)N,JZL,JZH,JZA,JZS,ZC,JTL,JTH,JTA,JTS,TC,JRL,JRH,JRA,
   1JRS,RC,JCL,JCH,JCA,JCS,CC
176 FORMAT(1H1,T43,'TABLE 11.  FINANCIAL ARRANGEMENTS - MACHINERY'//)
    WRITE(6,176)
    WRITE(6,164)
    DO 178 N=1,25
    JZL=FNCL(N,5)
    JZH=FNCH(N,5)
    JZA=FNCAV(N,5)
    JZS=FNCSD(N,5)
    ZC=FNCCV(N,5)
    JTL=FNCL(N,6)
    JTH=FNCH(N,6)
    JTA=FNCAV(N,6)
    JTS=FNCSD(N,6)
    TC=FNCCV(N,6)
    JRL=FNCL(N,7)
    JRH=FNCH(N,7)
    JRA=FNCAV(N,7)
    JRS=FNCSD(N,7)
    RC=FNCCV(N,7)
    JCL=FNCL(N,8)
    JCH=FNCH(N,8)
    JCA=FNCAV(N,8)
    JCS=FNCSD(N,8)
    CC=FNCCV(N,8)
178 WRITE(6,166)N,JZL,JZH,JZA,JZS,ZC,JTL,JTH,JTA,JTS,TC,JRL,JRH,JRA,
   1JRS,RC,JCL,JCH,JCA,JCS,CC
179 FORMAT(1H1,T45,'TABLE 12.  FINANCIAL ARRANGEMENTS - COWS'//)
    WRITE(6,179)
    WRITE(6,164)
    DO 181 N=1,25
    JZL=FNCL(N,9)
    JZH=FNCH(N,9)
    JZA=FNCAV(N,9)
    JZS=FNCSD(N,9)
    ZC=FNCCV(N,9)
    JTL=FNCL(N,10)
    JTH=FNCH(N,10)
    JTA=FNCAV(N,10)
    JTS=FNCSD(N,10)
    TC=FNCCV(N,10)
    JRL=FNCL(N,11)
    JRH=FNCH(N,11)
    JRA=FNCAV(N,11)
    JRS=FNCSD(N,11)
    RC=FNCCV(N,11)
    JCL=FNCL(N,12)
    JCH=FNCH(N,12)
    JCA=FNCAV(N,12)
    JCS=FNCSD(N,12)
    CC=FNCCV(N,12)
181 WRITE(6,166)N,JZL,JZH,JZA,JZS,ZC,JTL,JTH,JTA,JTS,TC,JRL,JRH,JRA,
   1JRS,RC,JCL,JCH,JCA,JCS,CC
182 FORMAT(1H1,T44,'TABLE 13.  FINANCIAL ARRANGEMENTS - TOTALS'//)
    WRITE(6,182)
    WRITE(6,164)
    DO 184 N=1,25
    JZL=FNCL(N,13)
    JZH=FNCH(N,13)
    JZA=FNCAV(N,13)
    JZS=FNCSD(N,13)
    ZC=FNCCV(N,13)
    JTL=FNCL(N,14)
    JTH=FNCH(N,14)
    JTA=FNCAV(N,14)
    JTS=FNCSD(N,14)
    TC=FNCCV(N,14)
    JRL=FNCL(N,15)
    JRH=FNCH(N,15)
    JRA=FNCAV(N,15)
    JRS=FNCSD(N,15)
    RC=FNCCV(N,15)
    JCL=FNCL(N,16)
    JCH=FNCH(N,16)
    JCA=FNCAV(N,16)
    JCS=FNCSD(N,16)
    CC=FNCCV(N,16)
184 WRITE(6,166)N,JZL,JZH,JZA,JZS,ZC,JTL,JTH,JTA,JTS,TC,JRL,JRH,JRA,
   1JRS,RC,JCL,JCH,JCA,JCS,CC
211 FORMAT(1H1,T42,'TABLE 14.  FARM OPERATION MONETARY SUMMARY *'//)
    WRITE(6,211)
212 FORMAT(1H ,T66,'NET FAMILY'/
   1                         T7,'-------OPERATING CAPITAL------- -------
   1NET FARM INCOME------ INCOME ------AFTER TAX INCOME----- --------C
```

TABLE XVI (Continued)

```
     2ONSUMPTION---------'/T2,'YEAR    LOW   HIGH    AVE   SD     CV   LO
     3W  HIGH   AVE   SD    CV   AVE   LOW  HIGH   AVE   SD    CV   LOW
     4 HIGH   AVE   SD    CV'/)
      WRITE(6,212)
  213 FORMAT(1H ,T3,I2,1X,3I7,I5,F6.3,3I6,I5,F6.3,I6,2(3I6,I5,F6.3))
      DO 215 N=1,25
      JZL=FNCL(N,21)
      JZH=FNCH(N,21)
      JZA=FNCAV(N,21)
      JZS=FNCSD(N,21)
      ZC =FNCCV(N,21)
      JTL=FNCL(N,22)
      JTH=FNCH(N,22)
      JTA=FNCAV(N,22)
      JTS=FNCSD(N,22)
      TC =FNCCV(N,22)
      JXA=TWEL(N)/R
      JRL=FNCL(N,23)
      JRH=FNCH(N,23)
      JRA=FNCAV(N,23)
      JRS=FNCSD(N,23)
      RC =FNCCV(N,23)
      JCL=FNCL(N,24)
      JCH=FNCH(N,24)
      JCA=FNCAV(N,24)
      JCS=FNCSD(N,24)
      CC =FNCCV(N,24)
  215 WRITE(6,213)N,JZL,JZH,JZA,JZS,ZC,JTL,JTH,JTA,JTS,TC,JXA,JRL,JRH,
     1JRA,JRS,RC,JCL,JCH,JCA,JCS,CC
 2151 FORMAT(1H0,T2,'* OPERATING CAPITAL INCLUDES VARIABLE COSTS OF CROP
     1 AND LIVESTOCK PRODUCTION, OVERHEAD, FEEDER PURCHASES, LAND RENT,
     2REAL ESTATE'/T4,'TAXES, PERSONAL PROPERTY TAXES, INTEREST ON ALL L
     3OANS, ANO COST OF FINANCIAL ARRANGEMENTS.'/T4,'NET FARM INCOME INC
     4LUDES THOSE RETURNS AND EXPENSES REPORTABLE ON FEDERAL INCOME TAX
     5FORM 1040 (CASH BASIS).'/T4,'NET FAMILY INCOME INCLUDES NET FARM I
     6NCOME PLUS INCOME FROM EXTERNAL EMPLOYMENT.'/T4,'AFTER TAX INCOME
     7INCLUDES NET FAMILY INCOME MINUS FEDERAL, STATE, AND SOCIAL SECURI
     8TY TAXES.'/T4,'CONSUMPTION IS BASED UPON AFTER TAX INCOME IN THE P
     9REVIOUS YEAR.')
      WRITE(6,2151)
  216 FORMAT(1H1,T54,'TABLE 14.  (CONTINUED) *'//)
      WRITE(6,216)
  217 FORMAT(1H ,T13,'---------------ASSETS--------------   ----------
     1--LIABILITIES-----------   --------------NET WORTH-------------'/
     2T6,'YEAR        LOW    HIGH     AVE     SD     CV       LOW     HIGH
     3   AVE      SD      CV       LOW    HIGH      AVE      SD      CV'/)
      WRITE(6,217)
  218 FORMAT(1H ,T7,I2,1X,3(I9,2I8,I7,F7.3))
      DO 220 N=1,25
      JZL=FNCL(N,25)
      JZH=FNCH(N,25)
      JZA=FNCAV(N,25)
      JZS=FNCSD(N,25)
      ZC =FNCCV(N,25)
      JTL=FNCL(N,26)
      JTH=FNCH(N,26)
      JTA=FNCAV(N,26)
      JTS=FNCSD(N,26)
      TC =FNCCV(N,26)
      JRL=FNCL(N,27)
      JRH=FNCH(N,27)
      JRA=FNCAV(N,27)
      JRS=FNCSD(N,27)
      RC =FNCCV(N,27)
  220 WRITE(6,218)N,JZL,JZH,JZA,JZS,ZC,JTL,JTH,JTA,JTS,TC,JRL,JRH,JRA,
     1JRS,RC
  221 FORMAT(1H0,T6,'* ASSETS INCLUDES THE CURRENT VALUE OF LAND, MACHIN
     1ERY, AND LIVESTOCK AND SAVINGS AT THE END OF THE YEAR.'/T8,'LIABIL
     2ITIES INCLUDES THE OUTSTANDING PRINCIPAL AT THE END OF THE YEAR ON
     3 LAND, MACHINERY, LIVESTOCK, AND OTHER LOANS.     '/T8,'NET WORTH
     4IS ASSETS MINUS LIABILITIES.')
      WRITE(6,221)
      SX2=0.0
      SY2=0.0
      SXY=0.0
      SY=0.0
      SX=0.0
      DO 2221 J=1,25
      XJ=J
      DPS=FNCAV(J,27)
      SX=SX+XJ
      SY=SY+DPS
      SXY=SXY+XJ*DPS
      SX2=SX2+XJ*XJ
 2221 SY2=SY2+DPS*DPS
      AVX=SX/25.0
      AVY=SY/25.0
      SXY=SXY-SX*SY/25.0
      SX2=SX2-SX*SX/25.0
      SY2=SY2-SY*SY/25.0
      B=SXY/SX2
      A=AVY-B*AVX
      VAR=(SY2-B*SXY)/23.0
      SEB=SQRT(VAR/SX2)
 2222 FORMAT(1H ,T10,'NW = A + BX   (X=TIME)'/T15,'A = ',F9.2,/T15,
     1'B = ',F9.2,/T15,'STANDARD ERROR OF B = ',F7.2)
      WRITE(6,2222)A,B,SEB
      WRITE(6,216)
  222 FORMAT(1H ,T9,'-----------NET WORTH RATIO----------   -REAL ESTA
     1TE DEBT TO LIMITATION RATIO-  NON REAL ESTATE DEBT TO LIMITATION R
     2ATIO'/T3,'YEAR      LOW     HIGH      AVE       SD       CV       LOW
     3 HIGH      AVE       SD       CV       LOW     HIGH      AVE       SD
     4  CV'/)
      WRITE(6,222)
  223 FORMAT(1H ,T4,I2,3(F9.4,4F8.4))
      DO 225 N=1,25
  225 WRITE(6,223)N,FNCL(N,28),FNCH(N,28),FNCAV(N,28),FNCSD(N,28),
     1FNCCV(N,28),FNCL(N,19),FNCH(N,19),FNCAV(N,19),FNCSD(N,19),
     2FNCCV(N,19),FNCL(N,20),FNCH(N,20),FNCAV(N,20),FNCSD(N,20),
     3FNCCV(N,20)
```

TABLE XVI (Continued)

```
226 FORMAT(1H0,T3,'* NET WORTH RATIO IS NET WORTH DIVIDED BY ASSETS.'
   1/T5,'REAL ESTATE DEBT TO LIMITATION RATIO IS THE REAL ESTATE DEBT
   2DIVIDED BY THE'/T5,'REAL ESTATE DEBT LIMITATION.'/T5,'NON REAL EST
   3ATE DEBT TO LIMITATION RATIO IS THE NON REAL ESTATE DEBT DIVIDED B
   4Y THE'/T5,'NON REAL ESTATE DEBT LIMITATION.')
    WRITE(6,226)
227 FORMAT(1H1)
    WRITE(6,227)
    WRITE(6,227)
    RETURN
    END
```

TABLE XVII

SAMPLE OUTPUT

OUTPUT TABLE 1. FARM PLANS*

	LAND OPERATED		LAND OWNED		LAND RENTED		PRODUCTION PLAN INITIATED DURING THE CURRENT YEAR										
YEAR	JAN-MAY	JUN-DEC	JAN-MAY	JUN-DEC	JAN-MAY	JUN-DEC	WHEAT	GRAIN SORG	BARLEY	SMALL GRAIN PAST	FORAGE SORG	SUDAN GRASS PAST	ALFALFA	STEERS (1)	STEERS (2)	STEERS (3)	COW-CALF OPERATION
1	320	2240	320	320	0	1920	369	55	28	536	33	0	259	308	72	0	62
2	2240	2240	320	320	1920	1920	369	55	28	536	47	0	259	308	72	0	62
3	2240	2240	320	320	1920	1920	369	55	28	536	47	0	259	308	72	0	62
4	2240	2240	320	320	1920	1920	369	55	28	536	47	0	259	308	72	0	62
5	2240	2240	320	320	1920	1920	369	55	28	536	47	0	259	308	72	0	62
6	2240	2560	320	640	1920	1920	422	63	32	613	54	0	296	352	82	0	71
7	2560	2560	640	640	1920	1920	422	63	32	613	54	0	296	352	82	0	71
8	2560	2560	640	640	1920	1920	422	63	32	613	54	0	296	352	82	0	71
9	2560	2560	640	640	1920	1920	422	63	32	613	54	0	296	352	82	0	71
10	2560	2560	640	640	1920	1920	422	63	32	613	54	0	296	352	82	0	71
11	2560	2560	640	960	1920	1600	422	63	32	613	54	0	296	352	82	0	71
12	2560	2560	960	960	1600	1600	422	63	32	613	54	0	296	352	82	0	71
13	2560	2560	960	960	1600	1600	422	63	32	613	54	0	296	352	82	0	71
14	2560	2560	960	960	1600	1600	422	63	32	613	54	0	296	352	82	0	71
15	2560	2560	960	960	1600	1600	422	63	32	613	54	0	296	352	82	0	71
16	2560	2560	960	1280	1600	1280	422	63	32	613	54	0	296	352	82	0	71
17	2560	2560	1280	1280	1280	1280	422	63	32	613	54	0	296	352	82	0	71
18	2560	2560	1280	1280	1280	1280	422	63	32	613	54	0	296	352	82	0	71
19	2560	2560	1280	1280	1280	1280	422	63	32	613	54	0	296	352	82	0	71
20	2560	2560	1280	1280	1280	1280	422	63	32	613	54	0	296	352	82	0	71
21	2560	2560	1280	1760	1280	800	422	63	32	613	54	0	296	352	82	0	71
22	2560	2560	1760	1760	800	800	422	63	32	613	54	0	296	352	82	0	71
23	2560	2560	1760	1760	800	800	422	63	32	613	54	0	296	352	82	0	71
24	2560	2560	1760	1760	800	800	422	63	32	613	54	0	296	352	82	0	71
25	2560	2560	1760	1760	800	800	422	63	32	613	54	0	296	352	82	0	71

* STEERS (1) - BUY IN OCTOBER AND SELL IN MAY. WINTERED ON SMALL GRAIN PASTURE, FORAGE SORGHUM, AND COTTON SEED CAKE.
STEERS (2) - BUY IN OCTOBER AND SELL IN MAY. WINTERED ON SM. GR. PAST., GR. SORG. STUBBLE, FORAGE SORG., AND COTTON SEED CAKE.
STEERS (3) - BUY IN OCT. AND SELL IN OCT. WINTERED ON RANGE AND COTTON SEED CAKE.
COW-CALF OPERATION - CALVES BORN IN MARCH AND SOLD IN OCTOBER.
SIMULATED 1 LAND SITUATIONS FOR THE SOLUTION.

OUTPUT TABLE 2. MACHINERY - COMBINATIONS, SIZES, AND AGES*

	---TRACTORS---					---PLOWS---					---DISCS---					SPRING-TOOTHS					---ROTARY HOES-				
YEAR	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
1	3	3	1	0	0	3	3	0	0	0	3	0	0	0	0	3	0	0	0	0	3	0	0	0	0
	1	1	6	0	0	1	1	0	0	0	1	0	0	0	0	1	0	0	0	0	1	0	0	0	0
2	3	3	1	0	0	3	3	0	0	0	3	0	0	0	0	3	0	0	0	0	3	0	0	0	0
	2	2	7	0	0	2	2	0	0	0	2	0	0	0	0	2	0	0	0	0	2	0	0	0	0
3	3	3	1	0	0	3	3	0	0	0	3	0	0	0	0	3	0	0	0	0	3	0	0	0	0
	3	3	8	0	0	3	3	0	0	0	3	0	0	0	0	3	0	0	0	0	3	0	0	0	0
4	3	3	1	0	0	3	3	0	0	0	3	0	0	0	0	3	0	0	0	0	3	0	0	0	0
	4	4	9	0	0	4	4	0	0	0	4	0	0	0	0	4	0	0	0	0	4	0	0	0	0
5	3	3	1	0	0	3	3	0	0	0	3	0	0	0	0	3	0	0	0	0	3	0	0	0	0
	5	5	10	0	0	5	5	0	0	0	5	0	0	0	0	5	0	0	0	0	5	0	0	0	0
6	4	4	1	0	0	4	4	0	0	0	4	0	0	0	0	4	0	0	0	0	4	0	0	0	0
	1	1	1	0	0	1	1	0	0	0	1	0	0	0	0	1	0	0	0	0	1	0	0	0	0
7	4	4	1	0	0	4	4	0	0	0	4	0	0	0	0	4	0	0	0	0	4	0	0	0	0
	2	2	2	0	0	2	2	0	0	0	2	0	0	0	0	2	0	0	0	0	2	0	0	0	0
8	4	4	1	0	0	4	4	0	0	0	4	0	0	0	0	4	0	0	0	0	4	0	0	0	0
	3	3	3	0	0	3	3	0	0	0	3	0	0	0	0	3	0	0	0	0	3	0	0	0	0
9	4	4	1	0	0	4	4	0	0	0	4	0	0	0	0	4	0	0	0	0	4	0	0	0	0
	4	4	4	0	0	4	4	0	0	0	4	0	0	0	0	4	0	0	0	0	4	0	0	0	0
10	4	4	1	0	0	4	4	0	0	0	4	0	0	0	0	4	0	0	0	0	4	0	0	0	0
	5	5	5	0	0	5	5	0	0	0	5	0	0	0	0	5	0	0	0	0	5	0	0	0	0
11	4	4	1	0	0	4	4	0	0	0	4	0	0	0	0	4	0	0	0	0	4	0	0	0	0
	6	6	6	0	0	6	6	0	0	0	6	0	0	0	0	6	0	0	0	0	6	0	0	0	0
12	4	4	1	0	0	4	4	0	0	0	4	0	0	0	0	4	0	0	0	0	4	0	0	0	0
	7	7	7	0	0	7	7	0	0	0	7	0	0	0	0	1	0	0	0	0	7	0	0	0	0
13	4	4	1	0	0	4	4	0	0	0	4	0	0	0	0	4	0	0	0	0	4	0	0	0	0
	8	8	8	0	0	1	1	0	0	0	8	0	0	0	0	2	0	0	0	0	8	0	0	0	0
14	4	4	1	0	0	4	4	0	0	0	4	0	0	0	0	4	0	0	0	0	4	0	0	0	0
	9	9	9	0	0	2	2	0	0	0	9	0	0	0	0	3	0	0	0	0	9	0	0	0	0
15	4	4	1	0	0	4	4	0	0	0	4	0	0	0	0	4	0	0	0	0	4	0	0	0	0
	1	1	10	0	0	3	3	0	0	0	10	0	0	0	0	4	0	0	0	0	10	0	0	0	0
16	4	4	1	0	0	4	4	0	0	0	4	0	0	0	0	4	0	0	0	0	4	0	0	0	0
	2	2	1	0	0	4	4	0	0	0	1	0	0	0	0	5	0	0	0	0	1	0	0	0	0
17	4	4	1	0	0	4	4	0	0	0	4	0	0	0	0	4	0	0	0	0	4	0	0	0	0
	3	3	2	0	0	5	5	0	0	0	2	0	0	0	0	6	0	0	0	0	2	0	0	0	0
18	4	4	1	0	0	4	4	0	0	0	4	0	0	0	0	4	0	0	0	0	4	0	0	0	0
	4	4	3	0	0	6	6	0	0	0	3	0	0	0	0	1	0	0	0	0	3	0	0	0	0
19	4	4	1	0	0	4	4	0	0	0	4	0	0	0	0	4	0	0	0	0	4	0	0	0	0
	5	5	4	0	0	7	7	0	0	0	4	0	0	0	0	2	0	0	0	0	4	0	0	0	0
20	4	4	1	0	0	4	4	0	0	0	4	0	0	0	0	4	0	0	0	0	4	0	0	0	0
	6	6	5	0	0	1	1	0	0	0	5	0	0	0	0	3	0	0	0	0	5	0	0	0	0
21	4	4	1	0	0	4	4	0	0	0	4	0	0	0	0	4	0	0	0	0	4	0	0	0	0
	7	7	6	0	0	2	2	0	0	0	6	0	0	0	0	4	0	0	0	0	6	0	0	0	0
22	4	4	1	0	0	4	4	0	0	0	4	0	0	0	0	4	0	0	0	0	4	0	0	0	0
	8	8	7	0	0	3	3	0	0	0	7	0	0	0	0	5	0	0	0	0	7	0	0	0	0
23	4	4	1	0	0	4	4	0	0	0	4	0	0	0	0	4	0	0	0	0	4	0	0	0	0
	9	9	8	0	0	4	4	0	0	0	8	0	0	0	0	6	0	0	0	0	8	0	0	0	0
24	4	4	1	0	0	4	4	0	0	0	4	0	0	0	0	4	0	0	0	0	4	0	0	0	0
	1	1	9	0	0	5	5	0	0	0	9	0	0	0	0	1	0	0	0	0	9	0	0	0	0
25	4	4	1	0	0	4	4	0	0	0	4	0	0	0	0	4	0	0	0	0	4	0	0	0	0
	2	2	10	0	0	6	6	0	0	0	10	0	0	0	0	2	0	0	0	0	10	0	0	0	0

* COMBINATION NUMBERS AT THE TOP OF THE COLUMNS.
MACHINERY SIZES ARE ON THE SAME LINE AS THE YEAR.
MACHINERY SIZES CORRESPOND TO THE NUMBERED MACHINERY SETS IN TABLE 6 OF INPUT.
UNDER THE SIZE IS THE AGE OF THE IMPLEMENT.

TABLE XVII (Continued)

OUTPUT TABLE 2. (CONTINUED)

	-SPIKE-TOOTHS-					----DRILLS----					----RAKES----					----MOWERS----				
YEAR	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
1	3	0	0	0	0	3	0	0	0	0	3	0	0	0	0	3	0	0	0	0
	1	0	0	0	0	1	0	0	0	0	6	0	0	0	0	6	0	0	0	0
2	3	0	0	0	0	3	0	0	0	0	3	0	0	0	0	3	0	0	0	0
	2	0	0	0	0	2	0	0	0	0	7	0	0	0	0	7	0	0	0	0
3	3	0	0	0	0	3	0	0	0	0	3	0	0	0	0	3	0	0	0	0
	3	0	0	0	0	3	0	0	0	0	8	0	0	0	0	8	0	0	0	0
4	3	0	0	0	0	3	0	0	0	0	3	0	0	0	0	3	0	0	0	0
	4	0	0	0	0	4	0	0	0	0	9	0	0	0	0	1	0	0	0	0
5	3	0	0	0	0	3	0	0	0	0	3	0	0	0	0	3	0	0	0	0
	5	0	0	0	0	5	0	0	0	0	1	0	0	0	0	2	0	0	0	0
6	4	0	0	0	0	4	0	0	0	0	4	0	0	0	0	4	0	0	0	0
	1	0	0	0	0	1	0	0	0	0	2	0	0	0	0	3	0	0	0	0
7	4	0	0	0	0	4	0	0	0	0	4	0	0	0	0	4	0	0	0	0
	2	0	0	0	0	2	0	0	0	0	3	0	0	0	0	4	0	0	0	0
8	4	0	0	0	0	4	0	0	0	0	4	0	0	0	0	4	0	0	0	0
	3	0	0	0	0	3	0	0	0	0	4	0	0	0	0	1	0	0	0	0
9	4	0	0	0	0	4	0	0	0	0	4	0	0	0	0	4	0	0	0	0
	4	0	0	0	0	4	0	0	0	0	1	0	0	0	0	2	0	0	0	0
10	4	0	0	0	0	4	0	0	0	0	4	0	0	0	0	4	0	0	0	0
	5	0	0	0	0	5	0	0	0	0	2	0	0	0	0	3	0	0	0	0
11	4	0	0	0	0	4	0	0	0	0	4	0	0	0	0	4	0	0	0	0
	6	0	0	0	0	6	0	0	0	0	3	0	0	0	0	4	0	0	0	0
12	4	0	0	0	0	4	0	0	0	0	4	0	0	0	0	4	0	0	0	0
	7	0	0	0	0	7	0	0	0	0	4	0	0	0	0	1	0	0	0	0
13	4	0	0	0	0	4	0	0	0	0	4	0	0	0	0	4	0	0	0	0
	8	0	0	0	0	1	0	0	0	0	1	0	0	0	0	2	0	0	0	0
14	4	0	0	0	0	4	0	0	0	0	4	0	0	0	0	4	0	0	0	0
	9	0	0	0	0	2	0	0	0	0	2	0	0	0	0	3	0	0	0	0
15	4	0	0	0	0	4	0	0	0	0	4	0	0	0	0	4	0	0	0	0
	10	0	0	0	0	3	0	0	0	0	3	0	0	0	0	4	0	0	0	0
16	4	0	0	0	0	4	0	0	0	0	4	0	0	0	0	4	0	0	0	0
	1	0	0	0	0	4	0	0	0	0	4	0	0	0	0	1	0	0	0	0
17	4	0	0	0	0	4	0	0	0	0	4	0	0	0	0	4	0	0	0	0
	2	0	0	0	0	5	0	0	0	0	1	0	0	0	0	2	0	0	0	0
18	4	0	0	0	0	4	0	0	0	0	4	0	0	0	0	4	0	0	0	0
	3	0	0	0	0	6	0	0	0	0	2	0	0	0	0	3	0	0	0	0
19	4	0	0	0	0	4	0	0	0	0	4	0	0	0	0	4	0	0	0	0
	4	0	0	0	0	7	0	0	0	0	3	0	0	0	0	4	0	0	0	0
20	4	0	0	0	0	4	0	0	0	0	4	0	0	0	0	4	0	0	0	0
	5	0	0	0	0	1	0	0	0	0	4	0	0	0	0	1	0	0	0	0
21	4	0	0	0	0	4	0	0	0	0	4	0	0	0	0	4	0	0	0	0
	6	0	0	0	0	2	0	0	0	0	1	0	0	0	0	2	0	0	0	0
22	4	0	0	0	0	4	0	0	0	0	4	0	0	0	0	4	0	0	0	0
	7	0	0	0	0	3	0	0	0	0	2	0	0	0	0	3	0	0	0	0
23	4	0	0	0	0	4	0	0	0	0	4	0	0	0	0	4	0	0	0	0
	8	0	0	0	0	4	0	0	0	0	3	0	0	0	0	4	0	0	0	0
24	4	0	0	0	0	4	0	0	0	0	4	0	0	0	0	4	0	0	0	0
	9	0	0	0	0	5	0	0	0	0	4	0	0	0	0	1	0	0	0	0
25	4	0	0	0	0	4	0	0	0	0	4	0	0	0	0	4	0	0	0	0
	10	0	0	0	0	6	0	0	0	0	1	0	0	0	0	2	0	0	0	0

TABLE XVII (Continued)

OUTPUT TABLE 3. CROP LABOR REQUIREMENTS

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
1	0	19	5	1	3	645	477	304	303	26	0	0	1788
2	0	135	48	13	25	648	479	306	303	37	0	0	1998
3	0	135	48	13	25	648	479	306	303	37	0	0	1998
4	0	135	48	13	25	648	479	306	303	37	0	0	1998
5	0	135	48	13	25	648	479	306	303	37	0	0	1998
6	0	135	39	9	21	634	439	300	251	43	0	0	1875
7	0	154	44	10	24	634	439	300	251	43	0	0	1905
8	0	154	44	10	24	634	439	300	251	43	0	0	1905
9	0	154	44	10	24	634	439	300	251	43	0	0	1905
10	0	154	44	10	24	634	439	300	251	43	0	0	1905
11	0	154	44	10	24	634	439	300	251	43	0	0	1905
12	0	154	44	10	24	634	439	300	251	43	0	0	1905
13	0	154	44	10	24	634	439	300	251	43	0	0	1905
14	0	154	44	10	24	634	439	300	251	43	0	0	1905
15	0	154	44	10	24	634	439	300	251	43	0	0	1905
16	0	154	44	10	24	634	439	300	251	43	0	0	1905
17	0	154	44	10	24	634	439	300	251	43	0	0	1905
18	0	154	44	10	24	634	439	300	251	43	0	0	1905
19	0	154	44	10	24	634	439	300	251	43	0	0	1905
20	0	154	44	10	24	634	439	300	251	43	0	0	1905
21	0	154	44	10	24	634	439	300	251	43	0	0	1905
22	0	154	44	10	24	634	439	300	251	43	0	0	1905
23	0	154	44	10	24	634	439	300	251	43	0	0	1905
24	0	154	44	10	24	634	439	300	251	43	0	0	1905
25	0	154	44	10	24	634	439	300	251	43	0	0	1905

TABLE XVII (Continued)

OUTPUT TABLE 4. TOTAL LABOR REQUIREMENTS

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
1	0	19	5	1	3	658	490	314	316	262	145	144	2362
2	251	440	317	247	459	660	491	316	316	273	145	144	4065
3	251	440	317	247	459	660	491	316	316	273	145	144	4065
4	251	440	317	247	459	660	491	316	316	273	145	144	4065
5	251	440	317	247	459	660	491	316	316	273	145	144	4065
6	251	440	307	243	455	649	453	312	265	313	166	165	4024
7	286	503	351	277	520	649	453	312	265	313	166	165	4267
8	286	503	351	277	520	649	453	312	265	313	166	165	4267
9	286	503	351	277	520	649	453	312	265	313	166	165	4267
10	286	503	351	277	520	649	453	312	265	313	166	165	4267
11	286	503	351	277	520	649	453	312	265	313	166	165	4267
12	286	503	351	277	520	649	453	312	265	313	166	165	4267
13	286	503	351	277	520	649	453	312	265	313	166	165	4267
14	286	503	351	277	520	649	453	312	265	313	166	165	4267
15	286	503	351	277	520	649	453	312	265	313	166	165	4267
16	286	503	351	277	520	649	453	312	265	313	166	165	4267
17	286	503	351	277	520	649	453	312	265	313	166	165	4267
18	286	503	351	277	520	649	453	312	265	313	166	165	4267
19	286	503	351	277	520	649	453	312	265	313	166	165	4267
20	286	503	351	277	520	649	453	312	265	313	166	165	4267
21	286	503	351	277	520	649	453	312	265	313	166	165	4267
22	286	503	351	277	520	649	453	312	265	313	166	165	4267
23	286	503	351	277	520	649	453	312	265	313	166	165	4267
24	286	503	351	277	520	649	453	312	265	313	166	165	4267
25	286	503	351	277	520	649	453	312	265	313	166	165	4267

TABLE XVII (Continued)

OUTPUT TABLE 5. TOTAL RETURNS*

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL LOW	TOTAL HIGH	TOTAL AVE	TOTAL SD	TOTAL CV
	AVERAGE																
1	0	990	0	0	0	2091	432	2568	10305	9106	0	1143	19338	33309	26638	3561	0.134
2	0	1419	0	0	78002	15475	359	17976	11757	9837	0	1307	116098	155436	136135	8698	0.064
3	0	1409	0	0	78059	14788	419	17977	10569	9157	0	1108	118897	151737	133489	7790	0.058
4	0	1159	0	0	74069	13245	613	17977	11650	9155	0	864	115926	142531	128735	6540	0.051
5	0	1784	0	0	69323	13998	477	17978	10885	8492	0	996	110118	137958	123937	6949	0.056
6	0	1553	0	0	64912	14779	399	17976	12413	9184	0	1024	103745	139145	122243	7441	0.061
7	0	1472	0	0	71834	15492	549	20545	13162	9419	0	1165	112690	155251	133643	9700	0.073
8	0	1660	0	0	76028	15845	529	20546	13080	9605	0	1065	119242	156930	138361	8552	0.062
9	0	1414	0	0	79285	16106	574	20551	13585	10494	0	1110	125858	160770	143122	8358	0.058
10	0	1542	0	0	85735	16675	503	20563	11978	10677	0	1374	130773	179365	149052	9633	0.065
11	0	1830	0	0	92772	17620	299	20544	11574	11010	0	1076	139079	180357	156729	9425	0.060
12	0	1415	0	0	96211	16001	463	20549	13321	12023	0	1154	144713	179507	161141	9501	0.059
13	0	2117	0	0	94060	17858	509	20556	13630	11780	0	1536	142356	178946	162051	8602	0.053
14	0	1796	0	0	91687	17193	504	20565	12157	10848	0	1516	138137	174728	156269	9600	0.061
15	0	1644	0	0	84710	16278	453	20563	12554	10160	1	1458	137151	166321	147824	8040	0.054
16	0	1681	0	0	80239	16377	500	20544	12828	9882	0	1243	125691	161443	143298	8189	0.057
17	0	1352	0	0	79442	14101	577	20545	12087	9746	0	1105	125119	158436	138958	8598	0.062
18	0	1601	0	0	79627	16341	565	20546	12616	10253	0	1234	127015	163034	142787	8098	0.057
19	0	1709	0	0	85030	16809	421	20549	12953	10851	0	1305	126429	170632	149632	8874	0.059
20	0	1642	0	0	93227	15963	468	20554	12146	11418	0	1201	138679	171844	156623	8345	0.053
21	0	1763	0	0	99142	17104	251	20544	12202	12019	0	1131	147619	188653	164160	8847	0.054
22	0	1497	0	0	101710	15417	617	20545	13034	12247	0	1208	148425	179213	166278	7649	0.046
23	0	1581	0	0	100999	16545	505	20546	12496	11835	0	1396	146356	187446	165907	8098	0.049
24	0	1448	0	0	97144	16109	401	20547	12224	11342	0	1458	142903	176022	160678	7634	0.048
25	0	1545	0	0	91894	16852	598	20546	12607	10953	0	1291	140008	175744	156288	7288	0.047

* TOTAL INFLOW OF FUNDS INCLUDING OUTSIDE INCOME AND COWS SOLD. MONEY BORROWED IS EXCLUDED.

OUTPUT TABLE 6. MACHINERY EXPENSES - REPAIRS, TAXES, HOUSING, INSURANCE, FUEL AND LUBRICANTS

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
1	0	11	3	0	1	508	409	282	440	26	0	843	2528
2	0	114	52	14	24	709	536	350	619	44	0	777	3243
3	0	133	62	16	29	827	618	398	743	49	0	716	3598
4	0	146	71	19	32	909	675	429	845	51	0	670	3851
5	0	158	78	20	35	972	717	448	934	52	0	627	4045
6	0	100	32	7	17	593	484	349	435	53	0	1088	3164
7	0	163	60	13	29	806	615	421	600	62	0	1003	3777
8	0	187	72	16	33	925	692	463	716	66	0	930	4104
9	0	206	81	18	37	1014	749	491	811	68	0	862	4341
10	0	222	88	20	40	1114	818	534	893	74	0	795	4603
11	0	235	95	21	43	1200	877	572	967	79	0	733	4828
12	0	248	102	17	40	1262	871	552	996	81	0	695	4867
13	0	259	77	20	44	1017	914	574	623	82	0	745	4359
14	0	270	90	22	46	1147	970	611	761	87	0	684	4693
15	0	115	52	12	24	762	628	387	651	55	0	915	3606
16	0	164	69	16	31	888	609	437	760	61	0	986	4025
17	0	188	79	18	35	988	685	470	850	64	0	915	4296
18	0	206	87	14	33	1093	717	475	890	70	0	857	4448
19	0	222	94	17	38	1182	794	521	967	76	0	791	4706
20	0	236	70	19	41	949	843	549	594	78	0	834	4218
21	0	248	84	21	44	1058	882	568	733	79	0	772	4493
22	0	260	92	22	46	1161	939	604	834	84	0	710	4757
23	0	270	99	24	48	1247	989	636	918	88	0	654	4978
24	0	115	60	8	20	828	584	355	744	54	0	906	3679
25	0	164	75	13	29	964	678	408	843	58	0	843	4081

TABLE XVII (Continued)

OUTPUT TABLE 7. TOTAL EXPENSES*

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL LOW	TOTAL HIGH	TOTAL AVE	TOTAL SD	TOTAL CV
	AVERAGE																
1	714	5270	553	543	617	5438	2954	2614	7319	52996	1265	3832	78336	92483	84120	2675	0.032
2	11452	13686	1347	1189	3153	22755	3361	2591	7334	53663	1066	3593	120237	128804	125197	2325	0.019
3	12160	17686	1793	1630	3599	23270	3910	3094	7922	53471	1537	3983	124719	142075	134060	4905	0.037
4	12335	16544	1751	1582	3552	23254	3627	3105	7991	49872	1489	4040	119800	138668	129148	4620	0.036
5	12493	9107	1646	1471	3441	19410	3863	3019	7999	46549	1365	3923	107025	127572	114291	4751	0.042
6	12642	8974	1520	1382	3347	25463	3789	3136	8311	50119	1436	4889	107169	150057	125015	9935	0.079
7	12883	18205	1614	1440	3685	26450	3914	3138	8379	49314	1338	5073	126630	148809	135439	4705	0.035
8	13112	17533	1603	1419	3667	26741	3832	3132	8460	49668	1290	4920	127845	146977	135382	4613	0.034
9	13484	13473	1742	1552	3802	27192	3988	3289	8716	56470	1439	5185	130713	151574	140338	6295	0.045
10	13790	13979	1840	1644	3896	27347	4127	3420	8901	61089	1530	5156	132376	163280	146726	7187	0.049
11	13988	13723	1822	1621	3874	49683	4347	3474	8971	65785	1634	5735	142622	212734	174662	15694	0.090
12	12362	14676	1994	1784	4039	31084	4499	3504	9053	66994	1660	6047	147364	175225	157700	7213	0.046
13	12483	12226	1888	1704	3960	30982	4325	3464	8635	63984	1554	6033	135316	168236	151245	7856	0.052
14	12609	14174	1858	1663	3919	31305	4550	3506	8784	62161	1539	5975	135798	165267	152047	6602	0.043
15	12678	12778	1697	1529	3771	31014	3847	3193	8583	56933	1424	6062	130270	158245	143513	6917	0.048
16	12674	14186	1533	1351	3596	43309	3678	3113	8536	54259	1329	6529	135223	181985	154100	13759	0.089
17	10679	14512	1556	1367	3614	35527	3924	3127	8577	54948	1318	7053	140259	157528	146207	4474	0.031
18	10819	12214	1542	1341	3590	35730	3769	3097	8580	55721	1279	6986	135438	154226	144672	4000	0.028
19	11039	11361	1617	1412	3663	36030	4189	3191	8717	60259	1341	7127	142140	158324	149950	4425	0.030
20	11315	12541	1732	1554	3806	36067	4363	3330	8466	66325	1476	7253	148725	168004	158234	5105	0.032
21	11526	13486	1816	1626	3880	46587	4618	3425	8668	69921	1602	8009	153198	216136	175168	16040	0.092
22	8170	12408	1870	1674	3929	44166	4347	3475	8769	70548	1613	8774	161364	187899	169750	5765	0.034
23	8175	11005	1781	1578	3834	44236	4274	3410	8751	68899	1508	8621	158317	177808	166076	4592	0.028
24	8244	10694	1718	1539	3782	43891	4015	3130	8570	65508	1488	8976	151937	178060	161560	5849	0.036
25	8256	13227	1668	1479	3724	44051	4086	3143	8621	61841	1428	8892	150811	170095	160421	4761	0.030

* TOTAL OUTFLOW OF FUNDS INCLUDING CASH PAID ON INVESTMENTS, LOAN PAYMENTS, TAXES (FEDERAL, STATE, AND SOCIAL SECURITY), AND CONSUMPTION.

TABLE XVII (Continued)

OUTPUT TABLE 8. SAVINGS AND SHORT TERM DEBITS*

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	DECEMBER LOW	DECEMBER HIGH	DECEMBER AVE	DECEMBER SD	DECEMBER CV
	AVERAGE																
1	4285	5	-547	-1090	-1707	-5055	-7576	-7623	-4637	-48527	-49793	-52482	-68145	-45965	-52482	4539	-0.087
2	-63934	-76202	-77549	-78739	-3890	-11170	-14173	1211	5634	-38192	-39258	-41544	-66423	-23209	-41544	9118	-0.219
3	-53704	-69980	-71774	-73404	1055	-7426	-10918	3964	6611	-37702	-39240	-42115	-54752	-27526	-42115	7340	-0.174
4	-54450	-69835	-71587	-73170	-2652	-12661	-15675	-804	2854	-37862	-39351	-42527	-57389	-21383	-42527	8832	-0.208
5	-55021	-62343	-63989	-65461	421	-4991	-8377	6581	9468	-28588	-29954	-32881	-52452	-12730	-32881	10184	-0.310
6	-45523	-52945	-54465	-55847	5717	-4966	-8357	6482	10584	-30350	-31787	-35653	-54405	-17826	-35653	6903	-0.194
7	-48536	-65269	-66883	-68323	-174	-11132	-14498	2908	7691	-32203	-33541	-37449	-54460	-16021	-37449	10802	-0.288
8	-50561	-66434	-68037	-69457	2904	-7992	-11294	6119	10739	-29324	-30614	-34470	-61744	-13383	-34470	10567	-0.307
9	-47954	-60014	-61756	-63308	12174	1089	-2324	14937	19805	-26170	-27610	-31685	-59687	-7380	-31685	11150	-0.352
10	-45476	-57913	-59754	-61398	20439	9767	6143	23286	26364	-24047	-25578	-29359	-60966	-3495	-29359	12749	-0.434
11	-43348	-55241	-57063	-58684	30213	-1849	-5897	11172	13775	-40998	-42633	-47292	-55827	-36808	-47292	5107	-0.108
12	-59654	-72915	-74909	-76694	15477	394	-3640	13404	17673	-37298	-38958	-43851	-70716	-15056	-43851	11330	-0.258
13	-56335	-66444	-68332	-70037	20062	6938	3122	20214	25209	-26994	-28549	-33046	-53237	-13702	-33046	10666	-0.323
14	-45655	-58033	-59891	-61555	26212	12099	8054	25113	28486	-22825	-24364	-28823	-57705	1210	-28823	13883	-0.482
15	-41501	-52635	-54332	-55861	25076	10340	6946	24316	28287	-18485	-19908	-24512	-53654	6810	-24512	13366	-0.545
16	-37186	-49691	-51224	-52575	24067	-2865	-6043	11387	15679	-28698	-30028	-35314	-48490	-26835	-35314	6049	-0.171
17	-45993	-59153	-60710	-62077	13750	-7675	-11022	6395	9905	-35296	-36615	-42562	-56109	-16847	-42562	9836	-0.231
18	-53382	-63994	-65537	-66878	9158	-10229	-13434	4014	8051	-37416	-38695	-44448	-74151	-15118	-44448	13396	-0.301
19	-55487	-65138	-66756	-68168	13198	-6021	-9789	7568	11804	-37602	-38943	-44765	-69232	-16717	-44765	14257	-0.318
20	-56081	-66981	-68713	-70268	19152	-951	-4846	12378	16057	-38849	-40325	-46377	-83661	-12661	-46377	17260	-0.372
21	-57903	-69626	-71442	-73068	22194	-7288	-11655	5464	8998	-48903	-50506	-57384	-81184	-44195	-57384	9032	-0.157
22	-65555	-76466	-78337	-80011	17769	-10979	-14709	2359	6624	-51676	-53289	-60856	-85668	-31341	-60856	11486	-0.189
23	-69031	-78455	-80236	-81814	15350	-12340	-16108	1027	4771	-52292	-53800	-61025	-89941	-27736	-61025	13185	-0.216
24	-69270	-78516	-80234	-81774	11588	-16193	-19806	-2389	1264	-52901	-54390	-61907	-86309	-26219	-61907	14751	-0.238
25	-70164	-81846	-83514	-84993	3175	-24024	-27511	-10109	-6122	-57010	-58438	-66040	-89468	-18907	-66040	15484	-0.234

* SAVINGS ARE POSITIVE AND DEBTS ARE NEGATIVE.
THE AMOUNTS ARE CUMULATIVE TO THE END OF THE MONTH.

TABLE XVII (Continued)

OUTPUT TABLE 9. INVESTMENTS AND CURRENT VALUES - LAND, MACHINERY, AND BREEDING STOCK*

YEAR	INVESTMENT LAND	CURRENT VALUE LAND	INVESTMENT MACHINERY	CURRENT VALUE MACHINERY	INVESTMENT BREEDING STOCK	CURRENT VALUE BREEDING STOCK	TOTAL INVESTMENT
1	0	75840	22956	19412	12209	12209	35166
2	0	77535	0	17880	0	12209	0
3	0	79231	0	16475	0	12209	0
4	0	80927	446	15408	0	12209	446
5	0	82623	444	14431	0	12209	444
6	84319	168639	23478	25116	1615	13825	109413
7	0	172031	0	23119	0	13825	0
8	0	175423	361	21424	0	13825	361
9	0	178815	347	19862	0	13825	347
10	0	182207	0	18296	0	13825	0
11	92799	278399	0	16860	0	13825	92799
12	0	283487	1058	15992	0	13825	1058
13	0	288575	5518	17332	0	13825	5518
14	0	293663	0	15905	0	13825	0
15	0	298751	12168	20973	0	13825	12168
16	101279	405119	6297	22683	0	13825	107576
17	0	411903	347	21036	0	13825	347
18	0	418687	697	19706	0	13825	697
19	0	425471	0	18163	0	13825	0
20	0	432255	5532	19350	0	13825	5532
21	164639	603679	347	17907	0	13825	164987
22	0	613007	0	16454	0	13825	0
23	0	622335	0	15126	0	13825	0
24	0	631663	13226	20730	0	13825	13226
25	0	640991	347	19273	0	13825	347

* END OF THE YEAR VALUES

TABLE XVII (Continued)

OUTPUT TABLE 10. FINANCIAL ARRANGEMENTS - LAND

YEAR	TOTAL PAYMENT LOW	HIGH	AVE	SD	CV	INTEREST LOW	HIGH	AVE	SD	CV	PRINCIPAL LOW	HIGH	AVE	SD	CV	OUTSTANDING PRINCIPAL LOW	HIGH	AVE	SD	CV
1	0	0	0	0	0.0	0	0	0	0	0.0	0	0	0	0	0.0	34100	34100	34100	12	0.00D
2	2633	2633	2633	9	0.004	2386	2386	2386	8	0.004	246	246	246	0	0.002	33853	33853	33853	61	0.002
3	2633	2633	2633	9	0.004	2369	2369	2369	6	0.003	263	263	263	1	0.004	33589	33589	33589	70	0.002
4	2633	2633	2633	9	0.004	2351	2351	2351	3	0.002	282	282	282	1	0.004	33306	33306	33306	93	0.003
5	2633	2633	2633	9	0.004	2331	2331	2331	6	0.003	302	302	302	0	0.001	33004	33004	33004	80	0.002
6	2633	2633	2633	9	0.004	2310	2310	2310	5	0.002	323	323	323	0	0.003	93461	117001	112339	6623	0.059
7	7218	9036	8676	511	0.059	6542	8190	7863	463	0.059	676	846	812	47	0.059	92785	116154	111526	6579	0.059
8	7218	9036	8676	511	0.059	6495	8130	7806	460	0.059	723	905	869	51	0.059	92062	115249	110657	6523	0.059
9	7218	9036	8676	511	0.059	6444	8067	7746	456	0.059	774	969	930	54	0.059	91288	114280	109727	6468	0.059
10	7218	9036	8676	511	0.059	6390	7999	7680	453	0.059	828	1036	995	58	0.059	90459	113243	108731	6410	0.059
11	7218	9036	8676	511	0.059	6332	7927	7611	448	0.059	886	1109	1065	62	0.059	152577	204933	178573	14857	0.083
12	11784	15827	13791	1147	0.083	10680	14345	12500	1040	0.083	1103	1482	1291	107	0.083	151473	203450	177282	14749	0.083
13	11784	15827	13791	1147	0.083	10603	14241	12409	1032	0.083	1181	1586	1382	114	0.083	150292	201864	175899	14635	0.083
14	11784	15827	13791	1147	0.083	10520	14130	12312	1024	0.083	1263	1697	1479	123	0.083	149029	200167	174420	14511	0.083
15	11784	15827	13791	1147	0.083	10432	14011	12209	1015	0.083	1352	1816	1582	131	0.083	147676	198351	172837	14381	0.083
16	11784	15827	13791	1147	0.083	10337	13884	12098	1006	0.083	1446	1943	1693	140	0.083	222710	291992	260443	18992	0.073
17	17200	22551	20115	1466	0.073	15589	20439	18231	1329	0.073	1611	2112	1884	137	0.073	221099	289880	258559	18855	0.073
18	17200	22551	20115	1466	0.073	15476	20291	18099	1319	0.073	1723	2260	2015	146	0.073	219375	287619	256543	18707	0.073
19	17200	22551	20115	1466	0.073	15356	20133	17958	1309	0.073	1844	2418	2157	157	0.073	217530	285201	254386	18551	0.073
20	17200	22551	20115	1466	0.073	15227	19964	17807	1298	0.073	1973	2587	2308	168	0.073	215556	282613	252078	18383	0.073
21	17200	22551	20115	1466	0.073	15088	19782	17645	1286	0.073	2111	2768	2469	180	0.073	362579	443022	404272	25340	0.063
22	28003	34216	31223	1957	0.063	25380	31011	28299	1773	0.063	2622	3204	2924	183	0.063	359956	439817	401348	25158	0.063
23	28003	34216	31223	1957	0.063	25196	30787	28094	1761	0.063	2806	3429	3129	196	0.063	357149	436388	398218	24963	0.063
24	28003	34216	31223	1957	0.063	25000	30547	27875	1747	0.063	3003	3669	3348	210	0.063	354146	432718	394870	24752	0.063
25	28003	34216	31223	1957	0.063	24790	30290	27640	1732	0.063	3213	3926	3582	224	0.063	350933	428792	391287	24529	0.063

TABLE XVII (Continued)

OUTPUT TABLE 11. FINANCIAL ARRANGEMENTS - MACHINERY

	TOTAL PAYMENT					INTEREST					PRINCIPAL					OUTSTANDING PRINCIPAL				
YEAR	LOW	HIGH	AVE	SD	CV	LOW	HIGH	AVE	SD	CV	LOW	HIGH	AVE	SD	CV	LOW	HIGH	AVE	SD	CV
1	0	0	0	0	0.0	0	0	0	0	0.0	0	0	0	0	0.0	18487	19170	18922	153	0.008
2	7549	7827	7726	63	0.008	1386	1437	1419	11	0.008	6162	6390	6307	52	0.008	12324	12780	12614	102	0.008
3	7086	7348	7253	60	0.008	924	958	946	7	0.008	6162	6390	6307	52	0.008	6162	6390	6307	52	0.008
4	6624	6869	6780	56	0.008	462	479	473	3	0.008	6162	6390	6307	52	0.008	446	446	446	1	0.002
5	182	182	182	0	0.003	33	33	33	0	0.002	148	148	148	0	0.003	742	742	742	1	0.002
6	303	303	303	0	0.002	55	55	55	0	0.002	247	247	247	0	0.002	23973	23973	23973	43	0.002
7	9789	9789	9789	7	0.001	1797	1797	1797	2	0.001	7991	7991	7991	12	0.002	15982	15982	15982	30	0.002
8	9189	9189	9189	26	0.003	1198	1198	1198	1	0.001	7991	7991	7991	10	0.001	8352	8352	8352	18	0.002
9	3410	3410	3410	12	0.004	626	626	626	1	0.002	2784	2784	2784	10	0.004	5915	5915	5915	18	0.003
10	2415	2415	2415	7	0.003	443	443	443	1	0.003	1971	1971	1971	3	0.002	3943	3943	3943	6	0.002
11	2267	2267	2267	4	0.002	295	295	295	1	0.003	1971	1971	1971	3	0.002	1971	1971	1971	3	0.002
12	2119	2119	2119	6	0.003	147	147	147	0	0.004	1971	1971	1971	3	0.002	1058	1058	1058	1	0.002
13	432	432	432	0	0.002	79	79	79	0	0.002	352	352	352	1	0.003	6224	6224	6224	16	0.003
14	2541	2541	2541	9	0.004	466	466	466	1	0.003	2074	2074	2074	4	0.002	4149	4149	4149	13	0.003
15	2385	2385	2385	4	0.002	311	311	311	1	0.004	2074	2074	2074	4	0.002	14242	14242	14242	24	0.002
16	5815	5815	5815	16	0.003	1068	1068	1068	1	0.002	4747	4747	4747	5	0.001	15792	15792	15792	2	0.000
17	6448	6448	6448	21	0.003	1184	1184	1184	2	0.002	5264	5264	5264	19	0.004	10875	10875	10875	8	0.001
18	4440	4440	4440	10	0.002	815	815	815	1	0.002	3625	3625	3625	9	0.003	7947	7947	7947	7	0.001
19	3245	3245	3245	5	0.002	596	596	596	1	0.002	2649	2649	2649	8	0.003	5298	5298	5298	13	0.002
20	3046	3046	3046	12	0.004	397	397	397	1	0.003	2649	2649	2649	8	0.003	8181	8181	8181	20	0.003
21	3340	3340	3340	11	0.004	613	613	613	1	0.002	2727	2727	2727	9	0.004	5801	5801	5801	18	0.003
22	2369	2369	2369	7	0.003	435	435	435	1	0.003	1933	1933	1933	2	0.002	3867	3867	3867	7	0.002
23	2224	2224	2224	4	0.002	290	290	290	0	0.003	1933	1933	1933	2	0.002	1933	1933	1933	3	0.002
24	2079	2079	2079	4	0.002	145	145	145	0	0.002	1933	1933	1933	2	0.002	13226	13226	13226	14	0.001
25	5401	5401	5401	1	0.000	992	992	992	1	0.001	4408	4408	4408	14	0.003	9165	9165	9165	21	0.002

TABLE XVII (Continued)

OUTPUT TABLE 12. FINANCIAL ARRANGEMENTS - COWS

	TOTAL PAYMENT					INTEREST					PRINCIPAL					OUTSTANDING PRINCIPAL				
YEAR	LOW	HIGH	AVE	SD	CV	LOW	HIGH	AVE	SD	CV	LOW	HIGH	AVE	SD	CV	LOW	HIGH	AVE	SD	CV
1	0	0	0	0	0.0	0	0	0	0	0.0	0	0	0	0	0.0	11309	11309	11309	9	0.001
2	4618	4618	4618	11	0.002	848	848	848	1	0.001	3769	3769	3769	13	0.004	7539	7539	7539	16	0.002
3	4335	4335	4335	11	0.003	565	565	565	1	0.003	3769	3769	3769	12	0.003	3769	3769	3769	12	0.003
4	4052	4052	4052	13	0.003	282	282	282	0	0.002	3769	3769	3769	12	0.003	0	0	0	0	0.0
5	0	0	0	0	0.0	0	0	0	0	0.0	0	0	0	0	0.0	0	0	0	0	0.0
6	0	0	0	0	0.0	0	0	0	0	0.0	0	0	0	0	0.0	0	1615	740	814	1.100
7	0	659	302	332	1.100	0	121	55	61	1.100	0	538	246	271	1.100	0	1077	493	543	1.100
8	0	619	283	312	1.100	0	80	37	40	1.100	0	538	246	271	1.100	0	538	246	271	1.100
9	0	578	265	291	1.100	0	40	18	20	1.100	0	538	246	271	1.100	0	0	0	0	0.0
10	0	0	0	0	0.0	0	0	0	0	0.0	0	0	0	0	0.0	0	0	0	0	0.0
11	0	0	0	0	0.0	0	0	0	0	0.0	0	0	0	0	0.0	0	0	0	0	0.0
12	0	0	0	0	0.0	0	0	0	0	0.0	0	0	0	0	0.0	0	0	0	0	0.0
13	0	0	0	0	0.0	0	0	0	0	0.0	0	0	0	0	0.0	0	0	0	0	0.0
14	0	0	0	0	0.0	0	0	0	0	0.0	0	0	0	0	0.0	0	0	0	0	0.0
15	0	0	0	0	0.0	0	0	0	0	0.0	0	0	0	0	0.0	0	0	0	0	0.0
16	0	0	0	0	0.0	0	0	0	0	0.0	0	0	0	0	0.0	0	0	0	0	0.0
17	0	0	0	0	0.0	0	0	0	0	0.0	0	0	0	0	0.0	0	0	0	0	0.0
18	0	0	0	0	0.0	0	0	0	0	0.0	0	0	0	0	0.0	0	0	0	0	0.0
19	0	0	0	0	0.0	0	0	0	0	0.0	0	0	0	0	0.0	0	0	0	0	0.0
20	0	0	0	0	0.0	0	0	0	0	0.0	0	0	0	0	0.0	0	0	0	0	0.0
21	0	0	0	0	0.0	0	0	0	0	0.0	0	0	0	0	0.0	0	0	0	0	0.0
22	0	0	0	0	0.0	0	0	0	0	0.0	0	0	0	0	0.0	0	0	0	0	0.0
23	0	0	0	0	0.0	0	0	0	0	0.0	0	0	0	0	0.0	0	0	0	0	0.0
24	0	0	0	0	0.0	0	0	0	0	0.0	0	0	0	0	0.0	0	0	0	0	0.0
25	0	0	0	0	0.0	0	0	0	0	0.0	0	0	0	0	0.0	0	0	0	0	0.0

OUTPUT TABLE 13. FINANCIAL ARRANGEMENTS - TOTALS

	TOTAL PAYMENT					INTEREST					PRINCIPAL					OUTSTANDING PRINCIPAL				
YEAR	LOW	HIGH	AVE	SD	CV	LOW	HIGH	AVE	SD	CV	LOW	HIGH	AVE	SD	CV	LOW	HIGH	AVE	SD	CV
1	0	0	0	0	0.0	0	0	0	0	0.0	0	0	0	0	0.0	63897	64580	64331	239	0.004
2	14800	15079	14978	68	0.005	4621	4673	4654	15	0.003	10179	10406	10323	54	0.005	53718	54173	54007	174	0.003
3	14055	14317	14222	64	0.005	3859	3893	3881	14	0.004	10196	10424	10341	55	0.005	43521	43749	43666	146	0.003
4	13310	13555	13466	59	0.004	3096	3113	3107	9	0.003	10214	10442	10359	54	0.005	33753	33753	33753	57	0.002
5	2816	2816	2816	8	0.003	2364	2364	2364	7	0.003	451	451	451	1	0.003	33747	33747	33747	46	0.001
6	2936	2936	2936	6	0.002	2366	2366	2366	5	0.002	570	570	570	1	0.002	117435	142590	137053	7185	0.052
7	17007	19485	18767	772	0.041	8340	10109	9717	506	0.052	8667	9376	9050	306	0.034	108767	133213	128002	6951	0.054
8	16408	18845	18150	755	0.042	7693	9410	9042	488	0.054	8714	9435	9107	308	0.034	100414	124140	119256	6706	0.056
9	10629	13026	12352	737	0.060	7070	8734	8390	470	0.056	3558	4291	3961	310	0.078	97204	120195	115642	6473	0.056
10	9634	11452	11092	511	0.046	6833	8443	8124	453	0.056	2800	3008	2967	59	0.020	94403	117187	112675	6409	0.057
11	9486	11304	10944	511	0.047	6627	8222	7906	449	0.057	2858	3081	3037	63	0.021	154549	206905	18054514857		0.082
12	13904	17947	15911	1147	0.072	10828	14493	12648	1040	0.082	3075	3454	3263	107	0.033	152532	204509	17834014750		0.083
13	12216	16260	14224	1147	0.081	10682	14320	12489	1032	0.083	1533	1939	1735	115	0.066	156517	208088	18212314634		0.080
14	14325	18369	16333	1147	0.070	10987	14597	12779	1024	0.080	3338	3772	3553	123	0.035	153178	204316	17856914512		0.081
15	14170	18213	16177	1147	0.071	10743	14322	12520	1015	0.081	3426	3890	3657	132	0.036	161919	212593	18708014382		0.077
16	17600	21643	19607	1147	0.059	11405	14952	13166	1006	0.076	6194	6690	6440	141	0.022	238502	307784	27623518992		0.069
17	23649	29000	26563	1466	0.055	16774	21623	19415	1329	0.068	6875	7376	7148	138	0.019	231975	300755	26943518855		0.070
18	21641	26992	24556	1466	0.060	16292	21107	18914	1319	0.070	5349	5885	5641	147	0.026	227323	295567	26449118707		0.071
19	20446	25797	23360	1466	0.063	15952	20729	18554	1309	0.071	4493	5067	4806	157	0.033	222829	290500	25968418552		0.071
20	20247	25598	23161	1466	0.063	15624	20361	18204	1298	0.071	4622	5236	4957	168	0.034	223738	290795	26025918383		0.071
21	20541	25892	23455	1466	0.063	15702	20396	18259	1286	0.070	4839	5496	5196	180	0.035	368380	448824	41007425341		0.062
22	30372	36585	33592	1958	0.058	25815	31446	28734	1773	0.062	4556	5138	4858	183	0.038	363823	443685	40521625159		0.062
23	30227	36440	33447	1958	0.059	25487	31077	28384	1761	0.062	4740	5363	5063	196	0.039	359083	438322	40015224962		0.062
24	30082	36295	33302	1958	0.059	25145	30692	28020	1747	0.062	4937	5603	5282	210	0.040	367373	445945	40809724753		0.061
25	33404	39617	36624	1958	0.053	25782	31282	28632	1732	0.061	7622	8335	7991	225	0.028	360098	437958	40045324527		0.061

OUTPUT TABLE 14. FARM OPERATION MONETARY SUMMARY*

	OPERATING CAPITAL					NET FARM INCOME					NET FAMILY INCOME	AFTER TAX INCOME					CONSUMPTION				
YEAR	LOW	HIGH	AVE	SD	CV	LOW	HIGH	AVE	SD	CV	AVE	LOW	HIGH	AVE	SD	CV	LOW	HIGH	AVE	SD	CV
1	69689	83476	75273	2675	0.036	-15702	1251	-6294	4156	-0.660	-6294	-15817	1136	-6409	4156	-0.649	4811	4811	4811	3	0.001
2	106708	115256	111676	2329	0.021	300	35888	18571	8659	0.466	18571	104	25363	14312	6232	0.435	3196	3196	3196	9	0.003
3	104069	116508	110764	2969	0.027	-2202	31220	16226	8019	0.494	16226	-2397	22767	12683	5938	0.468	3196	12735	8890	2481	0.279
4	102397	110484	107140	1842	0.017	-2867	32772	13495	8108	0.601	13495	-3062	23650	10673	6017	0.564	3196	11940	8299	2370	C.286
5	98117	108025	103700	2570	0.025	-3330	29110	13041	7942	0.609	13041	-3525	21534	10332	6112	0.592	3196	12214	7512	2365	0.315
6	103400	117117	109017	2737	0.025	-8453	26336	8519	7801	0.916	8519	-8639	19839	6875	6239	0.907	3196	11551	7376	2479	0.336
7	112413	123577	118878	2509	0.021	-13909	28767	6702	10231	1.527	6702	-14122	21320	5058	8384	1.657	3196	11000	6052	2209	0.365
8	115154	123460	119152	2381	0.020	-7986	33588	13919	9852	0.708	13919	-8199	24085	10783	7621	0.707	3196	11488	5691	2653	0.466
9	120920	132751	125724	3117	0.025	507	38569	19157	9810	0.512	19157	294	26737	14630	6789	0.464	3196	12353	7727	2604	0.337
10	120511	136638	130474	3738	0.029	-4141	48471	18811	10837	0.576	18811	-4354	31385	14263	7389	0.518	3196	13150	8968	2632	0.294
11	129350	142063	136529	2681	0.020	-5930	47619	21126	11605	0.549	21126	-6143	31014	15755	7806	0.495	3196	14486	8867	2711	0.306
12	129458	148087	139823	3893	0.028	-1367	43496	19495	11194	0.574	19495	-1580	29156	14728	7809	0.530	3196	14382	9454	2670	0.282
13	127271	141861	135993	3519	0.026	578	39999	19474	9523	0.489	19474	365	27473	14848	6518	0.439	3196	13854	8962	3019	0.337
14	128454	146080	135004	4146	0.031	-4430	37563	15769	10609	0.673	15769	-4643	26219	12121	7756	0.640	3196	13366	9075	2515	0.277
15	122197	135869	128421	3821	0.030	-5668	28934	8822	8570	0.971	8822	-5881	21417	7032	6646	0.945	3196	12997	7998	3052	0.382
16	120178	133643	128045	3527	0.028	-11659	27653	6350	9145	1.440	6350	-11872	20648	4933	7563	1.533	3196	11519	6054	2515	0.416
17	126865	140480	132428	2888	0.022	-14388	22684	1582	10459	6.608	1582	-14601	17450	545	9332	17.122	3196	11272	5424	2500	0.461
18	126691	141264	133410	3361	0.025	-12847	27431	5451	9315	1.709	5451	-13060	20508	4076	8065	1.978	3196	10205	4794	2235	0.466
19	133936	143829	138459	3130	0.023	-8299	35816	11539	10039	0.870	11539	-8512	25309	8946	7846	0.877	3196	11226	5521	2190	0.397
20	134278	153091	143844	3868	0.027	-5386	31975	14126	10016	0.709	14126	-5599	23194	10937	7524	0.688	3196	12724	7051	2635	0.374
21	140706	160972	149330	3881	0.026	1717	39619	14168	8663	0.611	14168	1504	27277	11140	5973	0.536	3196	12078	7689	2710	0.352
22	145576	162407	154462	4054	0.026	-11247	25430	8881	8363	0.942	8881	-11460	19247	7034	6939	0.986	3196	13309	7613	2389	0.314
23	145930	160315	153074	3622	0.024	-12355	37088	8177	10031	1.227	8177	-12568	25974	6302	8016	1.272	3196	10812	6304	2252	0.357
24	142194	157689	148595	3501	0.024	-15695	24542	3237	9480	2.929	3237	-15907	18687	2128	8376	3.935	3196	12924	6020	2655	0.441
25	139959	151883	146543	3885	0.027	-16657	22982	965	8280	8.572	965	-16870	17651	266	7393	27.795	3196	10625	4989	2179	0.437

* OPERATING CAPITAL INCLUDES VARIABLE COSTS OF CROP AND LIVESTOCK PRODUCTION, OVERHEAD, FEEDER PURCHASES, LAND RENT, REAL ESTATE TAXES, PERSONAL PROPERTY TAXES, INTEREST ON ALL LOANS, AND COST OF FINANCIAL ARRANGEMENTS.
NET FARM INCOME INCLUDES THOSE RETURNS AND EXPENSES REPORTABLE ON FEDERAL INCOME TAX FORM 1040 (CASH BASIS).
NET FAMILY INCOME INCLUDES NET FARM INCOME PLUS INCOME FROM EXTERNAL EMPLOYMENT.
AFTER TAX INCOME INCLUDES NET FAMILY INCOME MINUS FEDERAL, STATE, AND SOCIAL SECURITY TAXES.
CONSUMPTION IS BASED UPON AFTER TAX INCOME IN THE PREVIOUS YEAR.

OUTPUT TABLE 14. (CONTINUED)*

YEAR	ASSETS LOW	ASSETS HIGH	ASSETS AVE	ASSETS SD	ASSETS CV	LIABILITIES LOW	LIABILITIES HIGH	LIABILITIES AVE	LIABILITIES SD	LIABILITIES CV	NET WORTH LOW	NET WORTH HIGH	NET WORTH AVE	NET WORTH SD	NET WORTH CV
1	150937	162659	156443	2519	0.016	111160	133216	117713	4499	0.038	29443	46299	38729	4165	0.108
2	152444	162208	157668	2549	0.016	78171	121224	96451	9090	0.094	37825	78834	61216	10009	0.164
3	151967	161927	157121	2588	0.016	72096	99265	86681	7335	0.085	58965	85612	70439	7489	0.106
4	148803	158082	154341	2009	0.013	56037	92043	77181	8834	0.114	60441	99394	77160	9465	0.123
5	147493	154698	151751	1972	0.013	47377	87099	67528	10186	0.151	65068	103529	84223	10282	0.122
6	247712	257420	253212	2201	0.009	145338	197895	173606	11929	0.069	59524	107535	79605	12073	0.152
7	249129	257915	253951	2243	0.009	136469	188574	166352	12235	0.074	68054	120028	87599	12485	0.143
8	252421	261729	255957	2404	0.009	128836	186784	154627	12054	0.078	67118	132892	101330	12785	0.126
9	259169	272984	264463	2772	0.010	110933	180783	148228	14450	0.097	79856	156674	116234	14996	0.129
10	263133	277676	270695	3346	0.012	111723	179053	142934	14735	0.103	91121	154864	127760	15105	0.118
11	363982	375853	369945	2820	0.008	196721	262432	228738	14818	0.065	105847	169271	141206	15660	0.111
12	365931	382402	375578	3712	0.010	190121	260124	223092	16738	0.075	114996	188494	152485	17222	0.113
13	371293	387014	379181	3193	0.008	178918	257085	216069	17507	0.081	125016	208095	163111	18151	0.111
14	374007	388986	380783	3269	0.009	165044	253700	208328	21480	0.103	129251	216178	172454	21154	0.123
15	380611	395707	386079	3669	0.010	176492	246849	212688	21223	0.100	136143	214421	173390	21791	0.126
16	484910	495872	491473	3059	0.006	268577	349186	312450	21775	0.070	138605	227294	179023	21694	0.121
17	490460	503946	497278	2626	0.005	270089	352232	312898	23482	0.075	146092	226057	184380	23165	0.126
18	499167	508051	503624	2395	0.005	258096	349968	309839	26160	0.084	155136	245814	193784	26363	0.136
19	508280	520261	513349	3231	0.006	257874	355418	305350	26868	0.088	158186	256447	207998	27701	0.133
20	521598	533597	527235	3390	0.006	254429	361063	307536	29231	0.095	167386	275014	219698	29719	0.135
21	695842	709439	700729	3730	0.005	418770	524403	468359	29662	0.063	177477	281268	232372	30241	0.130
22	699981	715438	709251	4508	0.006	417184	522324	466972	30940	0.066	181550	293258	242281	31880	0.132
23	708309	723063	715649	3827	0.005	394889	517866	462078	32352	0.070	196887	319821	253572	32994	0.130
24	718840	733363	727249	3894	0.005	405157	526827	470905	33853	0.072	194505	327824	256346	34638	0.135
25	726026	737057	731549	3482	0.005	403847	520958	467393	33990	0.073	211677	326466	264157	33976	0.129

* ASSETS INCLUDES THE CURRENT VALUE OF LAND, MACHINERY, AND LIVESTOCK AND SAVINGS AT THE END OF THE YEAR.
LIABILITIES INCLUDES THE OUTSTANDING PRINCIPAL AT THE END OF THE YEAR ON LAND, MACHINERY, LIVESTOCK, AND OTHER LOANS.
NET WORTH IS ASSETS MINUS LIABILITIES.

NW = A + BX (X=TIME)

A = 34920.69

B = 9253.99

STANDARD ERROR OF B = 174.33

TABLE XVII (Continued)

OUTPUT TABLE 14. (CONTINUED)*

YEAR	NET WORTH RATIO					REAL ESTATE DEBT TO LIMITATION RATIO					NON REAL ESTATE DEBT TO LIMITATION RATIO				
	LOW	HIGH	AVE	SD	CV	LOW	HIGH	AVE	SD	CV	LOW	HIGH	AVE	SD	CV
1	0.1810	0.2936	0.2476	0.0260	0.1052	0.5995	0.5995	0.5995	0.0014	0.0024	0.8190	1.0027	0.8967	0.0437	0.0487
2	0.2378	0.5003	0.3879	0.0609	0.1571	0.5822	0.5822	0.5821	0.0020	0.0034	0.4785	0.9199	0.6688	0.1026	0.1534
3	0.3768	0.5315	0.4483	0.0464	0.1034	0.5652	0.5652	0.5652	0.0009	0.0015	0.4286	0.6883	0.5682	0.0778	0.1369
4	0.3974	0.6395	0.4997	0.0590	0.1180	0.5488	0.5488	0.5487	0.0017	0.0030	0.2467	0.6544	0.4818	0.0994	0.2063
5	0.4276	0.6843	0.5550	0.0672	0.1211	0.5326	0.5326	0.5326	0.0008	0.0016	0.1642	0.6050	0.3878	0.1145	0.2953
6	0.2312	0.4253	0.3143	0.0473	0.1504	0.7389	0.9251	0.8882	0.0524	0.0590	0.4397	0.9316	0.7051	0.1140	0.1616
7	0.2689	0.4680	0.3449	0.0485	0.1407	0.7191	0.9003	0.8644	0.0510	0.0590	0.3468	0.8358	0.6277	0.1298	0.2067
8	0.2643	0.5077	0.3957	0.0485	0.1226	0.6997	0.8760	0.8411	0.0496	0.0590	0.2267	0.8541	0.4902	0.1223	0.2494
9	0.3064	0.5855	0.4394	0.0555	0.1263	0.6807	0.8521	0.8182	0.0483	0.0590	0.1242	0.7347	0.3950	0.1245	0.3151
10	0.3373	0.5754	0.4719	0.0550	0.1165	0.6620	0.8287	0.7957	0.0470	0.0590	0.0791	0.6592	0.3285	0.1285	0.3911
11	0.2874	0.4617	0.3816	0.0414	0.1084	0.7307	0.9815	0.8552	0.0712	0.0832	0.3343	0.6992	0.4637	0.0755	0.1628
12	0.3066	0.4979	0.4059	0.0451	0.1110	0.7124	0.9569	0.8338	0.0694	0.0832	0.1712	0.6900	0.3995	0.1053	0.2635
13	0.3272	0.5377	0.4301	0.0468	0.1087	0.6944	0.9327	0.8127	0.0676	0.0832	0.1495	0.5729	0.3404	0.0985	0.2893
14	0.3375	0.5671	0.4529	0.0557	0.1230	0.6766	0.9088	0.7919	0.0659	0.0832	0.0427	0.5460	0.2838	0.1247	0.4394
15	0.3555	0.5485	0.4490	0.0555	0.1235	0.6591	0.8852	0.7714	0.0642	0.0832	0.1201	0.5316	0.3197	0.1148	0.3591
16	0.2841	0.4584	0.3643	0.0441	0.1210	0.7330	0.9610	0.8572	0.0626	0.0730	0.2766	0.7050	0.4547	0.1045	0.2299
17	0.2932	0.4539	0.3708	0.0467	0.1260	0.7157	0.9383	0.8370	0.0611	0.0730	0.2518	0.6708	0.4505	0.1203	0.2670
18	0.3071	0.4878	0.3848	0.0521	0.1354	0.6986	0.9159	0.8170	0.0596	0.0730	0.1716	0.6706	0.4197	0.1345	0.3204
19	0.3080	0.4974	0.4051	0.0532	0.1313	0.6817	0.8938	0.7972	0.0582	0.0730	0.1495	0.6403	0.3725	0.1301	0.3491
20	0.3202	0.5194	0.4166	0.0558	0.1340	0.6649	0.8717	0.7776	0.0567	0.0730	0.1287	0.6607	0.3677	0.1346	0.3660
21	0.2529	0.4018	0.3316	0.0428	0.1292	0.8008	0.9785	0.8929	0.0560	0.0627	0.3225	0.8526	0.5039	0.1414	0.2806
22	0.2588	0.4128	0.3415	0.0445	0.1303	0.7829	0.9566	0.8730	0.0548	0.0627	0.2408	0.8254	0.4814	0.1477	0.3068
23	0.2755	0.4475	0.3543	0.0457	0.1291	0.7652	0.9349	0.8532	0.0535	0.0628	0.1668	0.7323	0.4428	0.1381	0.3118
24	0.2696	0.4472	0.3524	0.0472	0.1338	0.7475	0.9134	0.8335	0.0523	0.0627	0.2181	0.7885	0.4852	0.1414	0.2914
25	0.2889	0.4470	0.3611	0.0464	0.1285	0.7300	0.8919	0.8139	0.0511	0.0628	0.1627	0.7037	0.4680	0.1381	0.2951

* NET WORTH RATIO IS NET WORTH DIVIDED BY ASSETS.
REAL ESTATE DEBT TO LIMITATION RATIO IS THE REAL ESTATE DEBT DIVIDED BY THE REAL ESTATE DEBT LIMITATION.
NON REAL ESTATE DEBT TO LIMITATION RATIO IS THE NON REAL ESTATE DEBT DIVIDED BY THE NON REAL ESTATE DEBT LIMITATION.

TABLE XVIII

ARRANGEMENT OF DATA IN TABLE FORM

INPUT TABLE 1 PRODUCTION COEFFICIENTS* (CODE = PC)

ROW	ACTIVITY		YIELD	SGPHCH (AUM)	SGPHAY (AUM)	GSSP (AUM)	ALFHAY (TON)	PRARYH (TON)	NATPAS (AUM)
1	WHEAT	– CB	28.000	YIELDS	YIELDS	0.0	0.0	0.0	0.0
2	(76.)	CC	21.000	ARE	ARE	0.0	0.0	0.0	0.0
3		CD	16.000	A	A	0.0	0.0	0.0	0.0
4		LA	28.000	FUNC.	FUNC.	0.0	0.0	0.0	0.0
5		LB	25.000	OF	OF	0.0	0.0	0.0	0.0
6		LC	22.000	WHEAT	WHEAT	0.0	0.0	0.0	0.0
7		LD	18.000	YIELDS	YIELDS	0.0	0.0	0.0	0.0
8	GR SORGHUM	– CB	16.800	0.0	0.0	0.200	0.0	0.0	0.0
9	(73.)	CC	12.320	0.0	0.0	0.200	0.0	0.0	0.0
10		CD	8.960	0.0	0.0	0.200	0.0	0.0	0.0
11		LA	17.920	0.0	0.0	0.200	0.0	0.0	0.0
12		LB	15.680	0.0	0.0	0.200	0.0	0.0	0.0
13		LC	13.440	0.0	0.0	0.200	0.0	0.0	0.0
14		LD	10.640	0.0	0.0	0.200	0.0	0.0	0.0
15	BARLEY	– CB	32.000	0.0	0.0	0.0	0.0	0.0	0.0
16	(71.)	CC	25.000	0.0	0.0	0.0	0.0	0.0	0.0
17		CD	20.000	0.0	0.0	0.0	0.0	0.0	0.0
18		LA	34.000	0.0	0.0	0.0	0.0	0.0	0.0
19		LB	30.000	0.0	0.0	0.0	0.0	0.0	0.0
20		LC	26.000	0.0	0.0	0.0	0.0	0.0	0.0
21		LD	22.000	0.0	0.0	0.0	0.0	0.0	0.0
22	SM GR PAST	– CB	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23	(800)	CC	0.0	0.0	0.0	0.0	0.0	0.0	0.0
24		CD	0.0	0.0	0.0	0.0	0.0	0.0	0.0
25		LA	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26		LB	0.0	0.0	0.0	0.0	0.0	0.0	0.0
27		LC	0.0	0.0	0.0	0.0	0.0	0.0	0.0
28		LD	0.0	0.0	0.0	0.0	0.0	0.0	0.0
29	FORAGE SORG	– CB	0.0	0.0	0.0	0.200	0.0	2.600	0.0
30	(803)	CC	0.0	0.0	0.0	0.200	0.0	2.000	0.0
31		CD	0.0	0.0	0.0	0.200	0.0	1.600	0.0
32		LA	0.0	0.0	0.0	0.200	0.0	3.000	0.0
33		LB	0.0	0.0	0.0	0.200	0.0	2.600	0.0
34		LC	0.0	0.0	0.0	0.200	0.0	2.200	0.0
35		LD	0.0	0.0	0.0	0.200	0.0	1.800	0.0
36	SUD GR PAST	– CB	0.0	0.0	0.0	0.0	0.0	0.0	2.100
37	(85.)	CC	0.0	0.0	0.0	0.0	0.0	0.0	1.900
38		CD	0.0	0.0	0.0	0.0	0.0	0.0	1.800
39		LA	0.0	0.0	0.0	0.0	0.0	0.0	2.400
40		LB	0.0	0.0	0.0	0.0	0.0	0.0	2.200
41		LC	0.0	0.0	0.0	0.0	0.0	0.0	2.000
42		LD	0.0	0.0	0.0	0.0	0.0	0.0	1.800
43	ALFALFA	– CB	0.0	0.0	0.0	0.200	2.500	0.0	0.0
44	(81.)	CC	0.0	0.0	0.0	0.200	2.000	0.0	0.0
45		LA	0.0	0.0	0.0	0.200	2.600	0.0	0.0
46		LB	0.0	0.0	0.0	0.200	2.400	0.0	0.0
47		LC	0.0	0.0	0.0	0.200	2.200	0.0	0.0
48	NAT PAST	– C	0.0	0.0	0.0	0.0	0.0	0.0	1.000
49	(86.)	L	0.0	0.0	0.0	0.0	0.0	0.0	1.200
50	STEERS (144TYA)		0.0	1.400	1.400	0.0	0.0	0.450	0.500
51	B – OCT		4.500	0.0	0.0	0.0	0.0	0.0	0.0
52	S – MAY		7.080	0.0	0.0	0.0	0.0	0.0	0.0
53	STEERS (145TYA)		0.0	1.400	1.400	1.000	0.0	0.025	0.500
54	B – OCT		4.500	0.0	0.0	0.0	0.0	0.0	0.0
55	S – MAY		7.080	0.0	0.0	0.0	0.0	0.0	0.0
56	STEERS (141TTA)		0.0	0.0	0.0	0.0	0.0	0.025	6.700
57	B – OCT		4.500	0.0	0.0	0.0	0.0	0.0	0.0
58	S – OCT		7.670	0.0	0.0	0.0	0.0	0.0	0.0
59	COW–CALF (111RTA)		1.182	0.0	0.0	0.0	0.0	0.025	13.400
60	S – STEER CALF		2.134	0.0	0.0	0.0	0.0	0.0	0.0
61	S – HEIFER CALF		1.288	0.0	0.0	0.0	0.0	0.0	0.0

* YIELD OF WHEAT IN BU, GRAIN SORGHUM IN CWT, BARLEY IN BU, AND LVSTK IN CWT.

TABLE XVIII (Continued)

INPUT TABLE 2. EXPENSES (CODE = E)

ROW	ACTIVITY		JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	TOTAL
1	WHEAT	– CB	0.0	3.960	0.0	0.0	0.0	5.300	0.0	0.0	5.780	0.0	0.0	0.0	15.040
2		CC	0.0	3.960	0.0	0.0	0.0	4.600	0.0	0.0	5.780	0.0	0.0	0.0	14.340
3		CD	0.0	3.960	0.0	0.0	0.0	4.300	0.0	0.0	5.780	0.0	0.0	0.0	14.040
4		LA	0.0	3.960	0.0	0.0	0.0	5.300	0.0	0.0	5.400	0.0	0.0	0.0	14.660
5		LB	0.0	3.960	0.0	0.0	0.0	5.000	0.0	0.0	5.400	0.0	0.0	0.0	14.360
6		LC	0.0	3.960	0.0	0.0	0.0	4.700	0.0	0.0	5.400	0.0	0.0	0.0	14.060
7		LD	0.0	3.960	0.0	0.0	0.0	4.400	0.0	0.0	5.400	0.0	0.0	0.0	13.760
8	GR SORGHUM	– CB	0.0	0.0	0.0	0.0	5.500	1.000	0.0	0.0	0.0	5.500	0.0	0.0	12.000
9		CC	0.0	0.0	0.0	0.0	5.500	1.000	0.0	0.0	0.0	4.700	0.0	0.0	11.200
10		CD	0.0	0.0	0.0	0.0	5.500	1.000	0.0	0.0	0.0	4.300	0.0	0.0	10.800
11		LA	0.0	0.0	0.0	0.0	1.980	1.000	0.0	0.0	0.0	5.700	0.0	0.0	8.680
12		LB	0.0	0.0	0.0	0.0	1.980	1.000	0.0	0.0	0.0	5.300	0.0	0.0	8.280
13		LC	0.0	0.0	0.0	0.0	1.980	1.000	0.0	0.0	0.0	4.900	0.0	0.0	7.880
14		LD	0.0	0.0	0.0	0.0	1.980	1.000	0.0	0.0	0.0	4.450	0.0	0.0	7.430
15	BARLEY	– CB	0.0	3.960	0.0	0.0	0.0	5.700	0.0	0.0	5.780	0.0	0.0	0.0	15.440
16		CC	0.0	3.960	0.0	0.0	0.0	5.700	0.0	0.0	5.780	0.0	0.0	0.0	15.440
17		CD	0.0	3.960	0.0	0.0	0.0	5.700	0.0	0.0	5.780	0.0	0.0	0.0	15.440
18		LA	0.0	3.960	0.0	0.0	0.0	5.900	0.0	0.0	5.780	0.0	0.0	0.0	15.640
19		LB	0.0	3.960	0.0	0.0	0.0	5.500	0.0	0.0	5.780	0.0	0.0	0.0	15.240
20		LC	0.0	3.960	0.0	0.0	0.0	5.100	0.0	0.0	5.780	0.0	0.0	0.0	14.840
21		LD	0.0	3.960	0.0	0.0	0.0	4.700	0.0	0.0	5.780	0.0	0.0	0.0	14.440
22	SM GR PAST		0.0	3.960	0.0	0.0	0.0	0.0	0.0	0.0	5.780	0.0	0.0	0.0	9.740
23	FORAGE SORG	– CB	0.0	0.0	0.0	0.0	7.480	2.400	0.0	0.0	0.0	18.750	0.0	0.0	28.630
24		CC	0.0	0.0	0.0	0.0	7.480	2.400	0.0	0.0	0.0	15.000	0.0	0.0	24.880
25		CD	0.0	0.0	0.0	0.0	7.480	2.400	0.0	0.0	0.0	12.000	0.0	0.0	21.880
26		LA	0.0	0.0	0.0	0.0	3.960	2.400	0.0	0.0	0.0	22.500	0.0	0.0	28.860
27		LB	0.0	0.0	0.0	0.0	3.960	2.400	0.0	0.0	0.0	19.500	0.0	0.0	25.860
28		LC	0.0	0.0	0.0	0.0	3.960	2.400	0.0	0.0	0.0	16.560	0.0	0.0	22.920
29		LD	0.0	0.0	0.0	0.0	3.960	2.400	0.0	0.0	0.0	13.500	0.0	0.0	19.860
30	SUD GR PAST	– C	0.0	0.0	0.0	4.780	5.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.780
31		L	0.0	0.0	0.0	3.960	5.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.960
32	ALFALFA	– C	0.0	0.0	0.0	0.0	0.0	3.000	0.0	7.910	10.000	0.0	0.0	0.0	20.910
33	SEED-IN	L	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.070	10.000	0.0	0.0	0.0	14.070
34	ALFALFA	– CB	0.0	1.640	0.0	0.0	0.0	6.250	6.250	6.250	0.0	0.0	0.0	0.0	20.390
35	ESTABLISHED	CC	0.0	1.640	0.0	0.0	0.0	5.000	5.000	5.000	0.0	0.0	0.0	0.0	16.640
36		LA	0.0	1.640	0.0	0.0	0.0	6.500	6.500	6.500	0.0	0.0	0.0	0.0	21.140
37		LB	0.0	1.640	0.0	0.0	0.0	6.000	6.000	6.000	0.0	0.0	0.0	0.0	19.640
38		LC	0.0	1.640	0.0	0.0	0.0	5.500	5.500	5.500	0.0	0.0	0.0	0.0	18.140
39	STEERS (144TYA)		0.578	0.578	0.264	0.264	3.279	0.0	0.0	0.0	0.0	2.642	0.578	2.653	10.836
40	STEERS (145TYA)		0.578	0.578	0.264	0.264	3.279	0.0	0.0	0.0	0.0	2.642	0.578	2.653	10.836
41	STEERS (141TTA)		2.193	2.193	0.212	0.212	0.210	0.210	0.210	0.210	0.210	7.812	2.193	4.188	20.053
42	COW-CALF		2.403	2.403	0.208	0.208	1.958	0.208	0.208	0.208	0.208	4.515	2.403	4.804	19.734
43	OTHER		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
44	TAX/$1000 LAND VAL		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.418	8.418
45	RNT/$1000 LAND VAL		21.710	0.0	0.0	0.0	0.0	21.710	0.0	0.0	0.0	0.0	0.0	0.0	43.420
46	HIRED LABOR CHG/HR		1.250	1.250	1.250	1.250	1.250	1.250	1.250	1.250	1.250	1.250	1.250	1.250	0.0
47	OVERHEAD/FARM		287.430	197.210	117.500	111.450	129.860	147.320	132.390	117.430	117.430	113.790	102.630	125.560	1700.000
48	OVERHEAD/OWNED AC		0.001	0.129	0.099	0.082	0.134	0.183	0.142	0.099	0.099	0.088	0.057	0.057	1.250
49	OVERHEAD/RENTED AC		0.062	0.108	0.078	0.061	0.113	0.162	0.121	0.078	0.078	0.067	0.036	0.036	1.000

INPUT TABLE 3. LABOR REQUIREMENTS AND FAMILY LABOR AVAILABILITY* (CODE =¥)

ROW	ACTIVITY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	TOTAL
1	STEERS (144TYA)	0.450	0.450	0.300	0.300	1.020	0.0	0.0	0.0	0.0	0.540	0.300	0.300	3.660
2	STEERS (145TYA)	0.300	0.300	0.300	0.300	1.020	0.0	0.0	0.0	0.0	0.540	0.300	0.200	3.260
3	STEERS (141TTA)	0.700	0.700	0.700	0.700	0.500	0.500	0.500	0.500	0.500	0.900	0.700	0.700	7.600
4	COW-CALF (111RTA)	1.440	2.300	2.460	1.900	0.720	0.200	0.200	0.160	0.200	0.480	0.500	0.600	11.160
5	FAMILY LABOR AVAIL	200.000	200.000	200.000	200.000	200.000	200.000	200.000	200.000	200.000	200.000	200.000	200.000	2400.000

* CROP LABOR REQUIREMENTS ARE COMPUTED WITHIN THE PROGRAM.

INPUT TABLE 4. MONTHLY FIELD OPERATIONS (CODE = MO)

OPERATION	WHEAT	GRAIN SORGHUM	BARLEY	SMALL GRAIN PASTURE	FORAGE SORGHUM	SUDAN GRASS PASTURE	ALFALFA SEED-IN	ALFALFA ESTAB
PLOW	6	3	6	6	3	3	6	0
PLOW	0	0	0	0	0	0	0	0
PLOW	0	0	0	0	0	0	0	0
TANDEM DISC	7	0	7	7	0	0	7	0
TANDEM DISC	0	0	0	0	0	0	0	0
TANDEM DISC	0	0	0	0	0	0	0	0
SPRING-TOOTH	7	4	7	7	4	4	7	0
SPRING-TOOTH	8	5	8	8	5	5	8	0
SPRING-TOOTH	9	0	9	9	0	0	9	0
ROTARY HOE	0	7	0	0	7	0	0	0
ROTARY HOE	0	8	0	0	8	0	0	0
ROTARY HOE	0	0	0	0	0	0	0	0
SPIKE-TOOTH	0	0	0	0	0	0	9	0
SPIKE-TOOTH	0	0	0	0	0	0	0	0
SPIKE-TOOTH	0	0	0	0	0	0	0	0
DRILL	9	6	9	9	6	5	9	0
DRILL	0	0	0	0	0	0	0	0
DRILL	0	0	0	0	0	0	0	0
MOW	0	0	0	0	10	0	0	6
MOW	0	0	0	0	0	0	0	7
MOW	0	0	0	0	0	0	0	8
RAKE	0	0	0	0	10	0	0	6
RAKE	0	0	0	0	0	0	0	7
RAKE	0	0	0	0	0	0	0	8
FERT OR LIME	2	5	2	2	5	4	6	2
FERT OR LIME	0	0	0	0	0	0	8	0
FERT OR LIME	0	0	0	0	0	0	0	0

INPUT TABLE 5. CAPITAL INVESTMENTS (CODE = CI)

ROW	ACTIVITY	UNIT	MONTH	AMOUNT ($)
1	COW (DIS)INVESTMENT	COW	6	180.000
2	BULL (DIS)INVESTMENT	HEAD	6	300.000
3	MACHINERY(SEE TABLE 6)		2	0.0
4	LAND		0	0.0
5	VALUE(CURRENT)	ACRE	6	237.000
6	AVERAGE ANNUAL INCREASE	ACRE	6	5.300

INPUT TABLE 6. MACHINERY - SIZE, PRICE, AND LABOR REQUIREMENTS* (CODE = SCL)

	50 - 60 H.P. TRACTOR SET 1			70 - 80 H.P. TRACTOR SET 2			90 -100 H.P. TRACTOR SET 3			110-120 H.P. TRACTOR SET 4			130-140 H.P. TRACTOR SET 5		
IMPLEMENT	MACH SIZE	CASH PURCH PRICE	LABOR TIME PER ACRE	MACH SIZE	CASH PURCH PRICE	LABOR TIME PER ACRE	MACH SIZE	CASH PURCH PRICE	LABOR TIME PER ACRE	MACH SIZE	CASH PURCH PRICE	LABOR TIME PER ACRE	MACH SIZE	CASH PURCH PRICE	LABOR TIME PER ACRE
PLOW	3	746	0.823	4	963	0.599	5	1210	0.467	6	1508	0.379	7	1977	0.316
TANDEM DISC	11	906	0.289	14	1032	0.219	15	1144	0.181	22	1976	0.129	22	1976	0.103
SPRING-TOOTH	12	221	0.293	20	669	0.162	24	827	0.129	32	1022	0.091	32	1022	0.082
ROTARY HOE	14	361	0.207	21	730	0.129	21	730	0.129	30	1515	0.083	30	1515	0.083
SPIKE-TOOTH	24	291	0.179	24	291	0.179	30	360	0.091	30	360	0.091	30	360	0.091
DRILL	11	1551	0.363	13	2104	0.300	21	3474	0.169	27	4209	0.123	27	4209	0.123
MOWER	9	576	0.392	9	576	0.392	9	576	0.392	9	576	0.392	9	576	0.392
RAKE	9	599	0.409	9	599	0.409	9	599	0.409	9	599	0.409	9	599	0.409
FERT OR LIME	0	0	0.120	0	0	0.120	0	0	0.120	0	0	0.120	0	0	0.120
TRACTOR	0	4331	0.0	0	6612	0.0	0	7724	0.0	0	9531	0.0	0	11406	0.0

* FACTORY RATED H.P.
PLOW SIZE = NUMBER OF 16 INCH BOTTOMS. OTHER SIZES IN FEET.
DRILL HAS 8 INCH SPACINGS.

INPUT TABLE 7. TRACTOR COMBINATIONS (CODE = MCOMB)

10000	11000	11100	20000	21000	22000	21100	22100	22200	30000	31000	32000	33000	31100	32100	32200
33100	33200	33300	40000	41000	42000	43000	44000	41100	42100	42200	43100	43200	43300	44100	44200
44300	44400	50000	51000	52000	53000	54000	55000	51100	52100	52200	53100	53200	53300	54100	54200
54300	54400	55100	55200	55300	55400	55500	00000	00000	00000	00000	00000	00000	00000	00000	00000
00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000
00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000
00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000
00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000
00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000
00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000
00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000
00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000
00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000
00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000
00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000

TABLE XVIII (Continued)

INPUT TABLE 8. CROP PRICES AND GOVERNMENT PAYMENTS (CODE = CPGP)

ROW	ACTIVITY	UNIT	MONTH	AMOUNT ($)
1	WHEAT	BU	6	1.300
2	GRAIN SORGHUM	CWT	10	1.950
3	BARLEY	BU	6	0.880
4	SMALL GRAIN PASTURE - MARCH	AUM	12	10.000
5	SMALL GRAIN PASTURE - MAY	AUM	2	10.000
6	GRAIN SORGHUM STUBBLE PASTURE	AUM	10	3.000
7	ALFALFA HAY	TON	9	22.900
8	PRARIE HAY	TON	10	17.000
9	NATIVE PASTURE	AUM	7	3.000
10	WHEAT DIVERSION PAYMENT	ACRE	8	16.930
11	GR SORGHUM DIVERSION PAYMENT	ACRE	9	13.340
12	BARLEY DIVERSION PAYMENT	ACRE	9	11.420
13	WHEAT CERTIFICATE PAYMENT	ACRE	8	36.840
14	GR SORGHUM PRICE SUPPORT PAYMENT	ACRE	9	7.340
15	BARLEY PRICE SUPPORT PAYMENT	ACRE	9	5.080

INPUT TABLE 9. LIVESTOCK PRICES (CODE = LP AND FL)

	SLAUGHTER COWS COMMERCIAL	FEEDER STEERS GOOD	FEEDER STEERS GOOD	FEEDER STEER CALVES GOOD	FEEDER HEIFER CALVES GOOD
MONTH =	10	5	10	10	10
YEAR					
1	17.88	27.82	25.32	28.49	25.61
2	18.24	28.82	25.83	29.06	26.13
3	17.77	28.64	25.17	28.31	25.45
4	16.70	27.38	23.66	26.61	23.92
5	15.49	25.62	21.94	24.68	22.19
6	14.66	24.12	20.77	23.36	21.01
7	14.59	23.52	20.66	23.24	20.90
8	15.37	24.15	21.76	22.48	22.01
9	16.72	25.80	23.68	26.63	23.94
10	18.20	27.98	25.78	29.00	26.07
11	19.31	29.88	27.36	30.77	27.66
12	19.67	30.88	27.86	31.34	28.18
13	19.20	30.70	27.20	30.59	27.51
14	18.13	29.44	25.67	28.88	25.97
15	16.93	27.68	23.97	26.97	24.24
16	16.10	26.19	22.80	25.65	23.06
17	16.02	25.58	22.69	25.53	22.95
18	16.79	26.21	23.78	26.75	24.05
19	18.15	27.87	25.71	28.92	25.99
20	19.64	30.05	27.81	31.28	28.12
21	20.75	31.95	29.38	33.05	29.72
22	21.10	32.95	29.88	33.61	30.22
23	20.63	32.77	29.22	32.86	29.55
24	19.56	31.52	27.70	31.16	28.02
25	18.36	29.75	26.00	29.25	26.30

TABLE XVIII (Continued)

INPUT TABLE 10. COEFFICIENTS OF VARIATION (CODE - CV)

ROW	ACTIVITY	PRODUCTION	PRICES
1	WHEAT	0.3200	0.0193
2	GRAIN SORGHUM	0.3200	0.0850
3	BARLEY	0.4370	0.0840
4	SMALL GRAIN PASTURE - MARCH	0.2680	0.0790
5	SMALL GRAIN PASTURE - MAY	0.1310	0.0750
6	FORAGE SORGHUM	0.2610	0.0
7	GRAIN SORGHUM STUBBLE PASTURE	0.2610	0.0880
8	SUDAN GRASS PASTURE	0.2770	0.0
9	ALFALFA HAY	0.2280	0.1120
10	ALFALFA PASTURE	0.2280	0.0
11	NATIVE PASTURE	0.3850	0.0910
12	PRARIE HAY	0.0	0.0880
13	FEEDER STEERS - MAY	0.0	0.0400
14	FEEDER STEERS - OCT	0.0	0.0430
15	SLAUGHTER COWS	0.0	0.0380
16	FEEDER STEER CALVES	0.0	0.0530
17	FEEDER HEIFER CALVES	0.0	0.0530

TABLE XVIII (Continued)

INPUT TABLE 11. PROFIT MAX. PROD. PLAN ALTERNATIVES (CODE = PPA)

ROW	ACTIVITY		INCLUDES CROPS ONLY	INCLUDES CROPS AND COWS	INCLUDES CROPS AND FEEDERS	INCLUDES CROPS COWS AND FEEDERS
1	WHEAT	- CB	0.077857	0.077857	0.077857	0.077857
2	(76.)	CC	0.0	0.0	0.0	0.0
3		CD	0.0	0.0	0.0	0.0
4		LA	0.087232	0.087232	0.087232	0.087232
5		LB	0.0	0.0	0.0	0.0
6		LC	0.0	0.0	0.0	0.0
7		LD	0.0	0.0	0.0	0.0
8	GR SORGHUM	- CB	0.0	0.0	0.0	0.0
9	(73.)	CC	0.0	0.0	0.0	0.0
10		CD	0.0	0.0	0.0	0.0
11		LA	0.039857	0.039857	0.024911	0.024911
12		LB	0.0	0.0	0.0	0.0
13		LC	0.0	0.0	0.0	0.0
14		LD	0.0	0.0	0.0	0.0
15	BARLEY	- CB	0.0	0.0	0.0	0.0
16	(71.)	CC	0.0	0.0	0.0	0.0
17		CD	0.0	0.0	0.0	0.0
18		LA	0.019080	0.018794	0.012654	0.012866
19		LB	0.0	0.0	0.0	0.0
20		LC	0.0	0.0	0.0	0.0
21		LD	0.0	0.0	0.0	0.0
22	SM GR PAST	- CB	0.0	0.0	0.0	0.0
23	(800)	CC	0.124643	0.124643	0.124643	0.124643
24		CD	0.050357	0.050357	0.050357	0.050357
25		LA	0.0	0.0	0.0	0.0
26		LB	0.0	0.0	0.0	0.0
27		LC	0.052937	0.052937	0.052937	0.052937
28		LD	0.011607	0.011607	0.011607	0.011607
29	FORAGE SORG	- CB	0.0	0.0	0.0	0.0
30	(803)	CC	0.0	0.0	0.0	0.0
31		CD	0.0	0.0	0.0	0.0
32		LA	0.0	0.000287	0.021372	0.021160
33		LB	0.0	0.0	0.0	0.0
34		LC	0.0	0.0	0.0	0.0
35		LD	0.0	0.0	0.0	0.0
36	SUD GR PAST	- CB	0.0	0.0	0.0	0.0
37	(85.)	CC	0.0	0.0	0.0	0.0
38		CD	0.0	0.0	0.0	0.0
39		LA	0.0	0.0	0.0	0.0
40		LB	0.0	0.0	0.0	0.0
41		LC	0.0	0.0	0.0	0.0
42		LD	0.0	0.0	0.0	0.0
43	ALFALFA	- CB	0.0	0.0	0.0	0.0
44	(81.)	CC	0.0	0.0	0.0	0.0
45		LA	0.005973	0.005973	0.005973	0.005973
46		LB	0.107500	0.107500	0.107500	0.107500
47		LC	0.002420	0.002420	0.002420	0.002420
48	NAT PAST	- C	0.218571	0.218571	0.218571	0.218571
49	(86.)	L	0.201964	0.201964	0.201964	0.201964
50	STEERS (144TYA)		0.0	0.0	0.137562	0.137711
51	STEERS (145TYA)		0.0	0.0	0.032435	0.032393
52	STEERS (141TTA)		0.0	0.0	0.056109	0.0
53	COW-CALF (111RTA)		0.0	0.034398	0.0	0.028050
54	WHEAT DIV (66WDMA)		0.165089	0.165089	0.165089	0.165089
55	GR SORG DIV (63SDMA)		0.0	0.0	0.0	0.0
56	BARLEY DIV (61BDMA)		0.0	0.0	0.0	0.0
57	WHEAT CERT (66OWMA)		0.141977	0.141977	0.141977	0.141977
58	G.S. PR SUP (63OSMA)		0.024911	0.024911	0.024911	0.024911
59	BAR PR SUP (61OBMA)		0.019080	0.018794	0.012654	0.012866

TABLE XVIII (Continued)

INPUT TABLE 12. PROGRAMMING VARIABLES (CODE = V)

ROW	ACTIVITY		UNIT	AMOUNT
1	BEGINNING INVENTORY			0.0
2	LAND OWNED		ACRES	320.000
3	LIQUID ASSETS		$	5000.000
4	REAL ESTATE DEBT		$	34100.000
5	MACHINERY DEBT		$	0.0
6	MACHINERY			0.0
7	TRACTORS	- 1	SIZE	1.000
8			AGE	5.000
9		2	SIZE	0.0
10			AGE	0.0
11		3	SIZE	0.0
12			AGE	0.0
13		4	SIZE	0.0
14			AGE	0.0
15		5	SIZE	0.0
16			AGE	0.0
17	PLOWS	- 1	SIZE	1.000
18			AGE	5.000
19		2	SIZE	0.0
20			AGE	0.0
21		3	SIZE	0.0
22			AGE	0.0
23		4	SIZE	0.0
24			AGE	0.0
25		5	SIZE	0.0
26			AGE	0.0
27	DISCS	- 1	SIZE	1.000
28			AGE	5.000
29		2	SIZE	0.0
30			AGE	0.0
31		3	SIZE	0.0
32			AGE	0.0
33		4	SIZE	0.0
34			AGE	0.0
35		5	SIZE	0.0
36			AGE	0.0
37	SPRING-TOOTHS	- 1	SIZE	1.000
38			AGE	5.000
39		2	SIZE	0.0
40			AGE	0.0
41		3	SIZE	0.0
42			AGE	0.0
43		4	SIZE	0.0
44			AGE	0.0
45		5	SIZE	0.0
46			AGE	0.0
47	ROTARY HOES	- 1	SIZE	1.000
48			AGE	5.000
49		2	SIZE	0.0
50			AGE	0.0
51		3	SIZE	0.0
52			AGE	0.0
53		4	SIZE	0.0
54			AGE	0.0
55		5	SIZE	0.0
56			AGE	0.0

```
****************************
*FOR SIZE, INDICATE WHAT   *
*NUMBERED SET OF MACHINERY *
*FROM TABLE 6 APPROXIMATES *
*THE MACHINE AVAILABLE.    *
****************************
*LARGEST SIZE PLACED FIRST *
*AND PLACE NEWEST BEFORE   *
*OLDEST WHEN MACHINES ARE  *
*OF THE SAME SIZE.         *
****************************
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TABLE XVIII (Continued)

INPUT TABLE 12. (CONTINUED)

57	SPIKE-TOOTHS	- 1		SIZE	1.000
58				AGE	5.000
59		2		SIZE	0.0
60				AGE	0.0
61		3		SIZE	0.0
62				AGE	0.0
63		4		SIZE	0.0
64				AGE	0.0
65		5		SIZE	0.0
66				AGE	0.0
67	DRILLS	- 1		SIZE	1.000
68				AGE	5.000
69		2		SIZE	0.0
70				AGE	0.0
71		3		SIZE	0.0
72				AGE	0.0
73		4		SIZE	0.0
74				AGE	0.0
75		5		SIZE	0.0
76				AGE	0.0
77	MOWERS	- 1		SIZE	1.000
78				AGE	5.000
79		2		SIZE	0.0
80				AGE	0.0
81		3		SIZE	0.0
82				AGE	0.0
83		4		SIZE	0.0
84				AGE	0.0
85		5		SIZE	0.0
86				AGE	0.0
87	RAKES	- 1		SIZE	1.000
88				AGE	5.000
89		2		SIZE	0.0
90				AGE	0.0
91		3		SIZE	0.0
92				AGE	0.0
93		4		SIZE	0.0
94				AGE	0.0
95		5		SIZE	0.0
96				AGE	0.0
97	MONTHLY INCOME FROM OUTSIDE THE FARM BEFORE TAXES			ACRES	960.000
98	JANUARY		******************************	$	0.0
99	FEBRUARY		*ACRE LIMITATION ONLY *	$	0.0
100	MARCH		*REFERS TO EMPLOYMENT OF *	$	0.0
101	APRIL		*FAMILY LABOR IN EXCESS OF*	$	0.0
102	MAY		*MONTHLY LABOR REQUIREMENT*	$	0.0
103	JUNE		******************************	$	0.0
104	JULY			$	0.0
105	AUGUST			$	0.0
106	SEPTEMBER			$	0.0
107	OCTOBER			$	0.0
108	NOVEMBER			$	0.0
109	DECEMBER			$	0.0
110	FEDERAL INCOME TAX WITHHELD PER MONTH			$	0.0
111	STATE INCOME TAX WITHHELD PER MONTH			$	0.0
112	SOCIAL SECURITY TAX WITHHELD PER MONTH			$	0.0

INPUT TABLE 12. (CONTINUED)

113	FAMILY SIZE YEAR - 1 AND 2	NO	5.000
114	3 AND 4	NO	5.000
115	5 AND 6	NO	5.000
116	7 AND 8	NO	5.000
117	9 AND 10	NO	5.000
118	11 AND 12	NO	5.000
119	13 AND 14	NO	5.000
120	15 AND 16	NO	5.000
121	17 AND 18	NO	5.000
122	19 AND 20	NO	5.000
123	21 AND 22	NO	5.000
124	23 AND 24	NO	5.000
125	25	NO	5.000
126	CONSUMPTION (FUNCTION 1 OR 2)	CODE	2.000
127	1) C = A + B(ATI IN YEAR-1)		0.0
128	A	$	5000.000
129	B	PCT	0.0
130	.590 .163		0.0
131	2) C = 24.32(ATI IN YEAR-1) (FAMILY SIZE)		0.0
132	AFTER TAX INCOME LAST YEAR (ATI IN YEAR-1)	$	5000.000
133	PROFIT MAXIMIZING PRODUCTION PLAN ALTERNATIVES		0.0
134	1) INCLUDES CROPS ONLY	IMPLEMENT IN YEAR	0.0
135	2) INCLUDES CROPS AND COWS	IMPLEMENT IN YEAR	0.0
136	3) INCLUDES CROPS AND FEEDERS	IMPLEMENT IN YEAR	0.0
137	4) INCLUDES CROPS, COWS, AND FEEDERS	IMPLEMENT IN YEAR	1.000
138	5) OTHER	IMPLEMENT IN YEAR	0.0
139	6) OTHER	IMPLEMENT IN YEAR	0.0
140	LAND ACQUISITION BY THE MODEL (YES = 1 AND NO = 2)	CODE	2.000
141	UNIT OF ACQUISITION	ACRES	160.000
142	MAXIMUM ACQUISITION OVER 25 YEARS	ACRES	2240.000
143	MAXIMUM ACQUISITION DURING ANY YEAR	ACRES	2240.000
144	OPTIONS (YES = 1 AND NO = 2)		0.0
145	1) BUY ONLY	CODE	2.000
146	2) RENT ONLY	CODE	2.000
147	3) RENT AND BUY	CODE	1.000
148	LOAN SCHEDULES AND INTEREST RATES		0.0
149	LAND		0.0
150	INTEREST	PCT	0.070
151	PAYMENT (STANDARD = 1 AND SPRINGFIELD = 2)	CODE	1.000
152	NON AMORTIZED	YEARS	0.0
153	AMORTIZED (MUST SPECIFY NUMBER > 0)	YEARS	35.000
154	MONTH OF PAYMENT(NO EARLIER THAN MONTH OF PURCHASE)	MONTH	6.000
155	MACHINERY		0.0
156	INTEREST	PCT	0.075
157	PAYMENT (STANDARD = 1 AND SPRINGFIELD = 2)	CODE	2.000
158	NON AMORTIZED	YEARS	0.0
159	AMORTIZED (MUST SPECIFY NUMBER > 0)	YEARS	3.000
160	MONTH OF PAYMENT(NO EARLIER THAN MONTH OF PURCHASE)	MONTH	2.000
161	COWS		0.0
162	INTEREST	PCT	0.075
163	PAYMENT (STANDARD = 1 AND SPRINGFIELD = 2)	CODE	2.000
164	NON AMORTIZED	YEARS	0.0
165	AMORTIZED (MUST SPECIFY NUMBER > 0)	YEARS	3.000
166	MONTH OF PAYMENT(NO EARLIER THAN MONTH OF PURCHASE)	MONTH	6.000
167	PRODUCTION AND OTHER (ON A MONTHLY BASIS)		0.0
168	INTEREST	PCT	0.075
169	SAVINGS (ON A MONTHLY BASIS)		0.0
170	INTEREST	PCT	0.025

INPUT TABLE 12. (CONTINUED)

171	FINANCING CHARGES		0.0
172	ABSTRACTING, FILING, AND TITLE EXAMINATION COST	$	67.500
173	MORTGAGE TAX PER $100	$	0.100
174	COST OF FILING DEED	$	2.000
175	COST OF FILING FINANCIAL STATEMENT AND LIEN SEARCH	$	3.000
176	OTHER COSTS ASSOCIATED WITH R.E. CREDIT	$	0.0
177	OTHER COSTS ASSOCIATED WITH NON R.E. CREDIT	$	0.0
178	PERCENTAGE OF EACH ASSET VALUE TO WHICH CREDIT IS LIMITED		0.0
179	REAL ESTATE	PCT	0.750
180	NEW MACHINERY	PCT	0.800
181	USED MACHINERY	PCT	0.750
182	LIVESTOCK	PCT	0.900
183	*THE PURCHASE OF REAL ESTATE REQUIRES THAT ONLY R.E.*		0.0
184	*BE USED FOR SECURITY. R.E. CAN ALSO BE USED AS *		0.0
185	*SECURITY FOR NON R.E. ITEMS PURCHASED. *		0.0
186	SOLVENCY CRITERIA		0.0
187	PROBABILITY THAT FIRM SOLVENCY CAN		0.0
188	BE MAINTAINED OVER 25 YEARS	PCT	0.850
189	******************************		0.0
190	*PERCENTAGE DOES NOT HAVE TO*		0.0
191	*BE SPECIFIED IF THE RUN IS *		0.0
192	*BASED ON AVERAGE PRICES *		0.0
193	*AND YIELDS *		0.0
194	******************************		0.0
195			0.0
196			0.0
197			0.0
198			0.0
199			0.0
200			0.0
201			0.0
202			0.0
203	MISCELLANEOUS VARIABLES		0.0
204	NUMBER OF REPLICATIONS (MAXIMUM IS 50)	NO	35.000
205	DEPENDABILITY COEFFICIENT (FOR TRACTORS ONLY)	$	25.000
206	MAXIMUM TIME ANY MACHINE CAN BE USED PER MONTH	HOURS	250.000
207	MAXIMUM TIME ANY MACHINE CAN BE KEPT	YEARS	10.000
208	YEAR OF LAND ACQUISITION INCREMENTATION	YEARS	5.000
209	LAST YEAR LAND ACQUISITION PERMITTED	YEAR	25.000
210	INVESTMENT CREDIT	PCT	0.0
211	TAPE INPUT (YES = 1 AND NO = 2)	CODE	1.000
212	CREATING (YES = 1 AND NO = 2) (LAND ACQ. NOT ALLOWED)	CODE	2.000
213	LAND INPUT (YES = 1 AND NO = 2) ******************	CODE	1.000
214	LAND OWNED SECOND HALF OF YEAR 1 *LAND ACQUISITION*	ACRES	320.000
215	6 *BY THE MODEL IS *	ACRES	640.000
216	11 *NOT ALLOWED WHEN*	ACRES	960.000
217	16 *THE ACREAGES OF *	ACRES	1280.000
218	21 *LAND OWNED AND *	ACRES	1760.000
219	LAND RENTED SECOND HALF OF YEAR 1 *RENTED ARE INPUT*	ACRES	1920.000
220	6 ******************	ACRES	1920.000
221	11	ACRES	1600.000
222	16	ACRES	1280.000
223	21	ACRES	800.000
224	PRICES AND YIELDS (VARIABLE = 1 AND AVERAGE = 2)	CODE	1.000
225			0.0
226			0.0

TABLE XIX

ARRANGEMENT OF DATA ON CARDS

```
00000000011111111112222222222333333333344444444445555555555666666666677777777778
12345678901234567890123456789012345678901234567890123456789012345678901234567890

INPUT TABLE 1.  PRODUCTION COEFFICIENTS*  (CODE = PC)

ROW   ACTIVITY                    YIELDSGPMCHSGPMAY GSSP ALFHAYPRARYHNATPAS
                                        (AUM) (AUM) (AUM) (TON) (TON) (AUM)

  1   XXXXXXXXXXXXXXXXXXXXXXXX12.345XXXXXXXXXXXX12.34512.34512.34512.345
  .
  .
  .
  7   XXXXXXXXXXXXXXXXXXXXXXXX12.345XXXXXXXXXXXX12.34512.34512.34512.345
  8   XXXXXXXXXXXXXXXXXXXXXXXX12.34512.34512.34512.34512.34512.34512.345
  .
  .
  .
 61   XXXXXXXXXXXXXXXXXXXXXXXX12.34512.34512.34512.34512.34512.34512.345
* YIELD OF WHEAT IN BU, GRAIN SORGHUM IN CWT, BARLEY IN BU, AND LVSTK IN CWT.

00000000011111111112222222222333333333344444444445555555555666666666677777777778
12345678901234567890123456789012345678901234567890123456789012345678901234567890

INPUT TABLE 2.  EXPENSES (CODE = E)

ROW   ACTIVITY                JAN     FEB     MAR     APR     MAY    JUNE    JULY
                              AUG    SEPT     OCT     NOV     DEC   TOTAL

  1   XXXXXXXXXXXXXXXXXX1234.5671234.5671234.5671234.5671234.5671234.5671234.567
  1B                    1234.5671234.5671234.5671234.5671234.5671234.567
  .
  .
  .
 49   XXXXXXXXXXXXXXXXXX1234.5671234.5671234.5671234.5671234.5671234.5671234.567
 49B                    1234.5671234.5671234.5671234.5671234.5671234.567

00000000011111111112222222222333333333344444444445555555555666666666677777777778
12345678901234567890123456789012345678901234567890123456789012345678901234567890
```

TABLE XIX (Continued)

```
00000000011111111112222222222333333333344444444445555555555666666666677777777778
12345678901234567890123456789012345678901234567890123456789012345678901234567890
```

INPUT TABLE 3. LABOR REQUIREMENTS AND FAMILY LABOR AVAILABILITY* (CODE = W)

```
ROW   ACTIVITY                  JAN     FEB     MAR     APR     MAY    JUNE    JULY
                                AUG    SEPT     OCT     NOV     DEC   TOTAL

  1   XXXXXXXXXXXXXXXXXX1234.5671234.5671234.5671234.5671234.5671234.5671234.567
  1B                    1234.5671234.5671234.5671234.5671234.5671234.567
  .
  .
  .
  5   XXXXXXXXXXXXXXXXXX1234.5671234.5671234.5671234.5671234.5671234.5671234.567
  5B                    1234.5671234.5671234.5671234.5671234.5671234.567
```

* CROP LABOR REQUIREMENTS ARE COMPUTED WITHIN THE PROGRAM.

```
00000000011111111112222222222333333333344444444445555555555666666666677777777778
12345678901234567890123456789012345678901234567890123456789012345678901234567890
```

INPUT TABLE 4. MONTHLY FIELD OPERATIONS (CODE = MO)

```
                                          SMALL           SUDAN
                         GRAIN            GRAIN  FORAGE   GRASS  ALFALFA ALFALFA
OPERATION         WHEAT  SORGHUM BARLEY  PASTURE SORGHUM PASTURE SEED-IN  ESTAB

  XXXXXXXXXXXXXX   12      12      12      12      12      12      12      12
  .
  .  (27 ROWS)
  .
  XXXXXXXXXXXXXX   12      12      12      12      12      12      12      12
```

```
00000000011111111112222222222333333333344444444445555555555666666666677777777778
12345678901234567890123456789012345678901234567890123456789012345678901234567890
```

INPUT TABLE 5. CAPITAL INVESTMENTS (CODE = CI)

```
ROW   ACTIVITY                            UNIT     MONTH     AMOUNT
                                                               ($)
  1   XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX  XXXXXXXX 12       123.456
  .
  .
  .
  6   XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX  XXXXXXXX 12       123.456
```

```
00000000011111111112222222222333333333344444444445555555555666666666677777777778
12345678901234567890123456789012345678901234567890123456789012345678901234567890
```

TABLE XIX (Continued)

```
00000000011111111112222222222333333333344444444445555555555666666666677777777778
12345678901234567890123456789012345678901234567890123456789012345678901234567890


INPUT TABLE 6.  MACHINERY - SIZE, PRICE, AND LABOR REQUIREMENTS* (CODE = SCL)

                50 - 60 H.P. TRACTOR  70 - 80 H.P. TRACTOR  90 -100 H.P. TRACTOR
                -------SET 1--------  -------SET 2--------  -------SET 3--------
                               LABOR                 LABOR                 LABOR
                        CASH  TIME            CASH  TIME            CASH  TIME
                 MACH   PURCH  PER     MACH   PURCH  PER     MACH   PURCH  PER
IMPLEMENT        SIZE   PRICE ACRE     SIZE   PRICE ACRE     SIZE   PRICE ACRE

  XXXXXXXXXXXX    12  12345.  1.234     12  12345.  1.234     12  12345.  1.234
  .
  .  (10 ROWS)
  .
  XXXXXXXXXXXX    12  12345.  1.234     12  12345.  1.234     12  12345.  1.234

                110-120 H.P. TRACTOR  130-140 H.P. TRACTOR
                -------SET 4--------  -------SET 5--------
                               LABOR                 LABOR
                        CASH  TIME            CASH  TIME
                 MACH   PURCH  PER     MACH   PURCH  PER
IMPLEMENT        SIZE   PRICE ACRE     SIZE   PRICE ACRE

  XXXXXXXXXXXX    12  12345.  1.234     12  12345.  1.234
  .
  .  (10 ROWS)
  .
  XXXXXXXXXXXX    12  12345.  1.234     12  12345.  1.234

* FACTORY RATED H.P.
  PLOW SIZE = NUMBER OF 16 INCH BOTTOMS.  OTHER SIZES IN FEET.
  DRILL HAS 8 INCH SPACINGS.


00000000011111111112222222222333333333344444444445555555555666666666677777777778
12345678901234567890123456789012345678901234567890123456789012345678901234567890
```

TABLE XIX (Continued)

```
00000000011111111112222222222333333333344444444445555555555666666666677777777778
12345678901234567890123456789012345678901234567890123456789012345678901234567890

INPUT TABLE 7.  TRACTOR COMBINATIONS (CODE = MCOMB)

11111111111111111111111111111111111111111111111111111111111111111111111111111111
  .
  .  (15 ROWS)
  .
11111111111111111111111111111111111111111111111111111111111111111111111111111111


00000000011111111112222222222333333333344444444445555555555666666666677777777778
12345678901234567890123456789012345678901234567890123456789012345678901234567890

INPUT TABLE 8.  CROP PRICES AND GOVERNMENT PAYMENTS (CODE = CPGP)

ROW    ACTIVITY                              UNIT     MONTH      AMOUNT
                                                                  ($)

  1    XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX  XXXXXXXX 12         123.456
  .
  .
  .
 15    XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX  XXXXXXXX 12         123.456


00000000011111111112222222222333333333344444444445555555555666666666677777777778
12345678901234567890123456789012345678901234567890123456789012345678901234567890

INPUT TABLE 9.  LIVESTOCK PRICES (CODE = LP AND FL)

                                                             FEEDER        FEEDER
              SLAUGHTER      FEEDER         FEEDER          STEER         HEIFER
                COWS         STEERS         STEERS          CALVES        CALVES
             COMMERCIAL       GOOD           GOOD            GOOD          GOOD

MONTH =          12            12             12              12            12
YEAR
  1            12.34          12.34          12.34           12.34         12.34
  .
  .
  .
 25            12.34          12.34          12.34           12.34         12.34


00000000011111111112222222222333333333344444444445555555555666666666677777777778
12345678901234567890123456789012345678901234567890123456789012345678901234567890
```

TABLE XIX (Continued)

```
000000000111111111122222222223333333333444444444455555555556666666666777777777778
12345678901234567890123456789012345678901234567890123456789012345678901234567890

INPUT TABLE 10.  COEFFICIENTS OF VARIATION (CODE = CV)

ROW   ACTIVITY                                      PRODUCTION        PRICES

  1   XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX      1.2345          1.2345
  .
  .
  .
 17   XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX      1.2345          1.2345

000000000111111111122222222223333333333444444444455555555556666666666777777777778
12345678901234567890123456789012345678901234567890123456789012345678901234567890

INPUT TABLE 11.  PROFIT MAX. PROD. PLAN ALTERNATIVES (CODE = PPA)

                                                            INCLUDES
                                           INCLUDESINCLUDES  CROPS
                                  INCLUDES  CROPS   CROPS    COWS
                                   CROPS     AND     AND      AND
ROW   ACTIVITY                     ONLY     COWS   FEEDERS  FEEDERS

  1   XXXXXXXXXXXXXXXXXXXXXXXXXX .123456 .123456 .123456 .123456
  .
  .
  .
 59   XXXXXXXXXXXXXXXXXXXXXXXXXX .123456 .123456 .123456 .123456

000000000111111111122222222223333333333444444444455555555556666666666777777777778
12345678901234567890123456789012345678901234567890123456789012345678901234567890

TABLE 12.  PROGRAMMING VARIABLES (CODE = V)

ROW   ACTIVITY                                                        UNIT   AMOUNT

  1   XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX  XXXXX 12345.678
  .
  .
  .
224   XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX  XXXXX 12345.678

000000000111111111122222222223333333333444444444455555555556666666666777777777778
12345678901234567890123456789012345678901234567890123456789012345678901234567890
```

APPENDIX B

LEAST-COST MACHINERY INVENTORIES SELECTED FOR THE SIMULATION EXPERIMENTS CONDUCTED

Least-cost inventories were selected prior to conducting the simulation experiments. Inventories were then specified for various acreages in the MCHNRY subroutine. Thus, the MCHNRY subroutine never had to compute any least-cost machinery inventories when the simulation experiments were conducted. Each time the MCHNRY subroutine was called from the MAIN program to select a least-cost machinery inventory, an inventory was selected for the relevant acreages from one of the inventories specified. Since a number of experiments were conducted over the same range of acreage, the selection of least-cost machinery inventories during each experiment would have involved a considerable amount of computer processing time.

Least-cost machinery inventories were selected by the MCHNRY subroutine over 320-2,560 acres in 160 acre increments. The MCHNRY subroutine is presented in Appendix A, Table XVI. The auxiliary program used to call the MCHNRY subroutine is presented in Table XX. Comment cards in the auxiliary program explain the parameters which must be initialized when the program is employed. Comment cards are identified by a "c" in column 1.

The data required by the MCHNRY subroutine when called by the auxiliary program includes Input Tables 4, 6, and 7, and the beginning machinery inventory specified in Input Table 12 (Rows 7-96). The data must be inputed in the order just stated without the table headings and explanations. In Input Table 7, fifty-five tractor combinations were specified under the assumption that a farmer would not consider owning more than three tractors. The input tables are presented in Appendix A, Table XVIII.

TABLE XX

AUXILIARY PROGRAM USED TO CALL THE MCHNRY SUBROUTINE WHEN LEAST-COST MACHINERY INVENTORIES WERE SELECTED FOR THE SIMULATION EXPERIMENTS CONDUCTED

```
C     AULXILIARY PROGRAM USED TO CALL MCHNRY SUBROUTINE
C     ******************************************************************
C     ******************************************************************
      DIMENSION THAC(10,5),XXXNPP(47),AHT(10)
      COMMON        SCL(10,15),MO(27,8),MCOMB(1200),THRS(10,5),
     1XVNM(25),XVUM(25),  V(210),CROP1(8),CROP2(8),TIME,RINT,COPY,YEAR,
     2NYEAR,TOTHRS,BUYMO,MCHSAV(25,10,5),AGESAV(25,10,5),SAVHRS(25,12),
     3SAVEXP(25,12),TMCOST(25),TVMI(25),TMDEP(25),TMCRED(25),
     4TL2NPP(47),TL1NPP(47),E(46,12),TMNCST,THAC,AHT,TL1(25),TL2(25),
     5CROP(25,8),SVTHAC(25,10,5)
C     ******************************************************************
C     REMOVE REAL*8 AND COMMON STATEMENTS FROM MCHNRY SUBROUTINE.
C     AFTER THE DIMENSION STATEMENT IN THE MCHNRY SUBROUTINE, INSERT
C     A DUPLICATE OF THE COMMON STATEMENT SPECIFIED ABOVE.
C     ******************************************************************
    2 FORMAT(14X,F7.1,F9.2,F6.4,F7.1,F9.2,F6.4,F7.1,F9.2,F6.4)
    3 FORMAT(14X,F7.1,F9.2,F6.4,F7.1,F9.2,F6.4)
    5 FORMAT(16X,3X,I2,6X,I2,6X,I2,6X,I2,6X,I2,6X,I2,6X,I2,6X,I2)
    7 FORMAT (80I1)
    8 FORMAT (70X,F10.3)
      READ(5,2) ((SCL(I,J),J=1,9),I=1,10)
      READ(5,3)((SCL(I,J),J=10,15),I=1,10)
      READ(5,5) ((MO(I,J),J=1,8),I=1,27)
      READ (5,7) (MCOMB(I),I=1,1200)
      READ(5,8)(V(I),I=1,90)
   60 FORMAT(1H1,T55,'TRACTOR COMBINATIONS'///)
      WRITE(6,60)
   61 FORMAT(1H0,3X,16(5I1,3X))
      DO 62 J=1,1121,80
      K=J+75
   62 WRITE(6,61)(MCOMB(I),MCOMB(I+1),MCOMB(I+2),MCOMB(I+3),MCOMB(I+4),
     1I=J,K,5)
      DO 20 I=1,25
      DO 20 J=1,10
      DO 20 K=1,5
      MCHSAV(I,J,K)=0
   20 AGESAV(I,J,K)=0.0
      II=9
      DO 21 I=1,8
      DO 21 J=1,5
      II=II+2
      MCHSAV(1,I,J)=V(II)
   21 AGESAV(1,I,J)=V(II+1)
      II=-1
      DO 22 J=1,5
      II=II+2
      MCHSAV(1,10,J)=V(II)
   22 AGESAV(1,10,J)=V(II+1)
C     ******************************************************************
C     NYMAC   = NUMBER OF YEARS MACHINERY ANALYSIS CONDUCTED.
C     V(207)  = MAXIMUM NUMBER OF YEARS ANY MACHINE CAN BE KEPT.
C     V(210)  = PERCENT INVESTMENT CREDIT ALLOWED.
C     TIME    = MAXIMUM NUMBER OF HOURS ANY MACHINE CAN BE
C               USED PER MONTH.
C     RINT    = INTEREST RATE.
C     COPY    = DEPENDABILITY COEFFICIENT (FOR TRACTORS ONLY).
C     BUYMO   = THE MONTH DURING WHICH MACHINERY IS PURCHASED.
C     TL2X    = BEGINNING ACREAGE OPERATED.
C     E(46,J) = LABOR CHARGE PER HOUR FOR EACH OF 12 MONTHS.
C     ******************************************************************
      NYMAC=25
      V(207)=10.0
      V(210)=0.0
      TIME=250.0
      RINT=.075
      COPY=25.00
      BUYMO=2.0
      TL2X=320.0
      DO 24 J=1,12
   24 E(46,J)=1.25
      YEAR=0.0
      NYEAR=0.0
C     ******************************************************************
C     XXXNPP(I) = PRODUCTION PLAN ON A PER TOTAL ACRE BASIS.
C                 COEFFICIENTS MUST BE SPECIFIED FOR CROP
C                 ACTIVITIES REQUIRING MONTHLY FIELD OPERATIONS.
C                 THE MONTHLY FIELD OPERATIONS ARE PRESENTED
C                 IN INPUT TABLE 4.  THE COEFFICIENTS
C                 SPECIFIED REPRESENTS A PLAN WHICH
C                 INCLUDES CROPS, COWS, AND FEEDERS.  THE
C                 PLAN IS PRESENTED IN INPUT TABLE 11.
C     ******************************************************************
      DO 23 I=1,47
      XXXNPP(I)=0.0
      IF(I.EQ. 1) XXXNPP(I)=.077857
      IF(I.EQ. 4) XXXNPP(I)=.087232
      IF(I.EQ.11) XXXNPP(I)=.024911
      IF(I.EQ.18) XXXNPP(I)=.012866
      IF(I.EQ.23) XXXNPP(I)=.124643
      IF(I.EQ.24) XXXNPP(I)=.050357
      IF(I.EQ.27) XXXNPP(I)=.052937
      IF(I.EQ.28) XXXNPP(I)=.011607
      IF(I.EQ.32) XXXNPP(I)=.021160
      IF(I.EQ.45) XXXNPP(I)=.005973
      IF(I.EQ.46) XXXNPP(I)=.107500
      IF(I.EQ.47) XXXNPP(I)=.002420
   23 CONTINUE
      DO 9999 IJKL = 1,NYMAC
      YEAR=YEAR+1.0
      NYEAR=NYEAR+1
      TL1X=TL2X
C     ******************************************************************
C     THE FOLLOWING FIVE STATEMENTS ALLOWS THE ACREAGE
C     OPERATED TO CHANGE DURING YEARS 1, 6, 11, 16, AND 21.
C     THESE STATEMENTS CAN BE REMOVED OR SIMILAR
C     STATEMENTS CAN BE ADDED.
C     ******************************************************************
      IF(NYEAR.EQ. 1) TL2X=320.0
      IF(NYEAR.EQ. 6) TL2X=800.0
      IF(NYEAR.EQ.11) TL2X=1440.0
```

```
      XINTM=V(156)
      AMM=V(159)
      AMNOM=V(158)
      CODEM=V(157)
      XINTC=V(162)
      AMC=V(165)
      AMNOC=V(164)
      CODEC=V(163)
      BEGOL=V(4)
      XINTL=V(150)
      AML=V(153)
      AMNOL=V(152)
      CODEL=V(151)
      INCREM=V(208)
      NXLAST=V(209)
      DO 7 J=1,25
    7 NAY(J)=0
      DO 8 J=1,NXLAST,INCREM
    8 NAY(J)=1
      DO 9 I= 1,25
      DO 9 J =1,10
      DO 9 K =1,5
      MCHSAV(I,J,K)=0
    9 AGESAV(I,J,K)=0.0
      KOUNTV=113
      DO 10 J=1,24,2
      FS(J)=V(KOUNTV)
      FS(J+1)=V(KOUNTV)
   10 KOUNTV=KOUNTV+1
      FS(25)=V(125)
C     ******************************************************************
C     LAND ACQUISITION
C     ******************************************************************
C     BEGIN LAND INPUT
      NXLI=V(213)
      IF(NXLI.EQ.1) GO TO 602
      DO 601 J=1,26
      TL1(J)=BEGLND
      TL2(J)=BEGLND
      OWN(J)=BEGLND
  601 RENT2(J)=0.0
      GO TO 100
  602 TL1(1)=BEGLND
      TL2(1)=V(214)+V(219)
      OWN(1)=BEGLND
      RENT2(1)=V(219)
      DO 603 J=2,25
      TL2(J)=TL2(J-1)
      IF(J.EQ. 6)TL2(J)=V(215)+V(220)
      IF(J.EQ.11)TL2(J)=V(216)+V(221)
      IF(J.EQ.16)TL2(J)=V(217)+V(222)
      IF(J.EQ.21)TL2(J)=V(218)+V(223)
      TL1(J)=TL2(J-1)
      RENT2(J)=RENT2(J-1)
      IF(J.EQ. 6)RENT2(J)=V(220)
      IF(J.EQ.11)RENT2(J)=V(221)
      IF(J.EQ.16)RENT2(J)=V(222)
      IF(J.EQ.21)RENT2(J)=V(223)
  603 OWN(J)=TL2(J-1)-RENT2(J-1)
C     END LAND INPUT
  100 CALL LAND
      IF(DONE.EQ.1.0) GO TO 1000
C     ******************************************************************
C     INITIALIZE REPLICATION VARIABLES
C     ******************************************************************
      DO 2 I=1,25
      DO 2 J=1,12
      THREE(I,J)=0.0
      FOUR(I,J)=0.0
    2 ELEVEN(I,J)=0.0
      DO 3 J=1,25
    3 THEL(J)=0.0
      DO 4 I=1,25
      DO 4 J=1,29
      SFNC(I,J)=0.0
    4 SFNC2(I,J)=0.0
      IX=999999
      N=0
      YEAR=0.0
      NYEAR=0
      IREPS=0
      DO 900 JET=1,NRUNS
      N=N+1
      YEAR=YEAR+1.0
      NYEAR=NYEAR+1
      IF(NYEAR.NE.1.AND.NYEAR.NE.26) GO TO 20
C     ******************************************************************
C     INITIALIZE ONLY IN YEAR ONE
C     ******************************************************************
      N=1
      YEAR=1.0
      NYEAR=1
      IREPS=IREPS+1
      CA=V(3)
      ATI=V(132)
      SAVNY=0.0
      DBTNY=0.0
      NPP=1
      CICT=0.0
      CIBT=0.0
      CIMT=0.0
      CILT=0.0
      OPB=0.0
      DO 11 J=1,35
   11 OSCHED(J)=0.0
      DO 12 J=1,150
      PAY(J)=0.0
      TIN(J)=0.0
      PAYL(J)=0.0
      TINL(J)=0.0
```

TABLE XX (Continued)

```
 31 FORMAT(1H ,10X,15HPLOW           ,5F5.0,5X,5F6.0,5X,F6.0)
 32 FORMAT(1H ,10X,15HDISC           ,5F5.0,5X,5F6.0,5X,F6.0)
 33 FORMAT(1H ,10X,15HSPRING TOOTH   ,5F5.0,5X,5F6.0,5X,F6.0)
 34 FORMAT(1H ,10X,15HROTARY HOE     ,5F5.0,5X,5F6.0,5X,F6.0)
 35 FORMAT(1H ,10X,15HSPIKE TOOTH    ,5F5.0,5X,5F6.0,5X,F6.0)
 36 FORMAT(1H ,10X,15HDRILL          ,5F5.0,5X,5F6.0,5X,F6.0)
 37 FORMAT(1H ,10X,15HMOWER          ,5F5.0,5X,5F6.0,5X,F6.0)
 38 FORMAT(1H ,10X,15HRAKE           ,5F5.0,5X,5F6.0,5X,F6.0)
 39 FORMAT(1H ,10X,15HFERTILIZE      ,5F5.0,5X,5F6.0,5X,F6.0)
 40 FORMAT(1H ,10X,15HTRACTOR        ,5F5.0,5X,5F6.0,5X,F6.0)
    WRITE(6,107)
    WRITE(6,31) (THRS( 1,J),J=1,5),(THAC( 1,J),J=1,5),AHT( 1)
    WRITE(6,32) (THRS( 2,J),J=1,5),(THAC( 2,J),J=1,5),AHT( 2)
    WRITE(6,33) (THRS( 3,J),J=1,5),(THAC( 3,J),J=1,5),AHT( 3)
    WRITE(6,34) (THRS( 4,J),J=1,5),(THAC( 4,J),J=1,5),AHT( 4)
    WRITE(6,35) (THRS( 5,J),J=1,5),(THAC( 5,J),J=1,5),AHT( 5)
    WRITE(6,36) (THRS( 6,J),J=1,5),(THAC( 6,J),J=1,5),AHT( 6)
    WRITE(6,37) (THRS( 7,J),J=1,5),(THAC( 7,J),J=1,5),AHT( 7)
    WRITE(6,38) (THRS( 8,J),J=1,5),(THAC( 8,J),J=1,5),AHT( 8)
    WRITE(6,39) (THRS( 9,J),J=1,5),(THAC( 9,J),J=1,5),AHT( 9)
    WRITE(6,40) (THRS(10,J),J=1,5),(THAC(10,J),J=1,5),AHT(10)
1080 FORMAT(1H0,20HTOTAL HOURS BY MONTH,10X,'TOTAL ANNUAL HOURS = ',
   1F5.0)
    WRITE(6,1080) TOTHRS
1081 FORMAT(1H0,12F10.2)
    WRITE(6,1081)(SAVHRS(NYEAR,K),K=1,12)
    TANCST=0.0
    DO 211 I=1,12
211 TANCST=TANCST+SAVEXP(NYEAR,I)
109 FORMAT(1H0/82H TOTAL COSTS BY MONTH FOR REPAIRS, TAXES, HOUSING, I
   1NSURANCE, FUEL, AND LUBRICANTS,10X,'TOTAL ANNUAL COSTS = ',F5.0/)
    WRITE(6,109) TANCST
110 FORMAT(1H ,12F10.2)
    WRITE(6,110)(SAVEXP(NYEAR,I),I=1,12)
9999 CONTINUE
    WRITE(6,104)
    STOP
    END
```

The least-cost machinery inventories selected, the annual cost of each inventory, and the labor requirements for each inventory are specified in Table XXI. Ten different inventories were selected. As the per acre annual costs indicate, substantial economies of size resulted as farm size increased.

Seven of the 10 inventories selected were specified in the MCHNRY subroutine. The inventories specified were such that larger machines could never be traded for smaller machines as farm size increased. The inventories specified are presented in Table XXII. The programming statements required to specify the inventories in the MCHNRY subroutine are presented in Table XXIII. These statements replaced the MCHNRY subroutine statements identified by the numbers 1,841 to 2,103 when the inventories were specified. The numbers referred to are printed on the right-hand side of each statement.

The number of years a machine should be kept before being traded depends considerably on how many hours that machine is used during each year. Information about trade intervals for different machines was obtained from the simulation experiments conducted for this study. The maximum number of years that a machine could be kept was 10 years. A machine could be traded after less than 10 years under two conditions. A machine could be traded after less than 10 years if the acquisition of land required machinery of a larger size. A machine could be traded after less than 10 years if a machine's accumulated hours of use exceeded the amount of time when average hourly costs were about at a minimum. Generally, tractors were traded after nine or 10 years of use; plows were traded after seven or eight years of use;

TABLE XXI

LEAST-COST MACHINERY INVENTORIES SELECTED BY THE MCHNRY SUBROUTINE OVER 320 - 2,560 ACRES, THE ANNUAL COST OF EACH INVENTORY, AND THE LABOR REQUIREMENTS FOR EACH INVENTORY

	Tractors			Plows		Others[a]	Annual Cost		Labor Requirements	
Acreage[c]	1	2	3	1	2	1	Total	Per Acre	Total	Per Acre
	-Machinery Sizes[b]-						-Dollars-		-Hours-	
320	1			1		1	2,619	8.18	465	1.45
480	1			1		1	3,185	6.64	698	1.45
640	2			2		2	4,104	6.41	696	1.09
800	3			3		3	4,759	5.95	713	.89
960	1	1		1	1	1	5,643	5.88	1,397	1.45
1,120	3	1		3		3	6,435	5.74	999	.89
1,280	4	1		4		4	7,287	5.69	953	.74
1,440	3	3		3	3	3	7,862	5.46	1,284	.89
1,600	3	3		3	3	3	8,398	5.25	1,427	.89
1,760	4	4		4	4	4	9,329	5.30	1,310	.74
1,920	4	4		4	4	4	9,802	5.11	1,713	.89
2,080	3	3	1	3	3	3	10,570	5.08	1,855	.89
2,240	3	3	1	3	3	3	11,073	4.94	1,998	.89
2,400	4	4	1	4	4	4	11,900	4.96	1,786	.74
2,560	4	4	1	4	4	4	12,337	4.82	1,905	.74

[a]Others include a disc, spring-tooth, rotary hoe, spike-tooth, drill, rake, and mower.

[b]Machinery sizes correspond to the numbered machinery sets specified in Input Table 6 (Appendix A, Table XVIII). Size 1 is the smallest machinery.

[c]Fifty-eight percent cropland.

TABLE XXII

MACHINERY INVENTORIES SPECIFIED IN THE MCHNRY SUBROUTINE FOR THE SIMULATION EXPERIMENTS CONDUCTED, THE ANNUAL COST OF EACH INVENTORY, AND THE LABOR REQUIREMENTS FOR EACH INVENTORY

Acreage[c]	Tractors			Plows		Others[a]	Annual Cost		Labor Requirements	
	1	2	3	1	2	1	Total	Per Acre	Total	Per Acre
	Machinery Sizes[b]						Dollars		Hours	
320	1			1		1	2,619	8.18	465	1.45
480	1			1		1	3,185	6.64	698	1.45
640	2			2		2	4,104	6.41	696	1.09
800	3			3		3	4,759	5.95	713	.89
960	3	1		3		3	5,955	6.20	856	.89
1,120	3	1		3		3	6,435	5.74	999	.89
1,280	3	3		3	3	3	7,343	5.74	1,141	.89
1,440	3	3		3	3	3	7,862	5.46	1,284	.89
1,600	3	3		3	3	3	8,398	5.25	1,427	.89
1,760	3	3	1	3	3	3	9,585	5.45	1,570	.89
1,920	3	3	1	3	3	3	10,101	5.26	1,713	.89
2,080	3	3	1	3	3	3	10,570	5.08	1,855	.89
2,240	3	3	1	3	3	3	11,073	4.94	1,998	.89
2,400	4	4	1	4	4	4	11,900	4.96	1,786	.74
2,560	4	4	1	4	4	4	12,337	4.82	1,905	.74

[a]Others include a disc, spring-tooth, rotary hoe, spike-tooth, drill, rake, and mower.

[b]Machinery sizes correspond to the numbered machinery sets specified in Input Table 6 (Appendix A, Table XVIII). Size 1 is the smallest machinery.

[c]Fifty-eight percent cropland.

TABLE XXIII

PROGRAMMING STATEMENTS REQUIRED TO REPRESENT THE MACHINERY INVENTORIES IN THE MCHNRY SUBROUTINE

```
8750 DO 31 I=1,10
     DO 31 J=1,5
  31 INV(I,J)=0
     IF(TL2(NYEAR).GT.500.0) GO TO 33
     DO 32 I=1,10
  32 INV(I,1)=1
     GO TO 8021
  33 IF(TL2(NYEAR).GT.700.0) GO TO 35
     DO 34 I=1,10
  34 INV(I,1)=2
     GO TO 8021
  35 IF(TL2(NYEAR).GT.900.0) GO TO 37
     DO 36 I=1,10
  36 INV(I,1)=3
     GO TO 8021
  37 IF(TL2(NYEAR).GT.1200.0) GO TO 39
     DO 38 I=1,10
  38 INV(I,1)=3
     INV(10,2)=1
     GO TO 8021
  39 IF(TL2(NYEAR).GT.1700.0) GO TO 41
     DO 40 I=1,10
  40 INV(I,1)=3
     INV(1,2)=3
     INV(10,2)=3
     GO TO 8021
  41 IF(TL2(NYEAR).GT.2300.0) GO TO 43
     DO 42 I=1,10
  42 INV(I,1)=3
     INV(1,2)=3
     INV(10,2)=3
     INV(10,3)=1
     GO TO 8021
  43 DO 44 I=1,10
  44 INV(I,1)=4
     INV(1,2)=4
     INV(10,2)=4
     INV(10,3)=1
```

spring-tooths were traded after about six years of use; drills were traded after about seven years of use; rakes and mowers were traded after four to six years of use; and other machines were traded after 10 years of use. These other machines included discs, rotary hoes, and spike-tooths which were not used many hours during each year.

APPENDIX C

STATISTICAL CONCEPTS INCORPORATED WITHIN THE SIMULATION MODEL AND EMPLOYED TO EVALUATE THE SIMULATION RESULTS

Variability is associated with most of the items in the simulation results. The items are subject to variation because of variability associated with crop and livestock production. Production variability is represented in the firm growth simulation process by replications. Standard normal deviates that are generated by a normal random number generator determine the level of prices and yields in each replication. The 25 year firm growth process can be replicated 50 times during each simulation experiment conducted. The process was replicated 35 times during each experiment conducted for this study. The simulation model statistically summarizes monthly and annually by item the results from each replication. Monthly summary statistics include only the monthly average across replications. Annual summary statistics include the lowest and highest values generated annually during the replications, the annual average across replications, the annual standard deviation, and the annual coefficient of variation. Neither the low value nor the high value is necessarily representative of any one replication continuously over 25 years. For example, a low value during year 10 may be from replication 24 while during year 17 it may be from replication nine and so on. The coefficient of variation is the standard deviation divided by the mean. The annual rate of growth in net worth after year one is summarized by ordinary least-squares regression ($NW = a + bX$).

The summary statistics can be used in several ways. They can be used to compare the results from several simulation experiments to determine which one of several growth plans will allow a firm to grow with the least amount of variation in some variable, X. This variable X may be any one of the items in the simulation results such as net worth or consumption. The summary statistics can also be used to calculate probabilities that a variable will exceed some value, be less than some value, or lie between two values.

Probabilities can be calculated without making an assumption about the form of the frequency distribution. Tchebycheff's inequality assumes only the existence of the mean (μ) and standard deviation (σ) [24, p. 71]. This inequality can be expressed as follows:

$$P\ (\mu - k\sigma < X < \mu + k\sigma) > 1 - 1/k^2 \qquad \text{(C-1)}$$

where if k is equal to two, the probability (P) of a deviation less than 2σ from the mean is greater than 75 percent.

An assumption about the form of the frequency distribution allows more precise probabilities to be made [24, p. 72]. Suppose that a random variable X has a unimodal and symmetrical frequency distribution. For such a distribution, the following probability statement can be made:

$$P\ (\mu - k\sigma < X < \mu + k\sigma) > 1 - 4/9k^2 \qquad \text{(C-2)}$$

where if k is equal to two, the probability of a deviation less than 2σ from the mean is greater than 89 percent.

Suppose that a random variable X is normally distributed. The probability applicable to this distribution is as follows:

$$P\ (\mu - k\sigma < X < \mu + k\sigma) = \int_{\mu - k\sigma}^{\mu + k\sigma} \frac{1}{\sigma\sqrt{2\pi}} \ \exp. - \frac{1}{2}\left(\frac{X - \mu}{\sigma}\right)^2 dx \qquad (C-3)$$

The probability of a deviation from the mean less than 1, 2, and 3 standard deviations is approximately 68, 95, and 99 percent, respectively, when X is normally distributed [16, pp. 101-102]. A cumulative standard normal distribution table [24, pp. 517-522] can be used to obtain probabilities for a normally distributed X variable with nonzero mean and nonunit variance by converting the X variable to a z variable as follows:

$$z = \frac{X - \mu}{\sigma} \qquad (C-4)$$

The variable z is called a standard normal deviate. If $z = 1.64$, the cumulative standard normal distribution table value is .95. So, the $P\ (X \leq X_i) = .95$ or the $P\ (X > X_i) = 1 - .95 = .05$.

The distribution function of one item in the simulation results, net worth, was tested for normality twelve times. The twelve tests comprised five years of data from two simulation solutions and two years of data from a third solution. Each year contained observations from 35 replications. The Kolmogorov-Smirnov Test [16, pp. 345-349] was used to compare the empirical distribution function of net worth to three theoretical distribution functions. These three distribution functions were the normal, Cauchy, and uniform. In 11 of the 12 tests, the hypothesis that the distribution was normal required a higher level of significance for rejection than did the other hypothesized distributions. Consequently, net worth was assumed to be normally distributed in this study.

The empirical distribution functions of other items in the simulation results were not compared to any theoretical distribution functions. However, an assumption about the form of their frequency distribution was sometimes made in this study. When the average fell approximately in the middle between the lowest and highest values generated annually, the frequency distribution was assumed to be unimodal and symmetrical. Inequality (C-2) was used to make probability statements. If the mean was not approximately centered, no assumption was made about the form of the frequency distribution. In this case, Tchebycheff's inequality was used to make probability statements.

The probabilities discussed so far can not be computed within the simulation model. They can only be computed upon examining the simulation results. However, one probability is computed within the simulation model. That probability relates to firm solvency.

The firm solvency test discussed in Chapter II deals with two outcomes, solvency (success) or insolvency (failure) of the firm during n independent replications (trials). When there are only two possible outcomes to a situation, the binomial frequency distribution function gives the probability of obtaining x successes in n independent trials [16, p. 86]. The binomial distribution is as follows:

$$f(x) = \frac{n!}{x!\ (n - x)!}\ p^x\ (1 - p)^{n-x} \qquad (C-5)$$

where p is the probability of success in a single trial. If np and n (1 - p) are each larger than five, the normal distribution can be used as an approximation to the binomial distribution [9, p. 229].

Since n equaled 35 and the most critical values of p were less than or equal to .85 in this study, the normal distribution was used as an approximation to the binomial distribution (p could be as high as .90 if n equaled 50).

The solvency test involves estimating the probability (p) of success in a single trial, that is, the probability of the firm surviving over 25 years. A 95 percent one-sided confidence interval estimate of p is derived by computing a 95 percent lower (L) confidence limit as follows:

$$L = \frac{n}{n + z^2_{.95}} \left[\hat{p} + \frac{z^2_{.95}}{2n} - z_{.95} \left(\frac{\hat{p}\ (1 - \hat{p})}{n} + \frac{z^2_{.95}}{4n^2} \right)^{\frac{1}{2}} \right] \qquad \text{(C-6)}$$

where $\hat{p}$, the proportion of successes in n trials, is a point estimate of p [9, p. 229]. The value of $z_{.95}$ can be obtained from a cumulative standard normal distribution table [24, pp. 517-522]. As a result of computing L, it can be stated (with 95 percent confidence) that p is greater than or equal to L.

The probabilities calculated in this study are to be regarded as approximations. The mean (μ) and standard deviation (σ) required for each probability statement were not known but estimated from 35 observations.

APPENDIX D

THE USE OF TAPE AND DISK BY THE SIMULATION MODEL

The purpose of using tape and disk by the simulation model is to conserve computer processing time. The following discussion relates the conditions under which tape and disk are used by the model.

Results of the calculations performed by the STNMDV and PRODUC subroutines can be stored on either tape or disk. If tape storage is desired, the tape option must be specified as data. If the results are not stored on tape, they are stored on disk but only for the duration of the run.

The results are written on disk during the first stage of a run. A preliminary computer run is required when the results are written on tape since land acquisition during that run is not allowed. Once the results have been written on tape, they are read from tape during subsequent runs instead of generated.

Results of the calculations performed by the PRODUC subroutine are a linear function of the acreage operated except during the years in which the acreage operated changes. Thus, the PRODUC results read off tape or disk are not always used.

Suppose that during year six, 160 acres are acquired. Enterprise net returns, which are computed by the PRODUC subroutine, do not change in proportion to a change in acreage during a year of land acquisition. Thus, the PRODUC subroutine must be called by the MAIN program during year six. Results of the calculations performed by the PRODUC subroutine during this one year are not written on tape or disk.

During years in which the same acreage is operated all year, the PRODUC results read off tape or disk are used. However, the results usually have to be adjusted. If the results read off tape or disk were obtained for 320 acres, and 640 acres are currently operated, the results have to be adjusted for the change in acreage. In this example, returns, expenses, and so on have to be doubled.

The use of tape or disk discussed so far is optional. However, the use of disk is mandatory in one instance.

When land acquisition is determined by the model, the use of disk is required. Whenever the firm solvency test is passed during a stage of a run, the simulation results (feasible results) are written on disk by the WANDR subroutine. If the next stage of the run yields infeasible results, the feasible results on disk are read by the WANDR subroutine and then used to replace the infeasible results.

The writing and reading of feasible results have two implications. First, suppose that a unit of land is purchased during year 11 and feasible results are obtained. The results would be written on disk. Another unit of land would be purchased during year 11. If infeasible results are obtained, the feasible results on disk would be read and then used to replace the infeasible results. Thus, when a unit of land is purchased during a later year, say year 16, the machinery analysis would not have to be repeated during the years 1-15.

The second implication pertains to a situation where further land acquisition is impossible and the current simulation results are infeasible. In this case, the feasible results written on disk during a previous stage of the run would be read and then used to replace the infeasible results. Thus, the firm's operations would not have to be resimulated to obtain a feasible simulation solution.

VITA

3

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