Cotton seed oil

# Cottonseed Oil Mill Simulation Model: Documentation and User's Guide

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## ABSTRACT

A computer model for simulating costs and returns of cottonseed oil mills was developed using an economic-engineering approach. This report documents the computer model and explains specific input cost items and output relationships of cottonseed processing. An example data set and a computer run based on that data set are used to assist in explaining the use of the computer model. Technical details for constructing a data set and using the computer model are given in the appendices.



Key words: Cottonseed oil mill, simulation model, computer model, costs, returns.


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## INTRODUCTION

The cottonseed oil mill industry in the U.S. has experienced large changes in recent years in terms of location, size, and number of operating mills; e.g., there was a decline from 188 mills in 1963 to 83 mills in 1977 (7, p. 2).[2] In part these changes can be attributed to a decline in cotton production in the Southeast where a large number of smaller capacity mills were located and an increase in cotton production in the West where newer, large capacity mills were built as production shifted West (8, p. 3). While these changes may be somewhat stabilized, the industry is presently faced with new economic and technological questions which must be addressed on an individual mill basis and/or on an industry-wide basis. Increasing cost of equipment, labor, electricity, fuel, and hexane combined with low product prices (particularly hulls and linters) in some years, have caused mills to examine processing alternatives (3; 7). With the recent concern about cotton dust in all segments of the cotton industry, the cottonseed oil mill industry will need improved or new technologies to reduce dust levels in the mills. There are also regional problems (aflatoxin) and individual mill problems (increasing mill capacity, replacing equipment, etc.) which must be examined.

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[2] Numbers in parenthesis refer to the corresponding number in the List of References.

One method of analyzing questions of this type is the use of computerized simulation models developed for specific types of operations (6; 10). This report presents the documentation of a computerized simulation model developed for simulating the costs and returns for actual or hypothetical cottonseed oil mills. Particular emphasis is placed on developing a data set for use in the computer program.

In terms of organization of the report, the first section presents a general description of a cottonseed oil mill and is followed by a more specific discussion of individual cost centers or processing steps needed to accomplish cottonseed oil extraction. The next section defines the simulation model structure and specific input data needed. The last section discusses an example data set and the computer output based on the data set.

The appendices were developed for those readers interested in more technical details of the model. Included are: a list of computer program variable names and explanations; flow diagrams of the computer program logic; explanation of input data arrangement on cards; input data card deck arrangement; card deck arrangement including the program, data, and job control cards; listing of the computer program Fortran statements; and the results of a computer run using the example data set.

## COTTONSEED OIL MILL DESCRIPTION AND DESIGN

This section is designed for those users who are not familiar with oil mill operations and is only a guideline of what might be found in a "typical" oil mill operation. For a more specific description of production processes and technical information about machinery and equipment used in processing cottonseed, the reader is referred to Bailey (1) and Brewster (2).

Cottonseed oil mills process raw cottonseed into four products: oil (16-18%),[3] meal (46-48%), hulls (18-26%), and linters (8-11%) (4, p. 195). An oil mill may pelletize meal, have mixed feed operations, or refine the oil. The computer program does have the ability to estimate the costs of these operations. However, for this report in both the oil mill description and the example data set, the mills discussed are assumed to produce press oil or once-refined oil (depending on the extraction technology), bulk meal, bulk hulls, and baled linters.

A typical method of describing a cottonseed oil mill is its average daily processing capacity and the type of extraction technology used. Thus, a 300 ton-per-day (TPD) solvent mill refers to a mill which averages 300 TPD of cottonseed processed and uses direct solvent oil extraction. The processing capacity for a 24 hours per day processing operation is an average tonnage; it may vary from day to day due to seed quality, mechanical problems, and other factors. Individual mill processing capacities at present range from 50 to 1,200 TPD (7, p. 2), and three extraction methods, (screwpress, pre-press solvent, and direct solvent) are used.

The typical oil mill tends to process seed on a 24-hours per day, 7 days per week basis throughout the season except for those periods when major breakdowns occur. This 24-hour per day operating period will begin when the mill has received enough seed to process at its daily rate and average daily seed receipts are equal to or greater than daily crush. Maintenance and repairs cannot be performed properly on machinery when the mill operates at this rate, and some period for repairs, maintenance, and

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[3] The number in parenthesis are typical product percentages by weight from raw cottonseed.

cleanup between processing years is needed. The maximum capacity utilization of the mill is the maximum number of days the mill can process seed (or 365 days less the days necessary for major breakdown repairs during the season and less the days needed for repairs, maintenance and cleanup between processing years) times the average daily processing rate. As a standard, the industry generally accepts that a mill will seldom operate more than 330 days per year.[4] Within this maximum physical plant capacity, the determining factor on the annual production is the amount of seed available for processing.

Each mill in the industry is unique in terms of plant design and individual machinery items. However, the basic processes which must be performed on the seed to separate oil, meal, hulls, and linters can be defined with some degree of continuity among all mills in the industry.

In this report, a cost center is defined as a process or activity which constitutes an identifiable cost unit in the operation of a mill. Thus, production support items including office, seed receiving and storage, and product storage are cost centers even though they are not directly associated with the technical production processes of delintering, baling, hulling, or extraction. Therefore, a typical oil mill has more cost centers than actual processing steps needed to process cottonseed.

The oil mill cost centers presented in Figure 1 and discussed in the following sections show the flow of cottonseed through the mill. The product storage cost centers are discussed after the processing cost centers with a note as to when they are removed from the processing stream.

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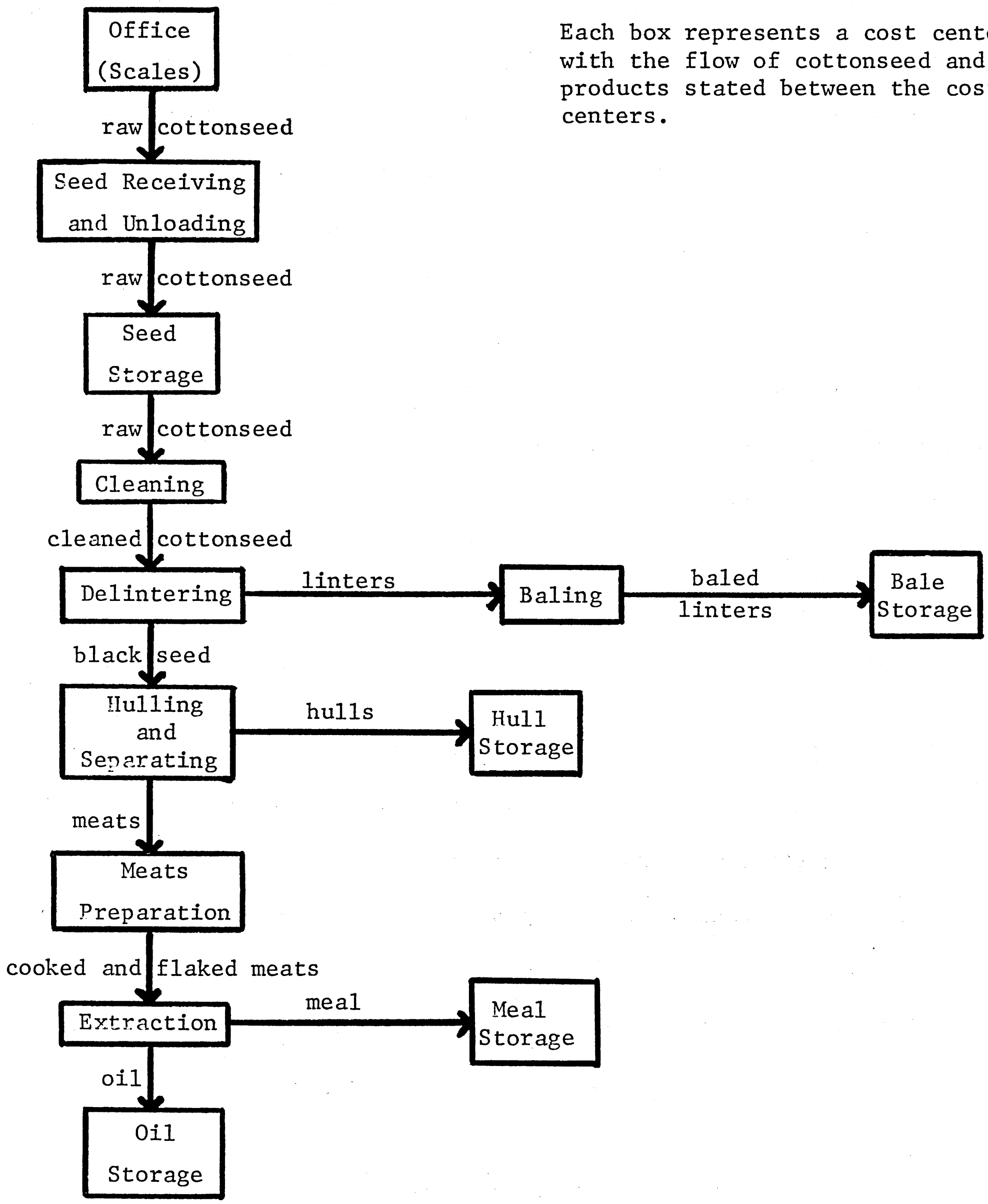
4 This average processing period is based on information gained through personal interview with various operating oil mills.

Figure 1. Flow of Cottonseed and Products Through the Cost Centers of a Typical Oil Mill

Each box represents a cost center with the flow of cottonseed and products stated between the cost centers.



## Office

Included in this cost center are the fixed costs of office buildings and equipment; the fixed labor costs of management, secretaries, and other office personnel; fixed costs for liability and business interuption insurance; and variable office operating costs such as telephones, office supplies, and temporary scale operator during the seed receiving period. The office may also include other costs which are not directly related to specific cost centers; these might include land costs, brokerage fees, and other administrative expenses.

Mills may contract outside laboratories to determine the grade basis of the raw seed received. However, other functions may be performed at laboratory facilities located at the mill, and a laboratory cost center included. Mills without a laboratory cost center assign costs of determining the grade basis of seed and other contracted laboratory expenses to the office or other cost centers.

## Seed Receiving

Seed receiving is the first cost center which deals directly with the handling of cottonseed. The seed receiving period is usually tied to the local and regional cotton harvesting and ginning season. However, some mills buy seed or transfer seed from outside the local or regional area in which they are located. In either case, the variable costs associated with this cost center are based on a shorter time period than the other mill cost centers.

A common unloading facility is a hydraulic truck dump which can lift an entire tractor-trailer truck loaded with cottonseed. The cottonseed is dumped into a pit and carried through an elavator system and screwtype conveying system to the seed storage area. In some portions of California, side dump trailers are used.

## Cottonseed Storage

The types of storage facilities and the associated costs of the facilities varies from region to region due basically to the amount of rainfall during the year. In areas of high rainfall, cottonseed must be stored inside to prevent moisture damage. The typical facility is a cottonseed warehouse designed specifically for storing cottonseed. In more arid regions of the U.S., cottonseed can be stored outside. To prevent moisture penetration, these stacks of seed may be packed and in more humid areas seed may be covered with water resistant material.

In addition to costs associated with the storage facilities, a major cost of seed storage is electricity for aeration of seed which is accomplished by large fans and wind tunnels through the seed stacks or warehouses. The amount of aeration depends on the seed, the area, the length of storage, and the type of storage facility used.

## Cleaning

The first actual processing stage within the cottonseed oil mill is cleaning. This step removes dirt, rocks, plant stems, and other foreign matter from the seed. The most common cleaning machine is a cleaning shaker which may have two to four trays depending on the size of the machine. The cottonseed are passed through the machine and foreign matter is screened out. Another cleaning machine, a boll reel, is used in some mills before the seed are cleaned in the shakers.

Cleaning prior to delintering and hulling help to lengthen saw blade life in delintering machines and knife life in hulling machines. Also, foreign matter removal facilitates the movement of the seed through the remaining machinery. The major variable cost items in this processing step are electricity, labor, and repairs.

Delintering

Delintering is a general term given to the removal of linters (short cotton fibers remaining on seed from the ginning process) from the seed. Delintering can be accomplished by various methods.[5] One method is saw delintering which uses a machine which has a series of saws which cut or tear the linters from the seed. Two or more separate cuts of linters are usually made; the seed pass through a separate delintering machine for each cut. Mills usually delinter to a point where 3-4 percent lint remains on the seed. Each delintering machine has a small hourly capacity so the delintering center has a high fixed cost and large electrical energy use.

Delintering saws must be sharpened (typically once every 24-hours) which involves removing the cylinder holding the saws (176 saws on a cylinder in a new machine) from the delintering machine and placing it in a gummer machine for sharpening. After the saws are sharpened, the cylinder must be replaced in the delinter. This activity incurs substantial labor and repair costs.

The delinters and gummers are not the only machinery needed in the delintering process, but account for a large portion of its costs. The linters are run through lint beaters and pneumatically conveyed to the baling area. The black seed (seed with linters removed) move on to the hulling and separating stage.

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5 For further information on alternative technologies of delinting cottonseed, read Clark (3) or Hise and Ethridge (7)

## Baling

After delintering, linters are packaged for handling, grading, and marketing. The linters are typically compressed into bales and are packaged with bagging and ties (in most mills) the same way cotton lint is baled at gins. Because there are separate uses and therefore separate markets for different cuts of linters, the various cuts of linters are typically baled separately. This cost center is more labor intensive than some other portions of the mill and uses less electrical energy. The linters are moved from baling directly to bale storage, which will be discussed subsequent to the remaining processing steps.

## Hulling and Separating

The black seed move directly from delintering to the huller room. Most mills use a magnet to remove metal objects that may have entered the seed flow; some mills have another small cleaning shaker to remove foreign materials before hulling. This step increases the life of the knives in the hullers. The seed enter the huller and the hulls are cracked by the knives. The amount of oil absorption by the hulls is affected by huller performance. The cracked seed are passed over a 2-tray shaker separator which allows the oil bearing meats to fall through to the bottom tray with the hulls remaining on the top tray. This, however, is not a final separation--some seed do not get cracked and remain with the hulls, some of the meats are not separated and remain in the hulls, and some hulls fall through with the meats. Thus, additional machinery such as hull beaters (which separate uncracked seed from hulls), meat purifiers (which separate hull fragments from meats to control protein level of meal), and tailings beaters are needed. The uncracked seed re-enter the huller. The hulls are removed to hull storage facilities, and meats continue in the mill to the meats preparation stage.

Machinery and conveying equipment used in this cost center require a sizable amount of electricity and repair costs in comparison with other portions of the mill. However, the hulling and separating step does not have a large labor requirement.

## Meats Preparation

After the final separation of hulls and hull fragments from meats, the meats are conveyed to the meats preparation processing step. In this step meats are treated with steam to prepare them to be flaked by a flaking roll. This is the first portion of the mill to use steam. Consequently, this cost center will incur some of the cost of boiler fuel and water as well as variable costs of labor, electricity, and repairs.

## Extraction

There are three methods of extracting oil from meats--screwpress, solvent, and pre-press solvent extraction. Screwpress extraction is accomplished by a mechanical application of pressure to the cooked flakes to squeeze out the oil. The screwpresses are powered by large electric motors causing this type of extraction to be a heavier user of electrical power. The cost of the machinery also gives this type of extraction a high fixed cost in terms of TPD capacity per machine.

Direct solvent extraction is accomplished by a chemical process in which the flaked meats are saturated with a solvent (hexane). The oil combines with the solvent to remove it from the meats. The hexane is separated from the oil by a distillation process and the hexane is then reused. However, there is some hexane loss in the process.

The pre-press solvent method of extraction is a combination of screw-press extraction and solvent extraction. A portion of the oil is extracted by screwpress, but at a lower level of pressure and a faster rate than by the screwpress method alone. The remaining oil is extracted by the solvent method. Approximate percentages of oil left in the meal are four, one, and less than one for screwpress, direct solvent, and pre-press solvent methods, respectively.

Following extraction the meal is cooled, ground and placed in storage. Oil extracted by the solvent method is partially refined before storage. In pre-press solvent mills, the partially refined oil is mixed with the press oil for storage. Screwpress extracted oil needs no refining before it is sotred.

## Oil Storage

Oil is stored in cylindrical, steel storage tanks, which makes the major oil storage costs fixed. Small amounts of electrical energy and labor are required to pump the oil to tank cars or trucks. Another cost of oil storage is product insurance, which is based on the average amount of oil in storage over the twelve month period.

## Meal Storage

Meal requires inside storage; thus, a major portion of this cost of storage is fixed. Loading of meal is accomplished a number of ways, mechanical conveying and front-end loaders are most common. The energy or fuel and labor requirements for meal loading are typically higher than for oil loading. As with oil storage, product insurance is a major cost.

## Hull Storage

Hull storage facilities vary greatly from mill to mill. Some mills in arid regions use open storage for hulls. The area required to store a ton of hulls is greater than meal because of the relative compactness of meal. Hull storage may have a high fixed cost associated with it, depending on the facilities used. Loading is accomplished by the same methods as meal. Because hulls do not have a high per unit value, the product insurance cost is not as high for hulls as for oil and meal.

## Linter Storage

Most mills use forklifts for handling bales from the press area to the bale storage area which is usually located in the same building. The same employees which operate the bale presses may also supply labor for this cost center. Again, the per unit value of linters makes the cost of insuring them small compared to insurance cost of oil and meal.

# MODEL DESCRIPTION

The cottonseed oil mill simulation model is a computerized model for estimating the cost and returns from processing cottonseed. The model can be defined as a set of mathematical relationships based on economic and engineering concepts within the framework of typical oil mill practices from which estimated costs and returns of processing cottonseed may be calculated. A flow diagram of the computer program logic and a listing of the Fortran statements of the computer model program are shown in Appendices II and VI, respectively.

The cottonseed oil mill industry consists of mills operating at different TPD capacity rates, in different regions of the U.S., with different extraction technologies, and under differing managerial practices. This leads to the development of a system which defines those relationships which are common to all mill situations. However, to maintain enough flexibility to accurately estimate the costs and returns of a wide range of cottonseed oil mill situations (actual or hypothesized), the simulation model is designed and programmed with many input variables allowing the user to develop the technical coefficients required for a specific mill situation. Definitions of variables and their use as input data follows.

## General Mill Specification

The exact division of a mill into cost centers and placement of costs and technical information on buildings, machinery, equipment, and resource inputs into these cost centers can vary among mills. This simulation model gives the user the ability to determine the cost centers to be modeled according to the following procedure. The production support cost centers of OFFICE, SEED UNLOADING, SEED STORAGE, OIL STORAGE, MEAL STORAGE, HULL STORAGE, and LINTER STORAGE can be selected by placing 1's in appropriate columns on the first data card (card 1, Appendix III). The remaining cost centers are the actual processing steps of the mill and can vary from mill to mill. Therefore, the number of these cost centers which will be included in the specific mill situation being modeled must be specified on the first data card (columns 6-8). Also, included on this card are the geographic area and the extraction technology of the mill situation specified (columns 1 and 2).

Costs and returns are based on specific time periods which are input data to the model. The times which must be specified are; (1) days processing, (2) days for major break-downs and repairs between processing years, and (3) days for seed receiving (card 2, Appendix III). The computer model develops costs and returns at 10 utilization levels from 100% to 10% by 10% decrements. For example, a mill operating 330 days at 100% utilization, will process 297 days at 90%, down to 33 days at 10% utilization. The model also requires the average daily processing rate as input data (card 2). The average daily processing rate times the number of days processing determines the tons of seed processed at each utilization level. Using the processing days at 330 and an average processing rate of 100 TPD, the mill will process 33,000 tons at 100% utilization, 29,700 tons at 90%, down to 3,300 tons at 10%.

To determine the cost of seed at each level of utilization, an average cost per ton of seed received, including the cost of transporting the seed to the mill, is needed (card 2, Appendix III). This value times the capacity utilization level in tons of seed yields the cost of cottonseed (excluding interest on operating capital) at each utilization level. The interest on operating capital for seed is determined by the formula in the Fortran statement number 59 of the MAIN program in Appendix VI[6] where the short term interest rate (RS) is included as input data on card 2, Appendix III.

The two remaining variables on card 2, Appendix III are the interest rate on long term capital and the average period of time in weeks from processing to sales of products. These variables are used to determine specific costs and are discussed when they are used by the computer model.

The computer model generates the following costs and returns of a mill situation: (1) the cottonseed oil mill description (Section A)[7];

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6 The variable names and definitions of the variables are shown in Appendix I.

7 The sections (in parentheses) refer to the divisions of the computer output the example mill data set in Appendix VII.

(2) fixed costs by item totaled by cost center and summed for the entire mill (Section B); (3) total revenue at 100% capacity utilization (Section C); (4) total variable costs by item, totaled by cost center, and summed for the entire mill at all levels of capacity utilization (Section D); (5) the associated average variable costs by item, totaled by cost center, and summed for the entire mill at all levels of capacity utilization (Section E); (6) average cost per ton of seed processed of ten specific resource items (labor, electricity, repairs, lab analysis, bagging and ties, fuel, miscellaneous, solvent, insurance, and water) at all levels of capacity utilization (Section F); (7) average fixed cost by cost center at all levels of capacity utilization (Section G); (8) average variable cost by cost center at all levels of capacity utilization (Section I); (10) total costs and returns of the entire mill at all levels of capacity utilization (Section J); and (11) average costs and returns for the entire mill at all levels of capacity utilization (Section K). The computer model is programmed to print each of these sections automatically with the exception of sections D, E, and F. To have these sections printed, the users must place 1's in the appropriate columns of the control card (column 15, 18, and 21, respectively, card 1, Appendix III).

## Cost and Revenue Input Data Requirements

The following sections discuss the data input requirements for developing cost and returns for a mill situation. These data will be discussed in the order in which they must be inputed: (1) fixed cost data, (2) revenue data, and (3) variable cost data.

### Capital Asset Items

The fixed ownership cost for each capital asset items includes the costs of depreciation, interest, taxes, insurance, and fixed repairs. For each capital asset item, the computer model requires the FOB cost, the number needed, the transportation and installation[8] rate [expressed as a fraction of FOB cost (4, pp. 110-113)], a fixed repair rate as a fraction of FOB cost, estimated years of useful life, and salvage value as a fraction of FOB cost are also required input data (cards 5 and 6, Appendix III).[9]

Depreciation is the cost of ownership due to wear and/or obsolescence and is calculated by the straight line depreciation method. Interest cost may represent the opportunity cost or revenue lost by not using the funds invested in the capital asset items in their next best alternative use. The simulation model uses a formula which calculates both interest and depreciation (Fortran Statement No. 70, in Subroutine FIX(TFC), Appendix VI) using the interest rate on long term capital previously discussed.

Taxes and insurance are based on the total cost of obtaining and installing each capital asset item. A tax rate per $100 of capital asset value and an insurance rate $1,000 of capital asset value are placed in the data set following the format of card 3, Appendix III. The annual equivalency cost (total fixed cost of the item) is the sum of depreciation, interest, fixed repair costs, taxes, and insurance (Section B, Appendix VII).

A special case is made for land, which is a non-depreciable, non-insurable capital asset item. Land is subject to the long term interest rate for developing interest cost and is taxable. The data requirements closely fit the other capital asset items so the only change in input

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[8] This installation cost may include piping, concrete, electrical, instrumentation, paint, engineering, labor, etc.

[9] The reader may find it useful to refer to Appendix IV simultaneously with reference to Appendix III.

format from card 6, Appendix III is the identification character in column 1 (card 5, Appendix III). This identification specifies that insurance and depreciation will not be calculated on land.

## Non-depreciable Fixed Costs

The costs of specific items which are non-depreciable, non-taxable, non-insurable, and have no fixed repair cost but will remain the same regardless of the level of production are classified as non-depreciable fixed costs. The cost of these items includes the annual outlay cost plus an interest cost (which reflects the opportunity cost). Because these items are not purchased on a long term basis, the short term interest rate is used in determining the interest cost of the item (Fortran statement 97, Subroutine FIX(TFC), Appendix VI).

The fixed labor component of a typical mill includes those employees which are salaried full time employees. Certain job classifications which may be in this group are: mill manager, assistant manager, sales staff, secretaries and bookkeepers, mill superintendents, engineers, shift supervisors, foremen, and laboratory employees. The majority of the fixed labor can be included in the office cost center due to the difficulty of allocating to other cost centers. Other fixed costs may include special insurance costs--such as business interruption--or special cost items which do not depend on the level of annual utilization such as office supplies, dues, subscriptions, audit, legal, and other administrative expenses.

## Revenue Data

The average amount of oil, meal, hulls, and linters (where linters may be entered by specific cuts) produced from a ton of seed and the average prices received for these products are required input data (cards 9-13, Appendix III). Each product produced must be entered as average pounds produced from one ton of cottonseed. However, product prices are entered as: (1) cents per pound for oil, (2) dollars per ton for meal, (3) dollars per ton for hulls, and (4) cents per pound for linters. The control character in column 1 determines which product is specified. If the control character is O, the product is oil; M, the product is meal; H, the product is hulls; and L, the product is linters. These data are used by the computer in Subroutine NR(TR) to generate total revenue by each product and total revenue at 100% capacity utilization. The model then uses these values to generate total revenue of the mill at each level of capacity utilization based on the amount of seed processed. Because average prices and production relationships are used for the entire period, average revenue is the same at all capacity utilization levels.

Variable Cost Data

Resources which vary directly (but not necessarily proportionally) with the level of capacity utilization are termed variable resources. Physical and cost relationships of these items at the 100% capacity utilization level are entered in the data set by cost centers. Computational procedures to develop input requirements and cost at the nine other utilization levels are programmed into the computer model for each specific cost item. Each of the eleven variable cost items are discussed below.

Labor: Variable mill labor consists of employees who are on an hourly wage rate and whose hours worked vary with the level of mill utilization. The total year can be divided into three time periods: (1) actual seed processing, (2) repair and maintenance between seasons, and (3) dormancy between processing years. An employee may be hired for one, two, or all three periods. If an employee is hired for all three periods the annual cost of the employee becomes fixed and can be included either as a non-depreciable fixed cost data input item or in the variable cost specification just described, depending on the user's descretion.

The typical oil mill operates three eight hour work shifts seven days per week. To alleviate overtime pay some mills have relief crews or a fourth shift which rotates with various shifts during a work week resulting in a 40 to 48 hour work week for most employees. Due to the variability of work schedules among and within mills, the computer model was not programmed to develop labor costs based on an hourly wage rate. The model does determine the number of weeks each employee works (in each of the three periods discussed) at each level of capacity utilization. Employees within a cost center which earn the same weekly wage can be grouped in the data set by entering the number of employees for each time period and the weekly wage rate, including allowances for all benefits (card 20, Appendix III). The number of cards required to include all variable labor within a cost center will be the number of wage groups within the cost center, not the number of employees.

<u>Electricity</u>: The major source of power in a cottonseed oil mill is electricity. Connected electric motor horsepower is user specified by machinery item as part of the fixed cost input data (card 6, Appendix III). The connected horsepower is totaled by cost center and converted to kilowatt hours based on the average number of hours per day the machinery in each cost center operates over the processing period [TIME(K), card 15, Appendix III] by the formula in Fortran statement 139, Main Program, Appendix VI. This

time variable must be input for the production support cost centers of unloading, seed storage, and product storage. The time variables used in these cost centers should reflect the average period of time to unload one truck in the unloading cost center and the average daily hours of machinery use for removing products from storage in the storage cost centers. In the unloading cost center, the user must also specify the number of unloading facilities for the mill and the average truck size (in tons) of trucks unloading at the mill (card 16, Appendix III). These variables are used to determine electrical energy usage by the unloading facilities (Fortran Statements 100 and 101, Main Program, Appendix VI). A default value of 24 hours is used if the user does not specify the time variable. Total kilowatt hours per year is the daily consumption times the annual days of operation at each utilization level.

There is a wide variation in the rate structures of electrical power companies serving cottonseed oil mills. All rate structures contain a cost per kilowatt hour consumed and a monthly or annual demand or service cost when no power is used. Therefore, electricity costs are based on a user supplied average cost per kilowatt hour and a monthly charge when the mill is not operating (card 14, Appendix III).

In the dormant period electricity cost is allocated to each cost center as a percentage of that cost center's connected horsepower to total mill connected horsepower.

Variable Repairs: Many factors affect the cost of variable repairs in a cottonseed oil mill. The two major factors are age of the mill equipment and the condition of the seed processed through the mill. These two factors can vary greatly within a region as well as from region to region.

The simulation model requires a user supplied variable repair cost per ton of seed processed for the entire mill as input data (card 14, Appendix III).

Repair cost per cost center usually depends on the amount of machinery within that cost center. One indicator of the amount of machinery in a cost center is the total connected horsepower of that cost center. The computer model divides the total mill variable repair cost among the cost centers based on the ratio of cost center connected horsepower to total mill connected horsepower.

Water: The amount of water used by a specific machinery or equipment item is included in the data set in the fixed cost section of the computer model. Water use is expressed in terms of 1,000 gallons per ton of cottonseed processed. Similiar to electricity, water costs are supplied by the user as a water rate per 1,000 gallons and a monthly charge when no water is used (card 14, Appendix III). The total water cost is developed at each level of capacity utilization (Fortran Statement 57, Appendix VI) and allocated to cost centers based on the ratio of cost center water usage to total mill water usage.

Fuel: The type of fuel used to operate the boiler tends to vary from region to region depending on the availability and costs. In the Southwest and West, the more common boiler fuel is natural gas. In the South, fuel oil is the common boiler fuel. Because these differences in fuel types exist, the model is designed to use a rate of fuel consumption per ton of seed processed and a price per unit of fuel as user supplied input data (card 16, Appendix III). These data must be entered by cost center and more than one fuel rate and price can be entered on separate data cards if necessary. The cost of fuel is developed by cost center and by utilization level according to the formulas in Fortran Statements 43, Subroutine STAGE and 141, Main Program, Appendix VI.

Bagging and Ties: To develop the cost of bagging and ties, the amount of linters produced per ton of seed processed and the average price paid per pattern are supplied by the user (card 16, Appendix III). The amount of linters produced can be entered by cut (up to 3 cuts including motes) or as a total of all cuts combined.

Total linters production at each utilization level is the pounds produced per ton of seed times the tons of seed processed at each utilization level. To determine the number of bagging and tie patterns needed, the total linter production is divided by 600 pounds, the standard size bale for the industry. This value times the price per pattern yields total cost of bagging and ties (Fortran Statements 41, Subroutine STAGE and 145, Main Program, Appendix VI).

Hexane: At pre-press and direct solvent mills, the cost of hexane is of major importance in the extraction cost center. The hexane loss varies from mill to mill but usually ranges around one gallon per ton of seed processed. Because of this variation, the user must supply the hexane loss per ton of seed processed as input data along with the average price paid per gallon for hexane (card 16, Appendix III). The hexane cost is developed for each utilization level by multiplying the cost per gallon times the amount of seed processed (Fortran Statements 45, Subroutine STAGE and 147, Main Program).

Lab Analysis: The lab analysis to determine the grade basis of seed received by the mill is assumed to be contracted at a specific cost per ton. This value must be supplied by the user (card 16, Appendix III). To determine total cost of lab analysis, this value is multiplied times the number of tons of seed processed at each utilization level (Fortran Statement 86, Main Program, Appendix VI).

Insurance: Cottonseed and product insurance costs are based on the average amounts and values of cottonseed and/or products held in storage during a one year period (Fortran Statements 122, 180, 198, 216, and 234, Main Program, Appendix VI). The insurance rate is user input as a dollar cost per $1,000 value of products held on the average throughout the year (card 14, Appendix III). The simulation model determines values based on the average prices for cottonseed and products which have previously been inserted in the data set.

Interest: The short term interest rate (previously discussed) and the average period of time (in weeks) from processing to sales of products are user input data needed to calculate the opportunity cost associated with using short term capital to purchase the resources for processing cottonseed (card 2, Appendix III). The interest on operating capital (opportunity cost) is calculated by cost center at each level of capacity utilization based on total amount of variable cost for all resources used within a particular cost center (Fortran Statement 88, Main Program, Appendix VI).

Miscellaneous: A special category is needed for all variable costs which are not included in the standard costs listed above. Miscellaneous costs per ton of seed processed is required user input data (card 16, Appendix III). Miscellaneous costs per ton of seed processed can be specified to applicable cost centers by the user. Costs which may fall into this category are costs of brokerage fees for sales of products, maintenance cost of items not included in the repair costs, legal fees, dues, etc.

## EXAMPLE MODEL RUN

This section discusses the data requirements, input format, and data card deck arrangement for a hypothetical mill situation. A listing of the example mill actual data cards are contained in Figures 2, 3, and 4 with explanatory headings and titles added. Additional descriptions, variable names, explanations of each variable input, and card deck arrangement are contained in Appendices III and IV. The data set used in this example is for a hypothetical mill situation and is intended to illustrate the use of the computer model program; the data do not represent an actual or typical mill.

The first data card (Figure 2) defines the mill situation by area, extraction technology, and the cost centers which are included in columns 1-12. The 1 in column 1 indicates the example mill is located in the South. The 1 in column 2 indicates the mill uses screwpress extraction. The 1's in columns 3-5 show that OFFICE (card 4), UNLOADING (card 12), and COTTONSEED STORAGE (card 15), are to be included as cost centers in this model run. The 6 in column 8 shows there are 6 mill cost centers which are actual processing steps. These are CLEANING (card 18), DELINTERING (card 22), BALING (card 31), HULLING-SEPARATING (card 33), MEATS PREPARATION (card 45), and EXTRACTION (card 51). The 1's in columns 9-12 show that OIL STORAGE (card 57), MEAL STORAGE (card 60), HULL STORAGE (card 62), and LINTER STORAGE (card 64) are included as cost centers in this run. The 1 in column 15 tells the computer to print total variable cost by item by cost center and total for the entire mill at all levels of capacity utilization (Section D, Appendix VII). The 1 in column 18 tells the computer to print average variable cost by item, by cost center, and total for the entire mill at all levels of capacity utilization

FIGURE 2. CONTROL, DESCRIPTIVE, AND FIXED COST DATA

```
CARD NO. CONTROL DATA
1.       11111  61111  1  1  1
                  10         20         30         40         50         60         70
         123456789-123456789-123456789-123456789-123456789-123456789-123456789-COL.NOS.


         CAP. DAYS DAYS DAYS    COST OF LONG SHORT
         PLANT PROC  REP UNLD      SEED TERM  TERM WEEKS
2.         100  330   35  120     118.88  .15   .10   4.
                  10         20         30         40         50         60         70
         123456789-123456789-123456789-123456789-123456789-123456789-123456789-COL.NOS.


           TAX INS.
          RATE RATE
3.         1.4   6.
                  10         20         30         40         50         60         70
         123456789-123456789-123456789-123456789-123456789-123456789-123456789-COL.NOS.

                                     FOB                 FIX  SAL CON
         ID  NAME(I)                 COST  NUM YR INST  REP VALUE HP      WATER
 4.      LOFFICE
 5.      ALAND                       1000     5 50              1
 6.      FBUILDING                  26.80 1500 40     0 .01   .1    0       0
 7.      CMILL MANAGER              25000     1
 8.      CMILL SUPT.                22000     1
 9.      CSHIFT SUPV.               18000     3
10.      CFOREMEN                   16000     6
11.      CSECRETARIES                7500     1
                  10         20         30         40         50         60         70
         123456789-123456789-123456789-123456789-123456789-123456789-123456789-COL.NOS.

         DATA FOR EACH COST CENTER ENTERED BY FORMAT FOR CARDS 4-11


12.      LUNLOADING
13.      FSCALES                    18852     1 30 1.45 .01   .1    0       0
14.      FTRUCKDUMP                 56877     1 25 1.45 .01   .1   50       0
15.      LSTORAGE
16.      FSEEDHOUSE                465750     2 40    0 .02   .1  100       0
17.      FCONVEYORS                 18880     1 20 1.45   0    0   50       0
18.      LCLEANING
19.      FBUILDING                   13.5   900 40    0 .01   .2    0       0
20.      F2-TRAY SHAKERS            29375     2 30 1.31   0    0   30       0
21.      FCONVEYORS                  4720     1 20 1.45   0    0   20       0
22.      LDELINTERING
23.      FBUILDING                   13.5  3000 40    0 .01   .2    0       0
24.      FDELINTERS                 14582    14 30 1.31   0    0  420       0
25.      FGUMMER                    15845     1 30  .76   0    0    2       0
26.      FLINT FLUE SYS              2500     1 20 1.45 .02    0   60       0
27.      FLINT ROBBING SYS           3500     1 20 1.45 .02    0    6       0
28.      FLINT PICKUP SYS            3000     1 20 1.45 .02    0    6       0
29.      FLINT CLEANER              24744     2 30 1.31   0    0   10       0
30.      FCONVEYORS                 11060     1 20 1.45 .02    0   20       0
31.      LBALING
32.      FBUILDING                   12.8   200 40    0 .01   .2    0       0
33.      FBALE PRESS               121713     1 40 1.31   0    0   75       0
34.      LHULL-SEP
35.      FSAFETY SHAKER              8378     1 20 1.31   0    0   10       0
36.      FHULLER                    14993     2 25 1.31   0    0
37.      FPURIFYING-HULLER           7383     2 25 1.31   0    0
38.      FDOUBLE DRUM BEATER        13230     1 25 1.31   0    0
39.      FH AND S MACHINE            7378     1 25 1.31   0    0
40.      FMEATS PURIFIER            11793     1 25 1.31   0    0
41.      FTAILINGS BEATER            7545     1 25 1.31   0    0
42.      FMOTES BEATER               5395     1 25 1.31   0    0
43.      FCONVEYORS                  1260     1 15 1.31   0    0
44.      FHULLS BLOWING SYS         10100     1 15 1.31   0    0
45.      LMEATS PREPARATION
46.      FMEATS COND. BLDG.         13.50   600 40    0 .01   .2    0       0
47.      FBOILER                    22700     1 30 1.31   0    0    0       0
48.      FCRUSHING ROLLS            95040     1 30 1.31   0    0    0       0
49.      F6-HIGH COOKER            128400     1 30 1.31   0    0    0       0
50.      FCONVEYORS                  8873     1 15 1.31   0    0    0       0
51.      LEXTRACTION
52.      FSCREWPRESS               139030     2 40 1.45   0    0  300     100
53.      FBUCKET ELEV.               5300     1 20 1.45 .01    0    2
54.      FSETTLING TANK             18000     1 20 1.31 .01    0    5      50
55.      FFILTER PRESS              25450     1 30 1.31   0    0    6      20
56.      FPUMP-CONVEYORS            11850     1 15 1.45 .01    0   10      10
57.      LOIL STORAGE
58.      FTANKS                     12000     3 25 1.31 .01   .1    0       0
59.      FPUMPS                      3300     1 10 1.31   0    0   20       0
60.      LMEAL STORAGE
61.      FBUILDING                   13.2  3150 40    0 .01   .1   20       0
62.      LHULL STORAGE
63.      FBUILDING                   13.2  7800 40    0 .01   .1   30       0
64.      LLINTER STORAGE
65.      FBUILDING                   13.2  3000 40    0 .01   .1    5       0
66.      END
                  10         20         30         40         50         60         70
         123456789-123456789-123456789-123456789-123456789-123456789-123456789-COL.NOS.
```

(Section E, Appendix VII). The 1 in column 21 tells the computer to sum the average variable cost items: labor, electricity, repairs, lab analysis, bagging and ties, fuel, miscellaneous, solvent, insurance, and water for the entire mill at each level of capacity utilization and print those costs (Section F, Appendix VII).

The second data card continues the mill descriptive data. The first variable states the average daily processing capacity of the example mill is 100 tons of cottonseed per day (cols. 3-5), for a maximum of 330 days per year (cols. 8-10), with 35 days needed for down time during the processing period and for major repairs and cleanup between seasons (cols. 14-15). The mill will receive seed for 120 days (cols. 18-20) and pay $118.88 per ton for seed and transportation to the mill (cols. 25-30). The next two variables are the interest rate on short term capital--15 percent (cols. 33-35)--and the interest rate on long term capital investment--10 percent (cols. 38-40). The last variable on the second data card is the average period between processing and sales of products--4 weeks in the example (cols. 44-45).

The third data card contains the property tax rate for land, buildings, and equipment per $100 value of these items--$1.40 (cols. 3-5)--and the insurance rate per $1,000 value of buildings and equipment--$6.00 (cols. 9-10).

## Fixed Cost Input Data

The next group of input data cards (4-66, Figure 2) provide the computer program the data to develop the fixed costs in Subroutine FIX(TFC). The identifying character (column 1) of each card tells the computer what information is on that card; an L in column 1 indicates a cost center title will follow and no calculations are performed (Appendix III, card 4). If the card has an F in column 1, the fixed cost item is a depreciable asset, such as OFFICE BUILDING in the example data set, card 6. The input data needed for each depreciable asset item is explained in Appendix III, card 6. If the card has an A in column 1, the item is a non-insurable item (not subject to property insurance but is subject to property taxes). The input data needed is the same for these items as for depreciable fixed asset items and is shown in Appendix III, card 5. An example of a non-insurable fixed asset is land (card 5, Figure 2).

The last type of fixed cost item is one which is not subject to property taxes, non-insurable (not subject to property insurance rate), and non-depreciable. An example of this type of fixed cost item in the example mill is fixed labor such as mill manager (card 7, Figure 2). This type of fixed cost item is designated by a C in column one and is entered in the data set as shown in Appendix III, card 7.

Control card 1 shows 13 cost centers. Therefore the data set must contain 13 cost center title cards and data must be entered in their appropriate cost center. Input data can have zero values for all variables with the exception of (1) the FOB cost, (2) the number of units needed, and (3), when applicable, the years of useful life.

The last fixed cost data card (card 66) must have END in columns 1-3. This tells the computer: (1) the end of the fixed cost data has been reached; (2) sum the total fixed cost of the last cost center ; (3) sum the total fixed cost for the entire mill; and (4) return to the main program.

<u>Revenue Input Data</u>

The example mill revenue input data are shown in Figure 3, cards 67-72

FIGURE 3. REVENUE DATA

| CARD NO. | ID | NUMBER PRODUCED | PRICE /UNIT |
|---|---|---|---|
| 67. | O | 319 | .281 |
| 68. | M | 932 | 143.62 |
| 69. | H | 443 | 39.26 |
| 70. | L | 140 | .073 |
| 71. | L | 45 | .088 |
| 72. | E | | |

```
         10        20        30        40        50        60        70
123456789-123456789-123456789-123456789-123456789-123456789-123456789-COL.NOS.
```

and the method for inputting the data is shown in Appendix III, cards 9-13. Following the data in card 67, the mill produces 319 pounds of oil per ton of seed processed (cols. 8-10) and receives an average price of 28.1¢ per pound (cols. 17-20). The remaining pounds of product produced from one ton of seed and average prices received (cards 68-71, Figure 3) are: 932 pounds of meal at $143.62 per ton of meal, 443 pounds of hulls at $39.26 per ton of hulls, and two cuts of linters--140 and 45 pounds at 7.3¢ and 8.8¢ per pound, respectively. The last card of the data set (card 72) has an E in column 1, which tells the computer: (1) the end of the revenue data has been reached; (2) total of the revenue generated by the products of the mill; and (3) return to the Main Program.

Variable Cost Data

The example mill variable cost data input cards are shown in Figure 4. Card 73 contains prices which are common to all cost centers. The first two variables indicate that electricity costs $.05 per kilowatt hour (cols. 8-10) and that the minimum monthly electricity charge is $70 (cols. 18-20), respectively. The next two variables are the cost of water: (1) $1.50 per 1,000 gallons of water used (cols. 27-30) and (2) $30 per month when the mill is not operating (cols. 38-40). Insurance costs $6.00 per $1,000-value on products in storage over the production year (cols. 49-50), and the repair cost is $3.65 per ton of seed processed (cols. 57-60). A more detailed description of these variables is shown in Appendix III, card 14.

The variable cost data must be placed in the data set by cost centers. Just as the fixed cost data needed 13 cost center titles, the variable cost data set must contain the same 13 cost center titles (Figure 4, cards 74, 79, 84, 87, 90, 95, 99, 102, 106, 110, 113, 116, and 119)

FIGURE 4. VARIABLE COST DATA

```
                     ELECTR    ELECTR     WATER      WATER       INSUR    VARIABLE
CARD NO.              RATE     MONTHLY     RATE      MONTHLY      RATE     REPAIR
73.                   .05       70.        1.50       30.          6.       3.65
                   10        20        30        40        50        60        70
          123456789-123456789-123456789-123456789-123456789-123456789-123456789-COL.NOS.


           TITLE(K,I)               TIME(K)
74.       OFFICE
                   10        20        30        40        50        60        70
          123456789-123456789-123456789-123456789-123456789-123456789-123456789-COL.NOS.


              PRICE
          ID   /UNIT        NUM1        NUM2        NUM3
75.       A      .25
76.       M     1.25
77.       M      .30
78.       E
                   10        20        30        40        50        60        70
          123456789-123456789-123456789-123456789-123456789-123456789-123456789-COL.NOS.

          DATA FOR EACH COST CENTER ENTERED BY FORMAT FOR CARDS 74-78


79.       UNLOADING                      .40
80.       L      250.        3.
81.       U                  1.
82.       T                 20.
83.       E
84.       SEED STORAGE                    3.
85.       L      250.        3.
86.       E
87.       CLEANING
88.       L      300.       1.5
89.       E
90.       DELINTERING
91.       L      275.        3.           3.
92.       L      350.        3.           3.          3.
93.       M        .3
94.       E
95.       BALING
96.       L      300.        1.           1.          1.
97.       B      2.45      140.          45.
98.       E
99.       HULLING-SEPARATION
100.      L      275.        1.
101.      E
102.      MEATS CONDITIONING
103.      L      275.        1.
104.      F      1.75        2.
105.      E
106.      EXTRACTION
107.      L      350.        3.           1.          1.
108.      L      250.        3.
109.      E
110.      OIL STORAGE                     1.
111.      L      250.        1.
112.      E
113.      MEAL STORAGE                    3.
114.      L      250.        .5
115.      E
116.      HULL STORAGE                    3.
117.      L      250.        .5
118.      E
119.      LINTER STORAGE                 .05
120.      L      200.        1.
121.      E
122.               10        20        30        40        50        60        70
123.      123456789-123456789-123456789-123456789-123456789-123456789-123456789-COL.NOS.
```

arranged in card deck in the same order. Each variable cost center must also have an end card (card 17, Appendix III and Figure 4, cards 78, 83, 86, 89, 94, 98, 101, 105, 109, 112, 115, 118, and 121).

On the title card for each cost center in the variable cost data set, a space is provided for a time variable (cols. 21-30). In the example data set, this time variable is .4 hour for the unloading cost center (card 79, cols. 28-30). This is the average time required to unload one truck which carries 20 tons of cottonseed (card 82). In the cottonseed storage cost center, the average hours per day over the production period which aeration motors were operated was 3 hours per day (card 84, cols. 29-30). In the product storage cost centers, the average time required to load products for shipment (in hours per day over the production period) is input data. An example is the average hours per day required to pump oil onto tank cars or tank trucks over the production period--1 hour per day (card 110, cols. 29-30).

Specific Variable Cost Item Data

Individual variable cost items within a cost center are inputted on data cards as shown on card 16, Appendix IV. In column 1 of these data cards (example: cards 75-77, Figure 4) is a control character which tells the computer what specific cost item data will be on that card. The list of individual items and their control character which can be included in a cost center are; lab analysis (A), bagging and ties (B), fuel (F), solvent (H), labor (L), miscellaneous (M), truck size (T), and number of unloading facilities (U). The following discussion of these individual items refers to data shown in Figure 4.

Lab Analysis (identified by "A" in column 1): The data needed to include the cost of lab analysis is shown on card 75. The cost of lab analysis in the example is $.25 per ton of cottonseed (cols. 8-10) and is placed in the OFFICE cost center.

Bagging and Ties (identified by "B" in column 1): The data required for including the cost of bagging and ties in the BALING cost center is shown on card 97: The cost of bagging and ties is $2.45 per pattern or per 600 pound bale. In the example, two linter cuts (140 lbs. and 45 lbs.) are produced and shown in columns 17-20 and 28-30, respectively.

Fuel (identified by "F" in column 1): The cost of fuel may be included in more than one cost center. However, the fuel in the example is boiler fuel and is only included in the meats preparation cost center (card 104). The average price paid for natural gas at the mill is $1.75 per thousand cubic feet (cols. 7-10). Natural gas used per ton of seed processed is 2 thousand cubic feet (cols. 19-20).

Solvent (identified by "H" in column 1): The example is a screwpress mill, and no solvent is needed. The method of inputting data for a mill using solvent extraction is much like the fuel cost data. In column 1, the control character "H" would be needed. The average price paid for solvent (hexane) would be placed in columns 2-10, and the average solvent loss per ton of seed processed would be placed in columns 11-20.

Labor (identified by "L" in column 1): More than one group or job classification of employees can be specified for a cost center (cards 91 and 92) due to different wage rates or time periods for which they are employed.

The labor cost data are inputted based on the weekly wage rate for the employee(s) including wages, overtime wages, and benefits--$250 per week (card 85, cols. 7-10). The labor data must also include the number of employees hired at this wage rate in this cost center--three employees are hired in SEED STORAGE during the processing period (card 85, cols. 19-20).

As previously stated, labor can be hired for three time periods which comprise the total year: processing, repair, and dormancy. The labor cost in the above example was hired only for the processing period. However, on card 91, delintering labor is hired for the processing and repair periods (cols. 19-20 and cols. 29-30, respectively). For some situations, not all the employees in a certain job classification will be hired for all three periods. In the example, extraction labor (card 107) has an average weekly wage rate of $350 (cols. 7-10) and pays three employees (cols. 19-20) when the mill is processing, but only one of these employees is hired during the repair period (cols. 29-30), and the employee is also paid during the dormant period (cols. 39-40). In the UNLOADING cost center, labor can be hired for the unloading period only and is entered as shown in card 80, columns 19-20.

Miscellaneous (identified by "M" in column 1): Miscellaneous costs may include any cost item not in this list of variable cost items. In the OFFICE cost center, the first miscellaneous cost item (card 76) represents a brokerage fee of $1.25 per ton of seed processed (cols. 7-10). The second miscellaneous cost (card 77) represents the cost of telephone, advertising, and dues ($.30) per ton of seed processed (cols. 8-10).

Average Truck Size (identified by "T" in column 1): To determine the amount of electrical usage in the UNLOADING cost center, the average size of trucks transporting cottonseed to the mill must be entered in the data set. For the example mill, the average size is 20 tons of cottonseed per truck and is entered on card 82, columns 18-20.

Unloading Facilities (identified by "U" in column 1): The number of unloading facilities the mill has is also an essential variable for determining electricity costs in the UNLOADING cost center. The example mill has one unloading facility (cols. 19-20, card 81).

Computer Output

This section presents the computer output of the cottonseed oil mill simulation model with references to the computer printout shown in Appendix VII using the example mill input data set shown in Figures 2, 3, and 4. The computer output in Appendix VII has been labeled as Sections A-K for purposes of description.

Section A, Cottonseed Oil Mill Description, identifies and describes the example mill and is derived in part from the control card information. The computer writes the appropriate area (South), extraction technology (Screwpress) of the mill, daily cottonseed processing rate in tons (100 TPD), the number of days processing (330 days), and the number of days for repairs (35 days) at the 100% capacity utilization level.

The fixed costs by item, by cost center, and total for the mill are in Section B. The appropriate component costs for each item are developed and summed as shown in the ANNUAL COST column. An example of a depreciable insurable and taxable fixed cost item is BUILDING in the first cost center, OFFICE. The total fixed cost of the building is the sum of the depreciation ($904.50), plus interest ($3,197.24), plus fixed repair ($402.00), plus taxes ($562.80), plus insurance ($241.20) for a total annual cost of $5307.73. For a non-depreciable item, only interest cost and the yearly cost of the item (NON-DEPRECIABLE COST) are the component costs. An example of this type of cost is the salary of the MILL MANAGER in the cost center OFFICE where the interest cost ($1,874.99) plus the non-depreciable cost (25,000.00) results in an annual cost of $26,874.99.

The component costs for each fixed cost item and the total fixed cost are totaled for each mill cost center. Using the OFFICE cost center as an example, these costs are shown reading across the page from TOTAL COSTS at the end of the cost center. The total depreciation ($904.50), interest ($19,034.64), fixed repair ($402.00), taxes ($632.80), insurance ($241.20), and the non-depreciable costs ($204,500.00) when totaled equal the total annual fixed cost of the OFFICE cost center. The last line of Section B is the annual cost for each component and shows the total fixed annual cost of ($783,309.31) for the example mill.

In Section C, the revenue generated by each product at 100% capacity utilization is shown (example: oil sales equal $2,958.986.00). The individual products are totaled to show the total revenue of the mill ($5,921,583.00) at the 100% capacity.

Section D of the computer output shows the total variable cost by item by cost center for each level of capacity utilization from 100% to 10%. The first three lines show the capacity utilization level in percent, the number of tons of seed processed at each utilization level, and the number of processing days at each utilization level.

In the COTTONSEED BUY cost center, the average price paid for cottonseed (plus transportation), the number of tons of cottonseed processed at each capacity utilization level, and the short term interest rate are used to determine the seed cost (e.g., $3,923,039.00 at 100% utilization), the interest cost ($266,014.00 at 100% utilization), and the total cost ($4,189,053.00) of acquiring and transporting cottonseed to the mill. The remaining parts of Section D are the variable costs by cost centers. The variable costs of these 13 cost centers are reported by cost item (labor, electricity, repairs, etc., included in the cost center) by cost center. The variable costs are totaled for the cost center (e.g., $59,442.00 at 100% utilization in cost center OFFICE); an interest expense calculated ($620.00); and the interest cost added to the total variable costs ($60,062). Average variable costs by item by cost center are reported in Section E similar to the associated total variable costs in Section D.

Section F of the computer output shows the cost per ton of cottonseed processed for the ten variable resources which may be included in a mill input data set. These are the total costs for all cost centers at each level of capacity utilization. The example mill is a screwpress mill and does not include a solvent extraction processing step. Therefore, the cost of solvent per ton is zero at all utilization levels.

The next three sections (G, H, and I) summarize the previously developed cost information into matrices of average costs by cost center at each level of capacity utilization. Section G reports the average fixed costs (e.g., $6.84 per ton of seed processed in the OFFICE cost center at 100% utilization); Section H shows the average variable cost (e.g., $1.82 per ton of seed in the OFFICE cost center); and Section I shows average total cost ($8.66 per ton of seed in the OFFICE cost center), which is average fixed plus average variable costs.

The last two sections (J and K) report the total and average cost and returns respectively from processing cottonseed in the example mill situation. The costs and returns are developed at each level of capacity utilization with the exception of total fixed cost ($783,309), which are by definition the same at all levels of utilization.

In Section J, the total cost at each level of capacity utilization is total fixed cost plus total variable cost for each utilization level. Total net revenue is the total revenue less total cost at each level of capacity utilization.

## LIMITATIONS

The cottonseed oil mill simulation model was developed with the goal of maintaining enough flexibility in the computer program to accurately estimate costs and returns under varying processing capacities, extraction technologies, mill designs, and regions. To maintain this flexibility, a large number of variables are required to be supplied to the program. Therefore, knowledge of cottonseed oil mills is required to effectively utilize the model. This large data requirement is the major limitation to the computer model. Unless the user(s) has a good working knowledge of cottonseed oil mills and oil mill practices, this type of simulation may prove to be very difficult. However, with reliable input data, the flexibility and detail possible with this type of model will produce accurate estimates of costs and returns. Also, once a data set has been developed, changes in price levels, product relationships, or resources required become relatively easy.

The other major limitation of the model is the use of annual average products produced—this does not allow for changes in products due to the grade basis of the cottonseed processed—and annual average product prices, which does not allow for varying market prices during the processing year. However, changing these variables for alternative computer runs can be accomplished with relative ease.

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## Appendix I

## Computer Program Variable Names and Explanations

MAIN PROGRAM

| Variable | Explanation |
|---|---|
| ABP | Average borrowing period of short term capital (in weeks) |
| AC(K,J) | Average total cost of cost center K at capacity utilization level J ($/ton) |
| ACC(J) | Average cost of cottonseed (plus transportation) at capacity utilization level J ($/ton) |
| ACI(J) | Average cost of cottonseed (plus transportation) plus interest cost at capacity utilization level J ($/ton) |
| AFC(J) | Average fixed cost at capacity utilization level J ($/ton) |
| AIC(J) | Average interest on operating capital on purchases of cottonseed at capacity utilization level J ($/ton) |
| AIOC(K,J) | Average interest on operating capital of cost center K at capacity utilization level J ($/ton) |
| ANR(J) | Average net revenue of the mill at capacity utilization level J ($/ton) |
| APFC(K,J) | Average fixed cost of cost center K at capacity utilization level J ($/ton) |
| APSC(K,J) | Average variable cost of cost center K at capacity utilization level J ($/ton) |
| AREV(J) | Average revenue of the mill at capacity utilization level J ($/ton) |
| ATC(J) | Average total cost of the mill at capacity utilization level J ($/ton) |
| AVC(J) | Average variable cost of the mill at capacity utilization level J ($/ton) |
| AVCA(K,J) | Average variable cost of lab analysis of cost center K at capacity utilization level J ($/ton) |
| AVCB(K,J) | Average variable cost of bagging and ties of cost center K at capacity utilization level J ($/ton) |
| AVCE(K,J) | Average variable cost of electricity of cost center K at capacity utilization level J ($/ton) |
| AVCF(K,J) | Average variable cost of fuel of cost center K at capacity utilization level J ($/ton) |

| Variable | Explanation |
| --- | --- |
| AVCH(K,J) | Average variable cost of solvent of cost center K at capacity utilization level J ($/ton) |
| AVCI(K,J) | Average variable cost of product insurance of cost center K at capacity utilization level J ($/ton) |
| AVCL(K,J) | Average variable cost of labor of cost center K at capacity utilization level J ($/ton) |
| AVCM(K,J) | Average variable cost of miscellaneous items of cost center K at capacity utilization level J ($/ton) |
| AVCR(K,J) | Average variable cost of repairs of cost center K at capacity utilization level J ($/ton) |
| AVCW(K,J) | Average variable cost of water of cost center K at capacity utilization level J ($/ton) |
| CAP(J) | Capacity of plant in tons (processed) per year at capacity utilization level J (tons) |
| CL(J) | Capacity utilization level J (percent) |
| CPP | Capacity of plant in tons crushed per day (average at 100% capacity utilization) |
| CU | Capacity utilization level as a fraction of mill capacity |
| DAYD | No. of days down for repairs between seasons at 100% capacity utilization |
| DAYP | No. of days processing at 100% capacity utilization |
| DAYU | No. of days unloading at 100% capacity utilization |
| DD(J) | Days down for repairs between seasons at capacity utilization level J |
| DF(J) | Days dormant plus days down for major repairs during the year at capacity utilization level J |
| DP(J) | No. of days processing at capacity utilization level J |
| DU(J) | No. of days unloading at capacity utilization level J |
| ELER | Average electricity charge in $ per kilowatt hour ($/KWH) |
| ELEM | Average monthly electricity charge when the mill is not processing (dollars) |
| HRS(K,J) | Operating hours of machinery in unloading or storage cost center K at capacity utilization level J |

| Variable | | Explanation |
|---|---|---|
| ICC(J) | | Total interest on operating capital used in the purchase of cottonseed at capacity utilization level J ($) |
| IOC(K,J) | | Interest on operating capital of cost center K at capacity utilization level J |
| J | | No. of capacity utilization levels calculated |
| K | | No. of cost centers of the mill |
| M | | No. of cost centers which are actual processing steps in the mill |
| N(1) | | Area 1=Southeast 2=Southwest 3=West |
| N(2) | | Extraction technology 1=screwpress 2=direct solvent 3=prepress solvent |
| N(3) | 1=Yes 0=No | Is office included as a cost center? |
| N(4) | 1=Yes 0=No | Is unloading included as a cost center? |
| N(5) | 1=Yes 0=No | Is cottonseed storage included as a cost center? |
| N(6) | | No. of mill processing steps (from cleaning-extraction) |
| N(7) | 1=Yes 0=No | Is oil storage included as a cost center? |
| N(8) | 1=Yes 0=No | Is meal storage included as a cost center? |
| N(9) | 1=Yes 0=No | Is hull storage included as a cost center? |
| N(10) | 1=Yes 0=No | Is linter storage included as a cost center? |
| N(11) | 1=Yes 0=No | Control variable to print total variable cost by item by cost center |
| N(12) | 1=Yes 0=No | Control variable to print average variable cost by item by cost center |
| N(13) | 1=Yes 0=No | Control variable to print average cost of the variable inputs labor, electricity, repairs, lab analysis, bagging and ties, fuel, miscellaneous, solvent, insurance, and water |

| Variable | Explanation |
|---|---|
| N(I) | Vector of control variables (I=1, . . . ,13) |
| NPD(J) | No. of days the plant does not process seed during the processing year at capacity utilization level J |
| PC(K,J) | Total cost of cost center K at capacity utilization level J |
| PCS | Average price paid per ton for cottonseed including transportation (in $) |
| PFC(K) | Cost center K fixed cost ($) |
| PREP(K) | Fraction of repairs charged to cost center K |
| R | Interest rate on long term capital borrowings (decimal point value) |
| RS | Interest rate on short term capital borrowings (decimal point value) |
| TC(J) | Total cost of the mill at capacity utilization level J ($) |
| TCAP | Total capacity of mill at 100% capacity utilization level (tons) |
| TCC(J) | Total cost of cottonseed at capacity utilization level J (less interest cost) ($) |
| TCI(J) | Total cost of cottonseed at capacity utilization level J (includes interest on operating capital) ($) |
| TCWT(J) | Total cost of water for the mill at capacity utilization level J ($) |
| TITLE(K,I) | Title of cost center K |
| TMR | Total mill repair cost per ton of seed processed ($/ton) |
| TNR(J) | Total net revenue of the mill at capacity utilization level J ($) |
| TPC(K,J) | Total variable cost of cost center K (less interest on operating capital) at capacity utilization level J ($) |
| TPSC(K,J) | Total variable cost of cost center K at capacity utilization level J (includes interest on operating capital) ($) |
| TPSI | Time period (as a fraction of a year) for determining interest on short term capital |

| Variable | Explanation |
| --- | --- |
| TREV(J) | Total revenue of the mill at capacity utilization level J ($) |
| TVC(J) | Total variable cost of the mill at capacity utilization level J ($) |
| TVCA(J) | Variable cost of lab analysis for the mill per ton of seed processed at capacity utilization level J ($) |
| TVCB(J) | Variable cost of bagging and ties for the mill per ton of seed processed at capacity utilization level J ($) |
| TVCE(J) | Variable cost of electricity for the mill per ton of seed processed at capacity utilization level J ($) |
| TVCF(J) | Variable cost of fuel for the mill per ton of seed processed at capacity utilization level J ($) |
| TVCH(J) | Variable cost of solvent for the mill per ton of seed processed at capacity utilization level J ($) |
| TVCI(J) | Variable cost of product insurance for the mill per ton of seed processed at capacity utilization level J ($) |
| TVCM(J) | Variable cost of miscellaneous items for the mill per ton of seed processed at capacity utilization level J ($) |
| TVCR(J) | Variable cost of repairs for the mill per ton of seed processed at capacity utilization level J ($) |
| TVCW(J) | Variable cost of water for the mill per ton of seed processed at capacity utilization level J ($) |
| VCA(K,J) | Variable cost of lab analysis in cost center K at capacity utilization level J ($) |
| VCB(K,J) | Variable cost of bagging and ties in cost center K at capacity utilization level J ($) |
| VCE(K,J) | Variable cost of electricity in cost center K at capacity utilization level J ($) |
| VCF(K,J) | Variable cost of fuel in cost center K at capacity utilization level J ($) |
| VCH(K,J) | Variable cost of hexane in cost center K at capacity utilization level J ($) |
| VCI(K,J) | Variable cost of product insurance in cost center K at capacity utilization level J ($) |

| Variable | Explanation |
| --- | --- |
| VCL(K,J) | Variable cost of labor in cost center K at capacity utilization level J ($) |
| VCM(K,J) | Variable miscellaneous cost in cost center K at capacity utilization level J ($) |
| VCR(K,J) | Variable cost of repairs in cost center K at capacity utilization level J ($) |
| VCW(K,J) | Variable cost of water in cost center K at capacity utilization level J ($) |
| VINR | Product insurance rates ($/$1,000 value) |
| WTRR | Average water rate ($/1,000 gal.) |
| WTRM | Average water rate per month charge when mill is not processing ($) |

## SUBROUTINE FIX(TFC)

| Variable | Explanation |
|---|---|
| AEC | Annual equivalency cost of the fixed cost item ($) |
| AEC1 | Annual equivalency cost of a depreciable fixed cost item ($) |
| CHP | Connected horsepower of the machinery item (horsepower) |
| DEP1 | Annual depreciation cost of the fixed cost item ($) |
| FOB | F.O.B. cost of the depreciable items or installed cost of the depreciable items or annual cost of the non-depreciable items ($) |
| FOB1 | Cost of the depreciable fixed cost items including the installation when installation is included as a fraction of FOB ($) |
| ID | Identification for depreciable, non-depreciable, land, or cost center title cards |
| INSR | Insurance rate for fixed cost items which are insurable ($/$1,000 value) |
| INS | Annual insruance expense associated with the fixed cost item ($) |
| INST | Installation cost as a fraction of F.O.B. cost of the fixed cost item |
| INT | Annual interest expense associated with the fixed cost item ($) |
| NAME(I) | Name of cost center or a fixed cost item |
| NUM | Number of the fixed cost item needed |
| PFC(K) | Total fixed cost of cost center K |
| REP | Fixed repair rate (as a fraction of the F.O.B. cost) |
| REP1 | Annual fixed repair cost associated with the fixed cost item ($) |
| SAL | Salvage value (as a fraction of the F.O.B. cost of the depreciable item) |
| SAL1 | Salvage value of the fixed cost item ($) |
| TAX | Annual property tax associated with the fixed cost item ($) |

| Variable | Explanation |
|---|---|
| TAXR | Property tax rate for fixed cost items which are taxable ($/100 value) |
| TCH1 | Total connected horsepower of all machinery and equipment of the mill |
| TCHP(K) | Total connected horsepower of the machinery and equipment in cost center K |
| TDE1 | Total depreciation of all fixed cost items in the mill ($) |
| TDEP(K) | Total depreciation of fixed cost items in cost center K ($) |
| TFC | Total fixed cost of the entire mill ($) |
| TIN1 | Total interest of all fixed cost items in the mill ($) |
| TINS(K) | Total insurance cost of fixed cost items in cost center K ($) |
| TINT(K) | Total interest of fixed cost items in cost center K ($) |
| TIS1 | Total insurance cost of fixed cost items in the mill ($) |
| TNDC | Total non-depreciable fixed cost of the mill ($) |
| TND(K) | Total non-depreciable fixed cost in cost center K ($) |
| TREP(K) | Total fixed repair cost of cost center K ($) |
| TRP1 | Total fixed repair cost of the mill ($) |
| TTAX(K) | Total tax cost of items within cost center K ($) |
| TTX1 | Total tax cost of all items within the mill ($) |
| TWT1 | Total water cost of the mill ($) |
| TWTR(K) | Total water cost of cost center K ($) |
| WTR | Water requirements of the item (1,000 gals./day) |
| YRS | Years of useful life of the depreciable assets |

SUBROUTINE NR(TR)

| Variable | Explanation |
|---|---|
| ID | Identification of the type of revenue generated |
| NUM | Number of pounds of the output product item produced per ton of seed processed |
| PR | Expected average price per unit for which the product will be sold over the year |
| REVH | Total revenue generated by the sale of hulls during the year (at 100% capacity utilization) ($) |
| REVL | Revenue generated by the sale of one type of linters during the year (at 100% capacity utilization) ($) |
| REVM | Total revenue generated by the sale of meal during the year (at 100% capacity utilization) ($) |
| REVO | Total revenue generated by the sale of oil during the year (at 100% capacity utilization) ($) |
| TRL | Total revenue generated by the sale of all cuts of linters during the year (at 100% capacity utilization) ($) |
| TR | Total revenue generated by sale of all products (at 100% capacity utilization) ($) |

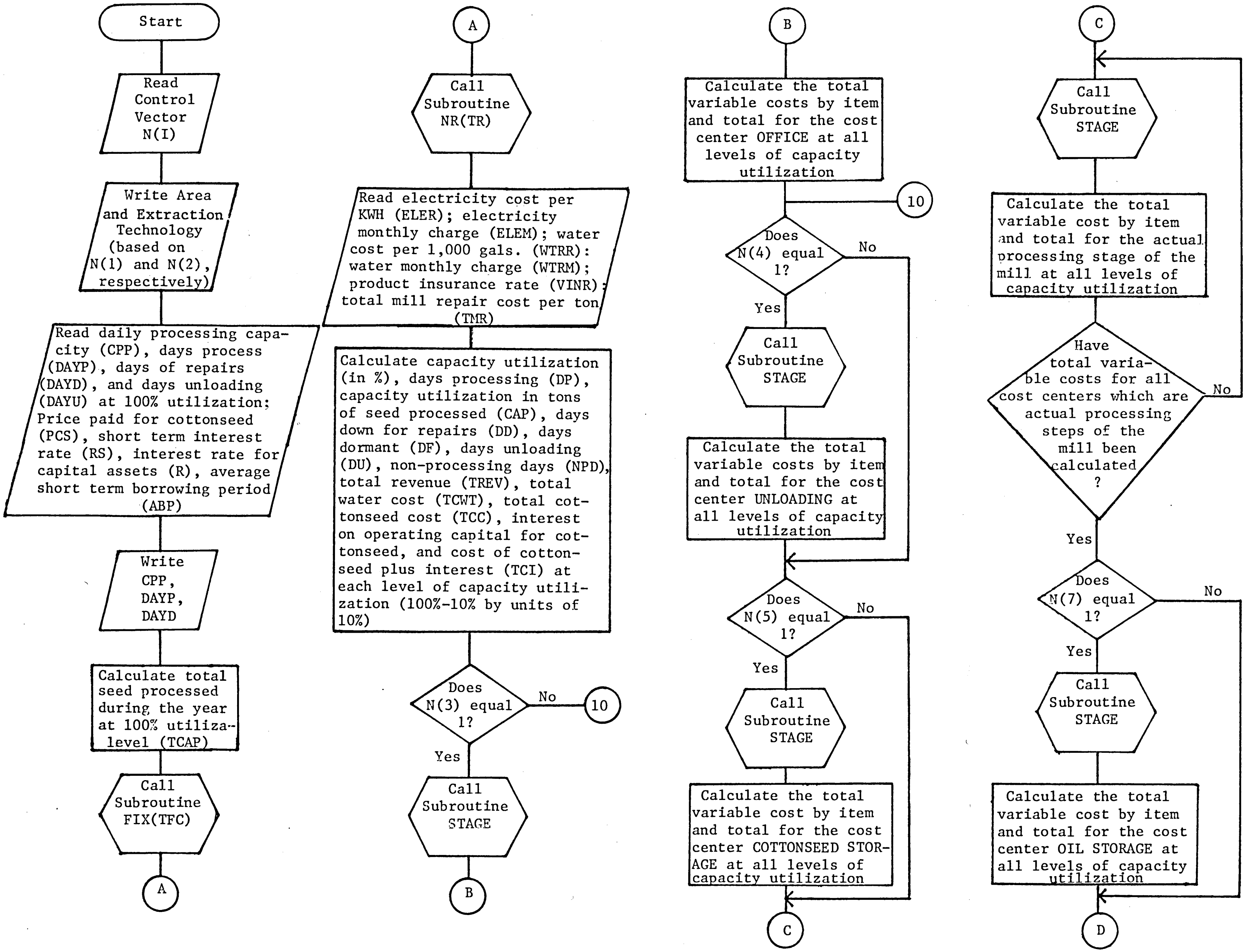
## SUBROUTINE STAGE

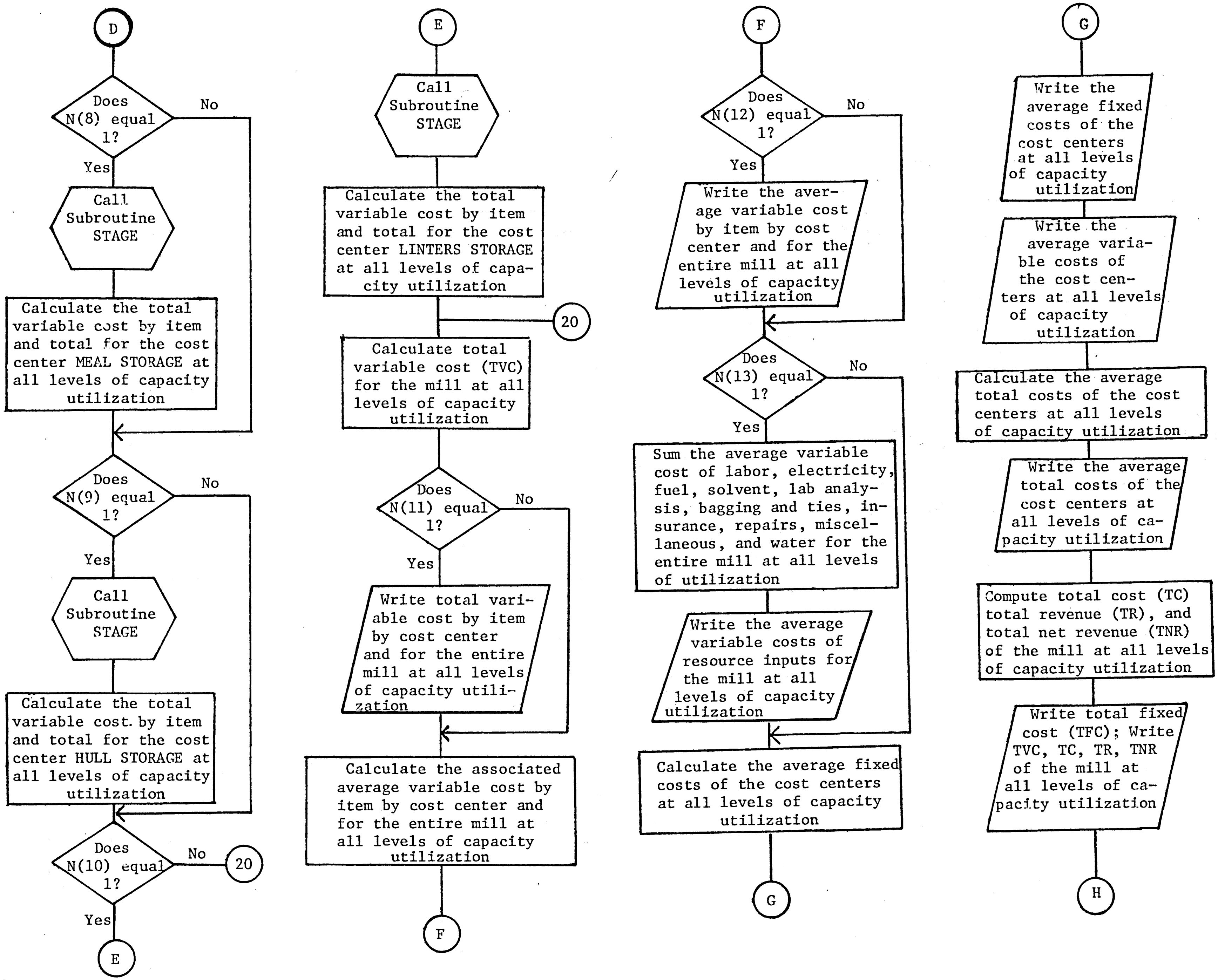
| Variable | Explanation |
| --- | --- |
| DLAB(K) | Labor cost of cost center K when the mill is not operating i.e., down for repairs ($) |
| DLBC | Labor cost of one group of workers within a cost center when the mill is not operating i.e., down for repairs ($) |
| ID | Identification of the variable input item |
| NUM1 | Number of variable cost item used during processing period |
| NUM2 | Number of variable cost item used during repair period |
| NUM3 | Number of variable cost item used during dormant period |
| PLAB(K) | Labor cost of cost center K when the mill is processing ($) |
| PLBC | Labor cost of one group of workers within a cost center when the mill is processing ($) |
| PREP(K) | Fraction of total variable repair cost charged to a cost center K |
| PR | Price of variable input item |
| RLAB(K) | Labor cost of cost center K during period of repairs between seasons ($) |
| RLBC | Labor cost of one group of workers within a cost center during period of repairs between seasons ($) |
| TANL(K) | Total lab analysis cost of cost center K ($) |
| TBAG(K) | Total bagging and ties cost of cost center K ($) |
| TFUEL(K) | Total fuel cost of cost center K ($) |
| THEX(K) | Total hexane cost of cost center K ($) |
| TIME(K) | Time variable for determining electricity usage in cost center K |
| TITLE(K,I) | Title of cost center K |
| TMIS(K) | Total miscellaneous cost of cost center K ($) |
| TRK | Average capacity of trucks which unload cottonseed at mill unloading cost center (tons/truck) |
| UF | No. of unloading facilities of the mill |

## Appendix II

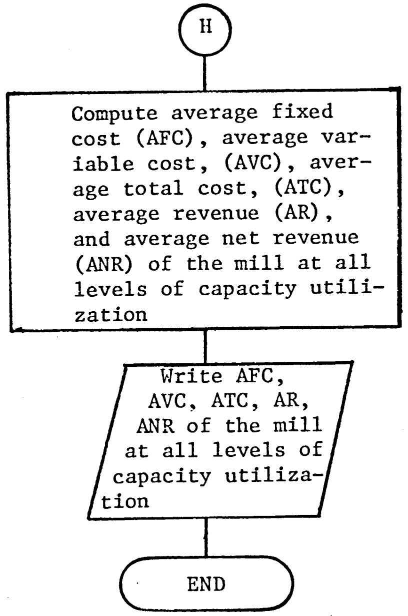
## Main Program and Subroutines Flow Diagrams

MAIN PROGRAM

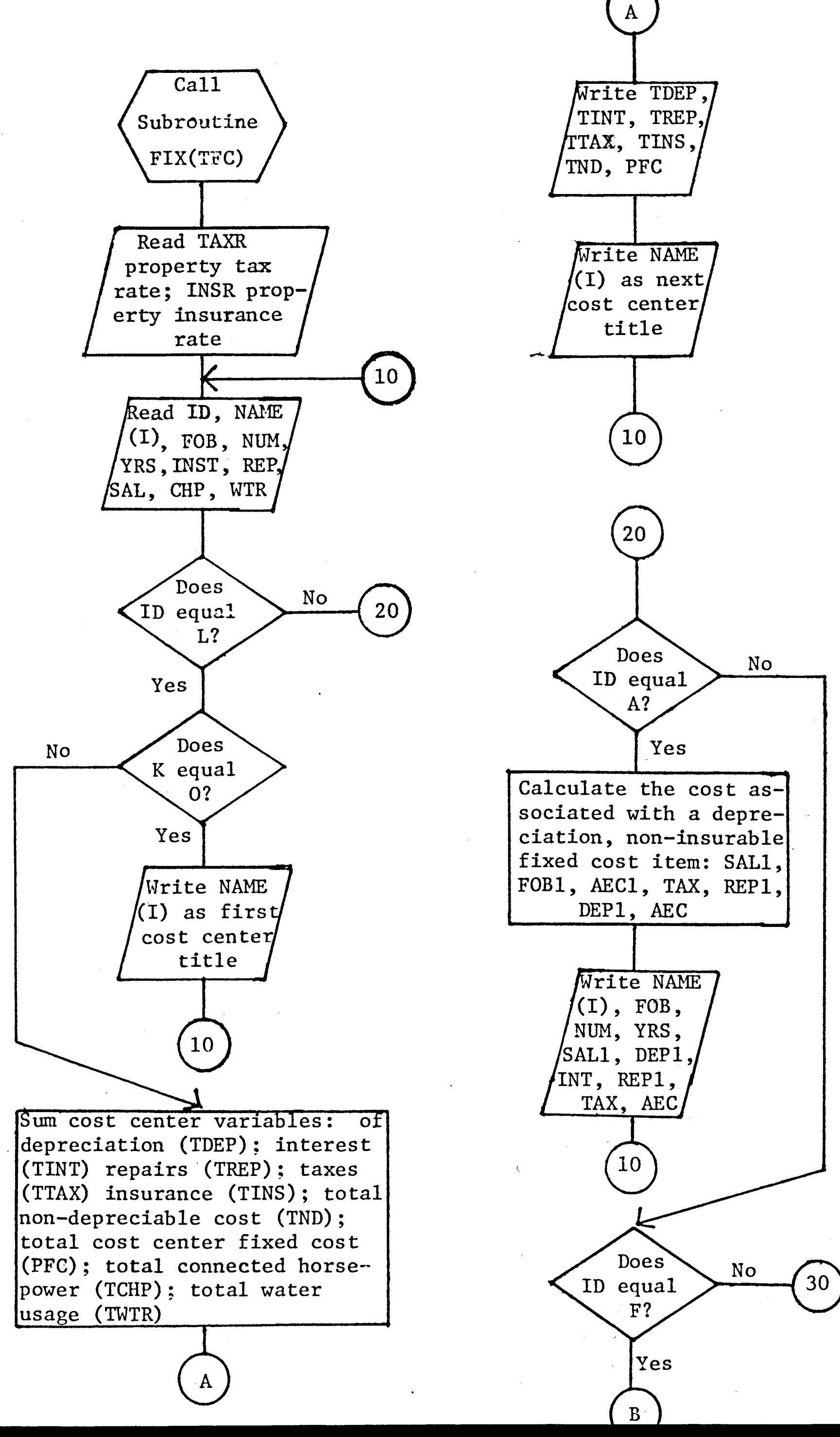




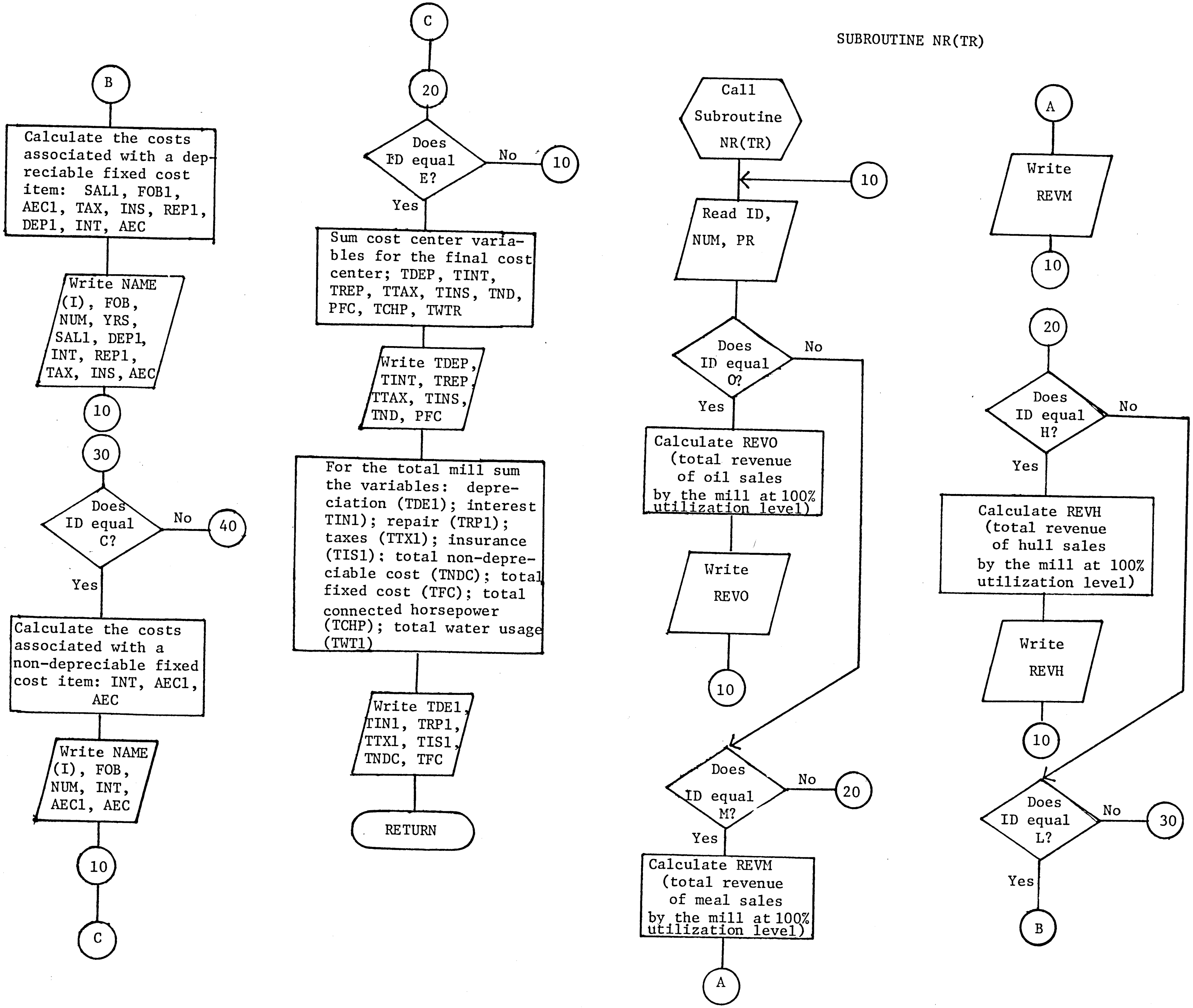
D
Does N(8) equal 1?
No
Yes
Call Subroutine STAGE
Calculate the total variable cost by item and total for the cost center MEAL STORAGE at all levels of capacity utilization
Does N(9) equal 1?
No
Yes
Call Subroutine STAGE
Calculate the total variable cost by item and total for the cost center HULL STORAGE at all levels of capacity utilization
Does N(10) equal 1?
No
20
Yes
E
E
Call Subroutine STAGE
Calculate the total variable cost by item and total for the cost center LINTERS STORAGE at all levels of capacity utilization
20
Calculate total variable cost (TVC) for the mill at all levels of capacity utilization
Does N(11) equal 1?
No
Yes
Write total variable cost by item by cost center and for the entire mill at all levels of capacity utilization
Calculate the associated average variable cost by item by cost center and for the entire mill at all levels of capacity utilization
F
F
Does N(12) equal 1?
No
Yes
Write the average variable cost by item by cost center and for the entire mill at all levels of capacity utilization
Does N(13) equal 1?
No
Yes
Sum the average variable cost of labor, electricity, fuel, solvent, lab analysis, bagging and ties, insurance, repairs, miscellaneous, and water for the entire mill at all levels of utilization
Write the average variable costs of resource inputs for the mill at all levels of capacity utilization
Calculate the average fixed costs of the cost centers at all levels of capacity utilization
G
G
Write the average fixed costs of the cost centers at all levels of capacity utilization
Write the average variable costs of the cost centers at all levels of capacity utilization
Calculate the average total costs of the cost centers at all levels of capacity utilization
Write the average total costs of the cost centers at all levels of capacity utilization
Compute total cost (TC) total revenue (TR), and total net revenue (TNR) of the mill at all levels of capacity utilization
Write total fixed cost (TFC); Write TVC, TC, TR, TNR of the mill at all levels of capacity utilization
H



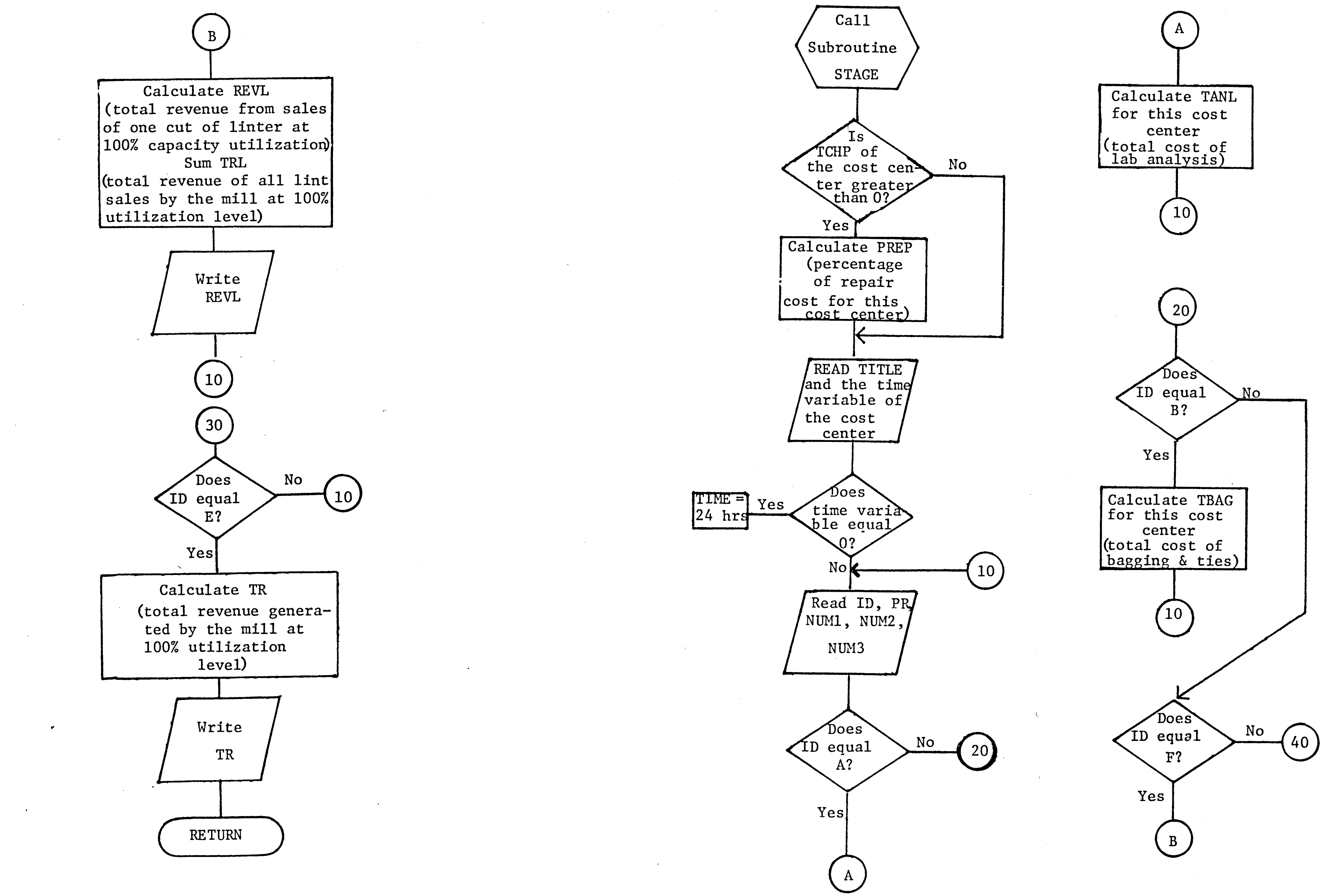

Subroutine FIX(TFC)

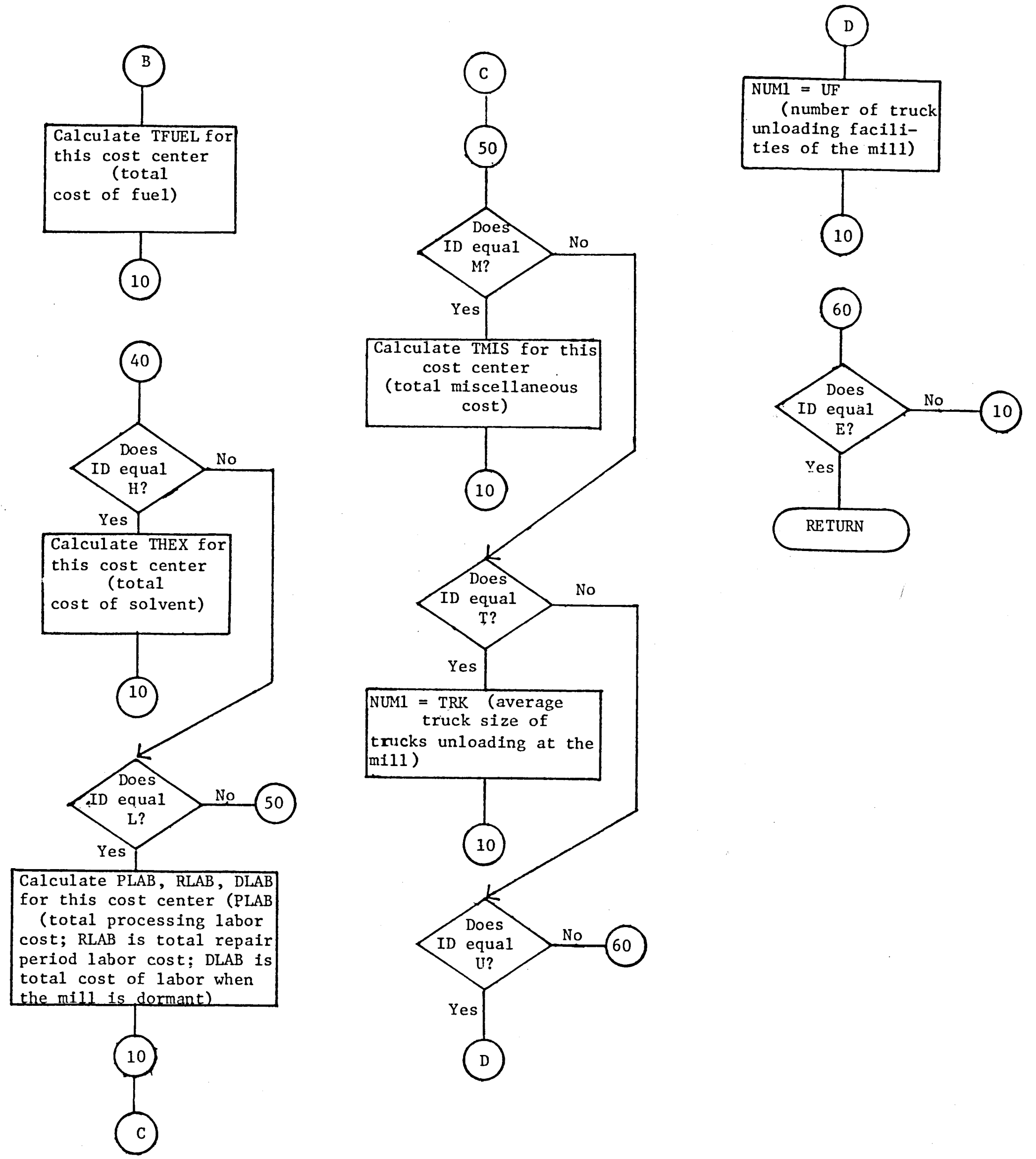


SUBROUTINE NR(TR)



SUBROUTINE STAGE




B
Calculate TFUEL for this cost center (total cost of fuel)
10
40
Does ID equal H?
No
Yes
Calculate THEX for this cost center (total cost of solvent)
10
Does ID equal L?
No
50
Yes
Calculate PLAB, RLAB, DLAB for this cost center (PLAB (total processing labor cost; RLAB is total repair period labor cost; DLAB is total cost of labor when the mill is dormant)
10
C
C
50
Does ID equal M?
No
Yes
Calculate TMIS for this cost center (total miscellaneous cost)
10
Does ID equal T?
No
Yes
NUM1 = TRK (average truck size of trucks unloading at the mill)
10
Does ID equal U?
No
60
Yes
D
D
NUM1 = UF (number of truck unloading facilities of the mill)
10
60
Does ID equal E?
No
10
Yes
RETURN

APPENDIX III

Input Variable Names,
Explanations, and Card Format

Input Variable Names, Explanation and Card Format

## Control Card

| Card No.[1] | Column | Variable | | Explanation |
|---|---|---|---|---|
| 1 | 1 | N(1) | 1=South<br>2=Southwest<br>3=West | Geographic area of the United States |
| 1 | 2 | N(2) | 1=Screwpress<br>2=Direct Solvent<br>3=Prepress Solvent | Extraction technology |
| 1 | 3 | N(3) | 1=Yes<br>0=No | Is office included as a cost center? |
| 1 | 4 | N(4) | 1=Yes<br>0=No | Is unloading included as a cost center? |
| 1 | 5 | N(5) | 1=Yes<br>0=No | Is seed storage included as a cost center? |
| 1 | 6-8 | N(6) | | No. of mill processing steps included as cost centers |
| 1 | 9 | N(7) | 1=Yes<br>0=No | Is oil storage included as a cost center? |
| 1 | 10 | N(8) | 1=Yes<br>0=No | Is meal storage included as a cost center? |
| 1 | 11 | N(9) | 1=Yes<br>0=No | Is hull storage included as a cost center? |
| 1 | 12 | N(10) | 1=Yes<br>0=No | Is linter storage included as a cost center? |
| 1 | 15 | N(11) | 1=Yes<br>0=No | Print total variable cost by item by cost center? |
| 1 | 18 | N(12) | 1=Yes<br>0=No | Print average variable cost by item by cost center? |
| 1 | 21 | N(13) | 1=Yes<br>0=No | Print variable costs at each utilization level for labor, electricity, repairs, fuel, lab analysis, bagging and ties, fuel miscellaneous, solvent, product insurance, and water per ton of seed processed for mill? |

[1] Card number references are to input data card arrangements shown in Appendix IV. Many cards or card sets are repeated.

## General Data

| Card No. | Column | Variable | Explanation |
|---|---|---|---|
| 2 | 1-5 | CPP | Capacity of plant (tons/day) |
| 2 | 6-10 | DAYP | Days processing (at 100% utilization) |
| 2 | 11-15 | DAYD | Days down for repairs between seasons (at 100% utilization) |
| 2 | 16-20 | DAYU | Days of the cottonseed receiving and unloading period |
| 2 | 21-30 | PCS | Price paid for cottonseed including transportation ($/ton) |
| 2 | 31-35 | RS | Short term interest rate (example: 15 percent = .15) |
| 2 | 36-40 | R | Long term interest rate (example: 10 percent = .1) |
| 2 | 41-45 | ABP | Average period of short term borrowing ( weeks) |

## Fixed Cost Information Used in Subroutine FIX(TFC)

| Card No. | Column | Variable | Explanation |
|---|---|---|---|
| 3 | 1-5 | TAXR | Property tax rate in $/$100 valuation (example: $1.40/ $100 value = 1.4) |
| 3 | 6-10 | INSR | Insurance rate on capital asset items in $/$1000 value (example: $6/$1000 value = 6) |
| 4 | 1 | ID | Identification (must enter L ) |
| 4 | 2-21 LJ* | NAME(I) | Cost center name (example: OFFICE) |
| 5 | 1 | ID | Identification (must enter A) |
| 5 | 2-21 LJ | NAME(I) | Name of non-insurable asset (example: LAND) |

* LJ means the input item is left-hand justified. The remaining variables are right-hand justified. All format specifications are for whole numbers, therefore,a decimal must be punched whenever the value of a variable is not a whole number.

| Card No. | Column | Variable | Explanation |
| --- | --- | --- | --- |
| 5 | 22-30 | FOB | Cost per unit of the fixed cost item |
| 5 | 31-35 | NUM | No. of units of the fixed cost items needed |
| 5 | 36-38 | YRS | Years of useful life |
| 5 | 39-43 | INST | Installation cost of the item (as a fraction of the F.O.B. cost) |
| 5 | 44-47 | REP | Fixed repair cost of the item (as a fraction of the F.O.B. cost) |
| 5 | 48-51 | SAL | Salvage value of the fixed cost item (as a fraction of the F.O.B. cost) |
| 5 | 52-55 | CHP | Connected horsepower of the total amount of equipment (not connected horsepower of one machine but the total connected of all machines specified) |
| 5 | 56-63 | WTR | Water usage of the fixed cost items (in 1000 gals.; total water usage of all machines specified) |
| 6 | 1 | ID | Identification (must enter F) |
| 6 | 2-21 LJ | NAME(I) | Name of the depreciable insurable fixed cost item (example: BUILDING) |
| 6 | 22-30 | FOB | F.O.B. cost of the depreciable item per unit (may include or exclude installation cost) |
| 6 | 31-35 | NUM | No. of units of the fixed cost items needed |
| 6 | 36-38 | YRS | Years of useful life |
| 6 | 39-43 | INST | Installation cost of the item (as a fraction of the F.O.B. cost) |
| 6 | 44-47 | REP | Fixed repair rate for the item (as a fraction of the F.O.B. cost) |

| Card No. | Column | Variable | Explanation |
|---|---|---|---|
| 6 | 48-51 | SAL | Salvage value of the fixed cost item (as a fraction of F.O.B. cost) |
| 6 | 52-55 | CHP | Connected horsepower of the total amount of equipment (not connected horsepower of one machine but the total connected of all machines specified) |
| 6 | 56-63 | WTR | Water usage of the fixed cost items (in 1000 gals.), (complete water usage of all machines specified) |
| 7 | 1 | ID | Identification (must enter C) |
| 7 | 2-21 LJ | NAME(I) | Name of the non-depreciable non-insurable fixed cost item (example: MILL MANAGER) |
| 7 | 22-30 | FOB | Cost per unit of the item during a one year period |
| 7 | 31-35 | NUM | No. of units of the fixed cost items needed |
| 8 | 1-3 | END | Must enter END (to show the end of the fixed cost data) |

## Information Used in Subroutine NR(TR)

### Product and Revenue

| Card No. | Column | Variable | Explanation |
|---|---|---|---|
| 9 | 1 | ID** | Identification |
| 9 | 2-10 | NUM | Number of pounds of product produced from one ton of cottonseed |
| 9 | 11-20 | PR | Average per unit price expected for the product: oil in $/lb.<br>meal in $/ton<br>hulls in $/ton<br>linters in $/lb. |

** Must have a card for each product produced.

| Card No. | Column | Variable | Explanation |
|---|---|---|---|
| 9 | If ID = O, the product is oil; | | |
| 10 | If ID = M, the product is meal; | | |
| 11 | If ID = H, the product is hulls; | | |
| 12 | If ID = L, the product is linters. | | |
| 13 | 1 | E | Must enter E (to show the end of the revenue data) |

Variable Costs Information Used in

Both the Main Program and Subroutine Stage

| Card No. | Column | Variable | Explanation |
|---|---|---|---|
| 14 | 1-10 | ELER | Average price paid for electricity in $/Kwh (example: $.05/KWH = .05) |
| 14 | 11-20 | ELEM | Average monthly charge for electricity when the mill is not processing ($) |
| 14 | 21-30 | WTRR | Average price paid for water in $/1,000 gals. (example: $1.50/1,000 gals. = 1.5) |
| 14 | 31-40 | WTRM | Average monthly charge for water when the mill is not operating ($) |
| 14 | 41-50 | VINR | Product insurance rate for products and cottonseed in $/$1,000-value (example: $6/$1,000-value = 6) |
| 14 | 51-60 | TMR | Total cost of mill repairs expected in the processing year (dollars/ton of seed processed) |
| 15 | 1-20 LJ | TITLE(K,J) | Title of the cost center |
| 15 | 21-30 | TIME(K) | Average hours per day machinery in the cost center will operate (hours). Hours to unload one truck in the unloading cost center. Default value is 24. |
| 16 | 1 | ID | Type of variable cost item (see explanation below) |
| 16 | 2-10 | PR | Price per unit of the variable input item |

| Card No. | Column | Variable | Explanation |
|---|---|---|---|
| 16 | 11-20 | NUM1 | Number needed of the variable input item as explained below |
| 16 | 21-30 | NUM2 | Number needed of the variable input item as explained below |
| 16 | 31-40 | NUM3 | Number needed of the variable input item as explained below |
| 17 | 1 | E | Must enter E (to show the end of the cost center data) |

If ID = A, the variable input item is lab analysis. The total cost of lab analysis is based on the amount of seed processed: therefore, only the cost per ton of seed processed is needed as data and is entered as PR in cols. 2-10.

If ID = B, the variable input item is bagging and ties. The cost per pattern of bagging and ties is placed in cols. 2-10. The amount of linters produced (in lbs./ton of seed processed) is entered as NUM1 (cols. 11-20) for 1st cuts; NUM2 (cols. 21-30) for 2nd cuts; and NUM3 (31-40) for other cuts. If more than three cuts are made, another card for bagging and ties is needed.

If ID = F, the variable input item is fuel. The specific fuel type is not specified by the input data. The average price per unit (per 1000 cu.ft. if it is natural gas; per gallon if it is fuel oil: etc.) is enter as PR in cols. 2-10 and the average fuel usage (in the appropriate units) per ton of seed processed is entered as NUM1 in cols. 11-20.

If ID = H, the variable input item is solvent. The cost per gallon is entered as PR in cols. 2-10 and the solvent loss (in gallons) per ton of seed processed is entered as NUM1 in cols. 11-20.

If ID = L, the variable input item is labor. The weekly wage rate of the employee (dollars per week including benefits) is entered as PR in cols. 2-10. The number of employees hired at this wage rate when the mill is processing is entered as NUM1 (cols. 11-20); the number of employees hired at this wage rate when the mill is down for major repairs between seasons is entered as NUM2 (cols. 21-30), and the number of employees which will be hired at this wage rate if the mill has a dormancy period is entered as NUM3 (cols. 31-40)

If ID = M, the variable input item is miscellaneous. The miscellaneous cost is entered as a cost per ton of seed processed in cols. 2-10 (PR). The number needed is not necessary because the cost only reflects a cost per ton of seed processed and not usage per ton of seed processed.

If ID = T, the variable input item is average truck size (needed only in the UNLOADING cost center data). The average truck size is entered as NUM1 (cols. 11-20) in tons per truck.

| Card No. | Column | Variable | Explanation |
| --- | --- | --- | --- |
| | | | If ID = U, the variable input item is the number of unloading facilities of the mill (needed only in the unloading cost center data). The number of unloading facilities is entered as NUM1 (cols. 11-20). |

# APPENDIX IV

## Input Data Cards Arrangement

| ID | Explanation | Card Order Number |
|---|---|---|
| | Repeat cards 15-17 as needed for each cost center of the mill | |
| E | End of each cost center variable cost data cards | 17 |
| | Repeat card 16 for each variable input | |
| | Variable input data card | 16 |
| | Cost center title card and time variable | 15 |
| | ELER, ELEM, WTRR, WTRM, VINR, TMR | 14 |
| E | End of revenue data card | 13 |
| | Repeat card 12 for each cut of linters | |
| L | Linter output and price | 12 |
| H | Hull output and price | 11 |
| M | Meal output and price | 10 |
| O | Oil output and price | 9 |
| E | End of fixed cost data card | 8 |
| | Repeat cards 4-7 as needed for each cost center | |
| | Repeat cards 5-7 as needed for fixed cost items within a cost center | |
| C | Non-depreciable fixed cost item | 7 |
| F | Depreciable fixed cost item | 6 |
| A | Depreciable non-insurable fixed cost item | 5 |
| L | Cost center title card | 4 |
| | TAXR, INSR | 3 |
| | CPP, DAYP, DAYD, DAYU, PCS, RS, R, ABP | 2 |
| | Control card | 1 |

APPENDIX V

Card Deck Arrangement

Card Deck Arrangement Including the Program, Data Set, and Necessary Job Control Language

This cottonseed oil mill model was programmed in Fortran IV, Level G and has been run on the ITEL AS/6 computer system at Texas Tech University. The card deck arrangement including the job control language needed to run the program is:

```
// JOB CARD
// EXEC FORTGCLG
//SYSIN DD *
   MAIN PROGRAM
   SUBROUTINE FIX(TFC)
   SUBROUTINE NR(TR)
   SUBROUTINE STAGE
/*
//GO.SYSIN DD *
   DATA SET
/*
//
```

## Appendix VI

## The Computer Program

```
C PROCESSING COST ESTIMATION SYSTEM REVISED FOR COTTONSEED OIL MILL MODEL
C N IS CONTROL VECTOR
      COMMON N(13),PCS,R,RS,CPP,CAP(10),DP(10),DD(10),PFC(20),TCAP,K,
     *TINT(20),TDEP(20),TCHP(20),TREP(20),TWTR(20),DF(10),TREV(10),
     *TDE1,TIN1,TRP1,TCH1,TWT1,TTAX(20),TINS(20),CL(10),NPD(10),TND(20)
     *,PREP(20),TRA (20 ,TANL(20),TFUEL(20),UF,
     *THEX(20),PLAB(20),RLAB(20),DLAB(20),TMIS(20),TITLE(20,5)
     *,TSURE(20),REVG,PEVM,REVH,TRL,HRS(20,10),TRK,TIME(20)
      DIMENSION VCL(20,10),VCE(20,10),VCA(20,10),VCB(20,10),VCW(20,10),
     *VCF(20,10),VCH(20,10),VCM(20,10),TPSC(20,10),APSC(20,10),
     *APFC(20,10),AREV(10),PC(20,10),DU(10),TCWT(10),AC(20,10),TVC(10)
     *,TC(10),TNR(10),ANR(10),AFC(10),AVC(10),ATC(10),TCC(10),TPC(20,10)
     *,VCI(20,10),VCR(20,10),AVCL(20,10),AVCE(20,10),AVCR(20,10)
     *,AVCA(20,10),AVCB(20,10),AVCF(20,10),AVCH(20,10),AVCI(20,10)
      DIMENSION AVCW(20,10),AVCM(20,10),AIOC(20,10),TCI(10),TVCL(10)
     *,ACC(10),AIC(10),ACI(10),TVCE(10),TVCA(10),TVCB(10),TVCR(10),
     *TVCW(10),TVCF(10),TVCI(10),TVCH(10),TVCM(10)
      REAL NPD,IOC(20,1 ),ICC(10)
      WRITE(6,31)
   31 FORMAT('1',39X,'********COTTONSEED OIL MILL SIMULATION MODEL******
     ***'/43X,'ECONOMICS, STATISTICS, AND COOPERATIVES SERVICE'/
     *51X,'USDA AND TEXAS TECH UNIVERSITY')
      READ (5,1) (N(I),I=1,13)
    1 FORMAT (5I1,I3,4I ,3I3)
      WRITE (6,21)
   21 FORMAT(////,20X,'COTTONSEED OIL MILL DESCRIPTION',/)
C N(1) IS THE AREA OF MILL LOCATION
      IF (N(1).EQ.1) WR TE(6,2)
    2 FORMAT(/5X,'AREA = SOUTH')
      IF (N(1).EQ.2) WRITE (6,3)
    3 FORMAT(/5X,'AREA = SOUTHWEST')
      IF (N(1).EQ.3) WRITE (6,4)
    4 FORMAT(/5X,'AREA = WEST')
C N(2) IS THE EXTRACTION TECHNOLOGY OF THE MILL
      IF (N(2).EQ.1) WRITE (6,5)
    5 FORMAT(5X,'EXTRAC ION TECHNOLOGY = SCREWPRESS')
      IF (N(2).EQ.2) WRITE (6,6)
    6 FORMAT(5X,'EXTRAC ION TECHNOLOGY = DIRECT SOLVENT')
      IF (N(2).EQ.3) WRITE (6,7)
    7 FORMAT(5X,'EXTRAC ION TECHNOLOGY = PRE-PRESS SOLVENT')
      DO 42 K=1,20
      DO 43 J=1,10
      VCL(K,J)=0.0
      VCE(K,J)=0.0
      VCR(K,J)=0.0
      VCM(K,J)=0.0
      VCH(K,J)=0.0
      VCW(K,J)=0.0
      VCI(K,J)=0.0
      VCA(K,J)=0.0
      VCB(K,J)=0.0
      VCF(K,J)=0.0
   43 CONTINUE
   42 CONTINUE
      READ (5,40) CPP,DAYP,DAYD,DAYU,PCS,RS,R,ABP
   40 FORMAT(4F5.0,F10.0,3F5.0)
      TPSI=ABP/52
      WRITE (6,41) CPP,DAYP,DAYD
   41 FORMAT(5X,'PROCESSING CAPACITY = ',F8.0,' TPD',/5X,
     *'NUMBER OF DAYS PROCESSING AT FULL CAPACITY = ',F6.0,' DAYS',/5X,
     *'NUMBER OF DAYS FOR REPAIRS BETWEEN SEASONS = ',F6.0,' DAYS')
      TCAP=CPP*DAYP
C SUBROUTINE FIX(TFC) CALCULATES THE FIXED COST ASSOCIATED WITH THE MILL
      CALL FIX(TFC)
C SUBROUTINE NR(TR) CALCULATES THE TOTAL REVENUE GENERATED BY THE MILL
      CALL NR(TR)
      READ(5,50) FLEH,ELEM,WTRR,WTRM,VINR,TMR
   50 FORMAT(6F10.0)
      CU=1.0
      DO 500 J=1,10
      CL(J)=100*CU
      DP(J)=DAYP*CU
      CAP(J)=(DP(J))*CPP
      DD(J)=DAYD*CU
      DF(J)=(365-DD(J))-DP(J)
      DU(J)=DAYU*CU
      NPD(J)=365-DP(J)
      TREV(J)=TR*CU
      TCWT(J)=((TWT1*WTRR)*DP(J))+((NPD(J)/30)*WTRM)
      TCC(J)=PCS*CAP(J)
      ICC(J)=(TCC(J)*.5)*((DP(J)/365)*RS)
      TCI(J)=TCC(J)+ICC(J)
      CU=CU-.1
  500 CONTINUE
C THIS SECTION OF THE MAIN PROGRAM CALCULATES THE VARIABLE COSTS OF
C THE MILL AT TEN UTILIZATION LEVELS (FROM 100% TO 10% UTILIZATION
      IF (N(11).NE.1) G  TO 210
      WRITE(6,220) (CL(J),J=1,10)
  220 FORMAT(///30X,'TOTAL VARIABLE COSTS BY ITEM BY COST CENTER',
     *///1X,'UTILIZATION LEVEL',7X,F4.0,'%',9(F9.0,'%'))
      WRITE(6,230) (CAP(J),J=1,10)
  230 FORMAT(1X,'SEED PROCESSED         ',10F10.0)
      WRITE(6,240) (DP(J),J=1,10)
  240 FORMAT(1X,'PROCES ING DAYS        ',10F10.0)
      WRITE(6,280) (TCC(J),J=1,10)
  280 FORMAT(//1X,'COTTONSEED BUY'/
     *1X,'COTTONSEED COST        ',10F10.0)
      WRITE(6,281) (ICC(J),J=1,10)
  281 FORMAT(2X,'INT. OPER. CAP.',4X,10F10.0)
      WRITE(6,282) (TCI(J),J=1,10)
  282 FORMAT(1X,'TOTAL COTTONSEED COST',F9.0,9F10.0)
  210 K=0
      NK=0
C N(3) IS THE CONTROL CHARACTER FOR INCLUDING OFFICE AS A
C COST CENTER
      IF (N(3).EQ.1) K= +1
      IF (N(3).EQ.1  NK=NK+1
      IF (N(3).NE.1) GO TO 300
C SUBROUTINE STAGE SUMMARIES THE VARIABLE COST ITEMS FOR USE IN THIS
C SECTION OF THE MODEL
      CALL STAGE
      DO 310 J=1,10
      VCL(K,J)=(PLAB(K)*(DP(J)*.1428))+(RLAB(K)*(DD(J)*.1428))+
     *(DLAB(K)*(DF(J)*. 428))
      VCE(K,J)=(ELEM*.6)
      VCM(K,J)=(TMIS(K)*CAP(J))
```

```
      VCA(K,J)=(TANL(K)*CAP(J))
      TPC(K,J)=VCL(K,J)+VCE(K,J)+VCM(K,J)+VCA(K,J)
      IOC(K,J)=TPC(K,J)*(((DP(J)/365)*TPSI)*RS)
      TPSC(K,J)=TPC(K,J)+IOC(K,J)
      APSC(K,J)=TPSC(K, )/CAP(J)
      APFC(K,J)=PFC(K)/CAP(J)
      AC(K,J)=APSC(K,J)+APFC(K,J)
  310 CONTINUE
C N(4) IS THE CONTROL CHARACTER FOR INCLUDING UNLOADING AS A
C COST CENTER
  300 IF (N(4).EQ.1) K= +1
      IF (N(4).EQ.1) NK=NK+1
      IF (N(4).NE.1) GO TO 320
      CALL STAGE
      DO 330 J=1,10
      VCL(K,J)=PLAB(K)*(DU(J)*.1428)
      HRS(K,J)=(CAP(J)/ RK)*TIME(K)
      VCE(K,J)=((TCHP(K)/UF)*.7457)*(HRS(K,J)*ELER)+((TCHP(K)/TCH1)
     1*ELEM)
      VCR(K,J)=(PREP(K)*TMR)*CAP(J)
      VCF(K,J)=(TFUEL(K)*CAP(J))
      VCM(K,J)=(THIS(K)*CAP(J))
      TPC(K,J)=VCL(K,J)+VCE(K,J)+VCM(K,J)+VCR(K,J)+VCF(K,J)
      IOC(K,J)=TPC(K,J)*(((DP(J)/365)*TPSI)*RS)
      TPSC(K,J)=TPC(K,J)+IOC(K,J)
      APSC(K,J)=TPSC(K,J)/CAP(J)
      APFC(K,J)=PFC(K)/CAP(J)
      AC(K,J)=APSC( ,J)+APFC(K,J)
  330 CONTINUE
C N(5) IS THE CONTROL CHARACTER FOR INCLUDING COTTONSEED STORAGE
C AS A COST CENTER
  320 IF (N(5).EQ.1) K=K+1
      IF (N(5).EQ.1) NK NK+1
      IF (N(5).NE.1) GO TO 340
      CALL STAGE
      DO 350 J=1,10
      VCL(K,J)=(PLAB(K)*(DP(J)*.1428))+(RLAB(K)*(DP(J)*.1428))+
     *(DLAB(K)*(DP(J)*.1428))
      VCE(K,J)=(TCHP(K)*.7457)*((TIME(K)*DP(J))*ELER)+((TCHP(K)/TCH1)
     **ELEM)
      VCR(K,J)=(PREP(K) TMR)*CAP(J)
      VCF(K,J)=(TFUEL(K)*CAP(J))
      VCM(K,J)=(THIS(K)*CAP(J))
      VCI(K,J)=((TCC(J)*.0833)*.001)*VINR
      TPC(K,J)=VCL(K,J) VCE(K,J)+VCM(K,J)+VCI(K,J)+VCR(K,J)+VCF(K,J)
      IOC(K,J)=TPC(K,J)*(((DP(J)/365)*TPSI)*RS)
      TPSC(K,J)=TPC(K,J +IOC(K,J)
      APSC(K,J)=TPSC(K,J)/CAP(J)
      APFC(K,J)=PFC(K)/CAP(J)
      AC(K,J)=APFC( ,J)+APSC(K,J)
  350 CONTINUE
C N(6) IS THE CONTROL CHARACTER WHICH SHOWS THE NUMBER OF COST
C CENTERS OF THE MILL WHICH ARE ACTUAL PROCESSING STEPS. THESE INCLUDE
C THOSE STAGES BETWEEN CLEANING AND EXTRACTION.
  340 NP=N(6)
      DO 400 M=1,NP
      K=K+1
      NK=NK+1
      CALL STAGE
      DO 700 J=1,10
  270 FORMAT(//1X,'COST CENTER ',5A4)
      VCL(K,J)=(PLAB(K)*(DP(J)*.1428))+(RLAB(K)*(DD(J)*.1428))
     *+(DLAB(K)*(DF(J)*.1428))
   60 FORMAT(1X,'LABOR',15X,10F10.0)
      VCE(K,J)=((TCHP(K)*.7457)*(TIME(K)*ELER)*DP(J))+((TCHP(K)/TCH1)*
     *ELEM)
   70 FORMAT(1X,'ELECTRICITY',9X,10F10.0)
      VCF(K,J)=(TFUEL(K *CAP(J))
      IF (TWT1.EQ.0) GO TO 333
      VCW(K,J)=(TWTR(K)/TWT1)*TCWT(J)
   71 FORMAT(1X,'WATER' 15X,10F10.0)
  333 VCB(K,J)=(TBAG(K)*CAP(J))
   72 FORMAT(1X,'BAGGIN -TIES',8X,10F10.0)
      VCH(K,J)=(THEX(K)*CAP(J))
   73 FORMAT(1X,'SOLVENT',13X,10F10.0)
      VCA(K,J)=(TANL(K)*CAP(J))
   74 FORMAT(1X,'LAB AN LYSIS',8X,10F10.0)
      VCR(K,J)=(PREP(K)*TMR)*CAP(J)
      VCM(K,J)=(THIS(K)*CAP(J))
   75 FORMAT(1X,'MISCELLANEOUS',7X,10F10.0)
      TPC(K,J)=VCA(K,J) VCB(K,J)+VCE(K,J)+VCL(K,J)+VCM(K,J)+
     *VCH(K,J)+VCW(K,J)+VCR(K,J)+VCF(K,J)
      IOC(K,J)=TPC(K,J)*(((DP(J)/365)*TPSI)*RS)
      TPSC(K,J)=TPC(K,J)+IOC(K,J)
   57 FORMAT(1X,'INSURA CE',11X,10F10.0)
   76 FORMAT(1X,'TOTAL P.S. COST',5X,10F10.0)
   56 FORMAT(2X,'INT. OPER. CAP.',4X,10F10.0)
   55 FORMAT(1X,'TOTAL LESS INTEREST',1X,10F10.0)
      APSC(K,J)=TPSC(K,J)/CAP(J)
      APFC(K,J)=PFC(K)/CAP(J)
      AC(K,J)=APSC( ,J)+APFC(K,J)
      AREV(J)=TREV(J)/CAP(J)
      PC(K,J)=PFC(K)+TPSC(K,J)
  700 CONTINUE
  501 FORMAT(1X,'FUEL',16X,10F10.0)
  502 FORMAT(1X,'REPAIRS',13X,10F10.0)
  400 CONTINUE
C N(7) IS THE CONTROL CHARACTER FOR INCLUDING OIL STORAGE.
C AS A COST CENTER
      IF (N(7).EQ.1) K= +1
      IF (N(7).EQ.1 ) NK=NK+1
      IF (N(7).NE.1) GO TO 410
      CALL STAGE
      DO 420 J=1,10
      VCL(K,J)=(PLAB(K)*(DP(J)*.1428))+(PLAB(K)*(DD(J)*.1428))+
     *(DLAB(K)*(DF(J)*.1428))
      VCE(K,J)=(TCHP(K) .7457)*((TIME(K)*DP(J))*ELER)+((TCHP(K)/TCH1)
     **ELEM)
      VCR(K,J)=(PREP(K)*TMR)*CAP(J)
      VCF(K,J)=(TFUEL(K)*CAP(J))
      VCM(K,J)=(THIS(K)*CAP(J))
      VCI(K,J)=(((REVO/ CAP)*CAP(J)*.083)*.001)*VINR
      TPC(K,J)=VCL(K,J)+VCE(K,J)+VCM(K,J)+VCI(K,J)+VCR(K,J)+VCF(K,J)
      IOC(K,J)=TPC( K,J)*(((DP(J)/365)*TPSI)*RS)
      TPSC(K,J)=TPC(K,J +IOC(K,J)
      APSC(K,J)=TPSC(K,J)/CAP(J)
```

```
      APFC(K,J)=PFC(K)/CAP(J)
      AC(K,J)=APSC( ,J)+APFC(K,J)
  420 CONTINUE
C N(8) IS THE CONTROL CHARACTER FOR INCLUDING MEAL STORAGE
C AS A COST CENTER
  410 IF (N(8).EQ.1) K=K+1
      IF (N(8).EQ.1) NK NK+1
      IF (N(8).NE.1) GO TO 430
      CALL STAGE
      DO 440 J=1,10
      VCL(K,J)=(PLAB(K)*(DP(J)*.1428))+(RLAB(K)*(DD(J)*.1428))+
     *(DLAB(K)*(DF(J)*.1428))
      VCE(K,J)=(TCHP(K)*.7457)*((TIME(K)*DP(J))*ELER)+((TCHP(K)/TCH1)
     **ELEM)
      VCR(K,J)=(PREP(K)*TMR)*CAP(J)
      VCF(K,J)=(TFUEL(K)*CAP(J))
      VCM(K,J)=(TMIS(K)*CAP(J))
      VCI(K,J)=(((REVM/ CAP)*CAP(J)*.083)*.001)*VINR
      TPC(K,J)=VCL(K,J)+VCE(K,J)+VCM(K,J)+VCI(K,J)+VCR(K,J)+VCF(K,J)
      IOC(K,J)=TPC(K,J)*(((DP(J)/365)*TPSI)*RS)
      TPSC(K,J)=TPC(K,J +IOC(K,J)
      APSC(K,J)=TPSC(K,J)/CAP(J)
      APFC(K,J)=PFC(K)/CAP(J)
      AC(K,J)=APSC( I,J)+APFC(K,J)
  440 CONTINUE
C N(9) IS THE CONTROL CHARACTER FOR INCLUDING HULL STORAGE
C AS A COST CENTER
  430 IF (N(9).EQ.1) K= +1
      IF (N(9).EQ.1 ) NK=NK+1
      IF (N(9).NE.1) GO TO 450
      CALL STAGE
      DO 460 J=1,10
      VCL(K,J)=(PLAB(K)*(DP(J)*.1428))+(RLAB(K)*(DD(J)*.1428))+
     *(DLAB(K)*(DF(J)*.1428))
      VCE(K,J)=(TCHP(K) .7457)*((TIME(K)*DP(J))*ELER)+((TCHP(K)/TCH1)
     **ELEM)
      VCR(K,J)=(PREP(K)*TMP)*CAP(J)
      VCF(K,J)=(TFUEL(K)*CAP(J))
      VCM(K,J)=(TMIS(K)*CAP(J))
      VCI(K,J)=(((REVH/TCAP)*CAP(J)*.083)*.001)*VINR
      TPC(K,J)=VCL(K,J)+VCE(K,J)+VCM(K,J)+VCI(K,J)+VCR(K,J)+VCF(K,J)
      IOC(K,J)=TPC(K,J)*(((DP(J)/365)*TPSI)*RS)
      TPSC(K,J)=TPC(K,J +IOC(K,J)
      APSC(K,J)=TPSC(K,J)/CAP(J)
      APFC(K,J)=PFC(K)/CAP(J)
      AC(K,J)=APSC(K,J)+APFC(K,J)
  460 CONTINUE
C N(10) IS THE CONTROL CHARACTER FOR INCLUDING LINTERS STORAGE
C AS A COST CENTER
  450 IF (N(10).EQ.1) K=K+1
      IF (N(10).EQ.1) NK=NK+1
      IF (N(10).NE.1) GO TO 470
      CALL STAGE
      DO 480 J=1,10
      VCL(K,J)=(PLAB(K)*(DP(J)*.1428))+(RLAB(K)*(DD(J)*.1428))+
     *(DLAB(K)*(DF(J)*.1428))
      VCE(K,J)=(TCHP(K) .7457)*((TIME(K)*DP(J))*ELER)+((TCHP(K)/TCH1)
     **ELEM)
      VCR(K,J)=(PREP(K)*TMR)*CAP(J)
      VCF(K,J)=(TFUEL(K)*CAP(J))
      VCM(K,J)=(TMIS(K)*CAP(J))
      VCI(K,J)=(((TRL/T AP)*CAP(J)*.083)*.001)*VINR
      TPC(K,J)=VCL(K,J)+VCE(K,J)+VCM(K,J)+VCI(K,J)+VCR(K,J)+VCF(K,J)
      IOC(K,J)=TPC(K,J)*(((DP(J)/365)*TPSI)*RS)
      TPSC(K,J)=TPC(K,J)+IOC(K,J)
      APSC(K,J)=TPSC(K,J)/CAP(J)
      APFC(K,J)=PFC(K)/CAP(J)
      AC(K,J)=APSC( ,J)+APFC(K,J)
  480 CONTINUE
      IF (N(11).NE.1) GO TO 200
      DO 121 K=1,NK
      WRITE(6,270) (TITLE(K,I),I=1,5)
      IF (VCL(K,1).GT.0) WRITE(6,60) (VCL(K,J),J=1,10)
      IF (VCE(K,1).GT.0  WRITE(6,70) (VCE(K,J),J=1,10)
      IF (VCR(K,1).GT.0) WRITE(6,502) ( CR(K,J),J=1,10)
      IF (VCA(K,1).GT.0  WRITE(6,74) (VCA(K,J),J=1,10)
      IF (VCB(K,1).GT.0) WRITE(6,72) (VCB(K,J),J=1,10)
      IF (VCF(K,1).GT.0  WRITE(6,501) (VCF(K,J),J=1,10)
      IF (VCM(K,1).GT.0) WRITE(6,75) (VCM(K,J),J=1,10)
      IF (VCH(K,1).GT.0  WRITE(6,73) (VCH(K,J),J=1,10)
      IF (VCI(K,1).GT.0) WRITE(6,57) (VCI(K,J),J=1,10)
      IF (VCW(K,1).GT.0) WRITE(6,71) (VCW(K,J),J=1,10)
      WRITE(6,55) (TPC( ,J),J=1,10)
      WRITE(6,56) (IOC(K,J),J=1,10)
      WRITE(6,76) (TPSC K,J),J=1,10)
  121 CONTINUE
  200 DO 35 J=1,10
      ACC(J)=TCC(J)*(1/CAP(J))
      ATC(J)=TCC(J)*(1/ AP(J))
      ACI(J)=TCI(J)*(1/CAP(J))
      TVC(J)=0.0
      TVC(J)=TVC(J)+TCI(J)
      TVCL(J)=0.0
      TVCE(J)=0.0
      TVCR(J)=0.0
      TVCM(J)=0.0
      TVCH(J)=0.0
      TVCA(J)=0.0
      TVCB(J)=0.0
      TVCI(J)=0.0
      TVCF(J)=0.0
      TVCW(J)=0.0
   35 CONTINUE
      IF (N(12).NE.1) GO TO 211
      WRITE(6,284) (CL(J),J=1,10)
  284 FORMAT(/////30X,'AVERAGE VARIABLE COST BY ITEM BY COST',
     *' CENTER'///1X,'UTILIZATION LEVEL',8X,F4.0,'%',9(F9.0,'%'))
      WRITE(6,286) (ACC(J),J=1,10)
  286 FORMAT(//1X,' OTTONSEED BUY'/,1X,
     *'COTTONSEED COST' 5X,10F10.2)
      WRITE(6,287) (ATC(J),J=1,10)
  287 FORMAT(2X,'IN . O ER. CAP.',4X,10F10.2)
      WRITE(6,288) (ACI(J),J=1,10)
  288 FORMAT(1X,'AVER.  .S. COST',5X,10F10.2)
  211 DO 37 J=1,10
      DO 36 K=1,NK
```

```
   36 TVC(J)=TVC(J)+TPSC(K,J)
   37 CONTINUE
      DO 39 K=1,NK
      DO 38 J=1,10
      AVCL(K,J)=VCL(K,J)*(1/CAP(J))
      AVCE(K,J)=VCE(K,J)*(1/CAP(J))
      AVCR(K,J)=VCR(K,J)*(1/CAP(J))
      AVCM(K,J)=VCM(K,J)*(1/CAP(J))
      AVCA(K,J)=VCA(K,J)*(1/CAP(J))
      AVCB(K,J)=VCB(K,J)*(1/CAP(J))
      AVCF(K,J)=VCF(K,J)*(1/CAP(J))
      AVCI(K,J)=VCI(K,J)*(1/CAP(J))
      AVCW(K,J)=VCW(K,J)*(1/CAP(J))
      AVCH(K,J)=VCH(K,J *(1/CAP(J))
      AIOC(K,J)=IOC(K,J)*(1/CAP(J))
      TVCL(J)=TVCL(J)+A CL(K,J)
      TVCE(J)=TVCE( )+A CE(K,J)
      TVCR(J)=TVCR(J)+AVCR(K,J)
      TVCA(J)=TVCA( )+A CA(K,J)
      TVCB(J)=TVCB(J)+AVCB(K,J)
      TVCF(J)=TVCF( )+A CF(K,J)
      TVCM(J)=TVCM(J)+AVCM(K,J)
      TVCH(J)=TVCH( )+A CH(K,J)
      TVCI(J)=TVCI(J)+AVCI(K,J)
      TVCW(J)=TVCW( J)+A CW(K,J)
   38 CONTINUE
      IF (N(12).NE.1) GO TO 470
      WRITE(6,270) (TITLE(K,I),I=1,5)
      IF (VCL(K,1).GT.0) WRITE(6,999) (AVCL(K,J),J=1,10)
  999 FORMAT(1X,'LABOR',15X,10F10.2)
      IF (VCE(K,1).GT.0) WRITE(6,998) (AVCE(K,J),J=1,10)
  998 FORMAT(1X,'ELECTR CITY',9X,10F10.2)
      IF (VCR(K,1).GT.0) WRITE(6,997) (AVCR(K,J),J=1,10)
  997 FORMAT(1X,'REPAIRS',13X,10F10.2)
      IF (VCA(K,1).GT.0) WRITE(6,996) (AVCA(K,J),J=1,10)
  996 FORMAT(1X,'LAB ANALYSIS',8X,10F10.2)
      IF (VCB(K,1).GT.0) WRITE(6,995) (AVCB(K,J),J=1,10)
  995 FORMAT(1X,'BAGGING-TIES',8X,10F10.2)
      IF (VCF(K,1).GT.0) WRITE(6,994) (AVCF(K,J),J=1,10)
  994 FORMAT(1X,'FUEL', 6X,10F10.2)
      IF (VCM(K,1).GT.0) WRITE(6,993) (AVCM(K,J),J=1,10)
  993 FORMAT(1X,'MISCELLANEOUS',7X,10F10.2)
      IF (VCH(K,1).GT.0) WRITE(6,992) (AVCH(K,J),J=1,10)
  992 FORMAT(1X,'SOLVENT',13X,10F10.2)
      IF (VCI(K,1).GT.0) WRITE(6,991) (AVCI(K,J),J=1,10)
  991 FORMAT(1X,'INSURANCE',11X,10F10.2)
      IF (VCW(K,1).GT.0  WRITE(6,989) (AVCW(K,J),J=1,10)
  989 FORMAT(1X,'WATER',15X,10F10.2)
      WRITE(6,988) (AIO (K,J),J=1,10)
  988 FORMAT(2X,'INT. OPER. CAP.',4X,10F10.2)
      WRITE(6,987) (APSC(K,J),J=1,10)
  987 FORMAT(1X,'AVER.  .S. COST',5X,10F10.2)
   39 CONTINUE
      IF (N(13).NE.1) GO TO 470
      WRITE(6,802)
  802 FORMAT(/////30X,'AVERAGE VARIABLE COST BY RESOURCE ITEM',
     *' PROCESSED'//)
      WRITE(6,999) (TVCL(J),J=1,10)
      WRITE(6,998) (TVCE(J),J=1,10)
      WRITE(6,997) (TVCR(J),J=1,10)
      WRITE(6,996) (TVCA(J),J=1,10)
      WRITE(6,995) (TVCB(J),J=1,10)
      WRITE(6,994) (TVC (J),J=1,10)
      WRITE(6,993) (TVCM(J),J=1,10)
      WRITE(6,992)  TVC (J),J=1,10)
      WRITE(6,991) (TVCI(J),J=1,10)
      WRITE(6,989) (TVCW(J),J=1,10)
  470 DO 750 J=1,10
      TC(J)=0.0
      TNR(J)=0.0
      AFC(J)=0.0
      AVC(J)=0.0
      ATC(J)=0.0
      ANR(J)=0.0
      TC(J)=TVC(J)+TFC
      TNR(J)=TREV(J)-TC(J)
      AFC(J)=TFC/CA (J)
      AVC(J)=TVC(J)/CAP(J)
      ATC(J)=TC(J)/CAP(J)
      ANR(J)=TNR(J)/CAP(J)
  750 CONTINUE
      WRITE(6,83)
   83 FORMAT(/////30X,'COST CENTER AVERAGE FIXED COSTS',//)
      WRITE(6,751) (CL(J),J=1,10)
  751 FORMAT(1X,'UTILIZ TION LEVEL',8X,F4.0,'%',9(F9.0,'%'))
      DO 600 K=1,NK
      WRITE(6,78) (TITLE(K,I),I=1,5),(APFC(K,J),J=1,10)
   78 FORMAT(1X,5A4,10F10.2)
  600 CONTINUE
      WRITE(6,84)
   84 FORMAT(/////30X,'COST CENTER AVERAGE VARIABLE COSTS',//)
      WRITE(6,751) (CL(J),J=1,10)
      DO 800 K=1,NK
      WRITE(6,77) (TITLE(K,I),I=1,5),(APSC(K,J),J=1,10)
   77 FORMAT(1X,5A4,10F10.2)
  800 CONTINUE
      WRITE(6,85)
   85 FORMAT(/////30X,'COST CENTER AVERAGE TOTAL COSTS',//)
      WRITE(6,751) (CL(J),J=1,10)
      DO 900 K=1,NK
      WRITE(6,86) (TITLE(K,I),I=1,5),(AC(K,J),J=1,10)
   86 FORMAT(1X,5A4,10F10.2)
  900 CONTINUE
      WRITE(6,91) (CL(J),J=1,10),TFC
   91 FORMAT(/////30X,'TOTAL COSTS AND RETURNS MATRIX',///1X,
     *'UTILIZATION LEVEL',8X,F4.0,'%',9(F9.0,'%')/1X,'TOTAL FIXED COST'
     *,4X,F10.0)
      WRITE(6,92) (TVC(J),J=1,10)
   92 FORMAT(1X,'TOTAL VAR. COST',5X,10F10.0)
      WRITE(6,93) (TC(J),J=1,10)
   93 FORMAT(1X,'TOTAL COST',10X,10F10.0)
      WRITE(6,79) (TREV(J),J=1,10)
   79 FORMAT(1X,'TOTAL REVENUE',7X,10F10.0)
      WRITE(6,95) (TNR( ),J=1,10)
   95 FORMAT(1X,'TOTAL NET REVENUE',3X,10F10.0)
      WRITE(6,61) (CL(J ,J=1,10)
```

```
   61 FORMAT(/////30X,'AVERAGE COST AND RETURNS MATRIX',//
     *1X,'UTILIZATION LEVEL',8X,F4.0,'%',9(F9.0,'%'))
      WRITE(6,96) (AFC(J),J=1,10)
   96 FORMAT(1X,'AVER. FIXED COST',4X,10F10.2)
      WRITE(6,97) (AVC(J),J=1,10)
   97 FORMAT(1X,'AVER. VAR. COST',5X,10F10.2)
      WRITE(6,98) (ATC(J),J=1,10)
   98 FORMAT(1X,'AVER. TOTAL COST',4X,10F10.2)
      WRITE(6,99) (AREV(J),J=1,10)
   99 FORMAT(1X,'AVER. REVENUE',7X,10F10.2)
      WRITE(6,100) (ANR(J),J=1,10)
  100 FORMAT(1X,'AVER. NET REVENUE',3X,10F10.2//////////)
      STOP
      END
```

FIX

```
      SUBROUTINE FIX(TFC)
      COMMON N(13),PCS,R,RS,CPP,CAP(10),DP(10),DD(10),PFC(20),TCAP,K,
     *TINT(20),TDEP(20),TCHP(20),TREP(20),TWTR(20),DF(10),TREV(10),
     *TDE1,TIN1,TRP1,TCH1,TWT1,TTAX(20),TINS(20),CL(10),NPD(10),TND(20)
     *,PREP(20),TBAG(20),TANL(20),TFUEL(20),UF,
     *THEX(20),PLAB(20),RLAB(20),DLAB(20),TMIS(20),TITLE(20,5)
     *,TSURE(20),REVO,REVM,REVH,TRL,HRS(20,10),TRK,TIME(20)
      INTEGER F/'F'/,C/'C'/,E/'E'/,L/'L'/,A/'A'/
      INTEGER NAME(5),NUM,YRS,ID
      REAL FOB,INST,REP,SAL,CHP,WTR,INT,INS,INSR
      READ(5,200) TAXR,INSR
  200 FORMAT(2F5.0)
      TDE1=0.0
      TNDC=0.0
      TIN1=0.0
      TRP1=0.0
      TCH1=0.0
      TWT1=0.0
      TTX1=0.0
      TIS1=0.0
      TFC=0.0
      K=0
      NK=0
      WRITE(6,10)
   10 FORMAT(////30X,'FIXED COST BY ITEM BY COST CENTER'//)
   50 AEC=0.0
      FOB1=0.0
      SAL1=0.0
      REP1=0.0
      DEP1=0.0
      INT=0.0
      AEC1=0.0
      READ(5,20) ID,(NAME(I),I=1,5),FOB,NUM,YRS,INST,REP,SAL,CHP,WTR
   20 FORMAT(A1,5A4,F9.0,I5,I3,F5.0,3F4.0,F8.0)
      IF (ID.EQ.F) GO TO 60
      IF (ID.EQ.A) GO TO 60
      IF (ID.EQ.C) GO TO 70
      IF (ID.EQ.E) GO TO 80
      IF (ID.EQ.L.AND.K.EQ.0)  WRITE(6,30) (NAME(I),I=1,5)
   30 FORMAT(//1X,'COST CENTER',16X,'UNIT',3X,'NUM',1X,'YRS',3X,
     *'SALVAGE',25X,'FIXED',24X,'NON-DEPR',9X,'ANNUAL'/1X,5A4,6X,'VALUE'
     *,2X,'UNIT',1X,'LIFE',4X,'VALUE',6X,'DEPR',2X,'INTEREST',4X,
     *'REPAIR',5X,'TAXES',4X,'INSURE',8X,'COST',11X,'COST')
      IF (ID.EQ.L.AND.K.GT.0) WRITE(6,40) TDEP(K),TINT(K),TREP(K),
     *TTAX(K),TINS(K),TND(K),PFC(K),(NAME(I),I=1,5)
   40 FORMAT(1X,'TOTAL COSTS',40X,5F10.2,F12.2,F15.2,//1X,
     *'COST CENTER',16X,'UNIT',3X,'NUM',1X,'YRS',3X,'SALVAGE',25X,
     *'FIXED',24X,'NON-DEPR',9X,'ANNUAL'/1X,5A4,6X,'VALUE',2X,'UNIT',1X,
     *'LIFE',4X,'VALUE',6X,'DEPR',2X,'INTEREST',4X,'REPAIR',5X,'TAXES',
     *4X,'INSURE',8X,'COST',11X,'COST')
      IF (K.EQ.0) GO TO 5
      TDE1=TDE1+TDEP(K)
      TNDC=TNDC+TND(K)
      TIN1=TIN1+TINT(K)
      TRP1=TRP1+TREP(K)
      TFC=TFC+PFC(K)
      TCH1=TCH1+TCHP(K)
      TWT1=TWT1+TWTR(K)
      TTX1=TTX1+TTAX(K)
      TIS1=TIS1+TINS(K)
    5 K=K+1
      NK=NK+1
      TDEP(K)=0.0
      TND(K)=0.0
      TINT(K)=0.0
      TREP(K)=0.0
      PFC(K)=0.0
      TCHP(K)=0.0
      TWTR(K)=0.0
      TTAX(K)=0.0
      TINS(K)=0.0
      GO TO 50
   60 FOB1=0.0
      SAL1=0.0
      AEC1=0.0
      REP1=0.0
      DEP1=0.0
      INT=0.0
      TAX=0.0
      INS=0.0
      SAL1=FOB*NUM*SAL
      FOB1=(FOB*NUM)*(1+INST)
      AEC1=((FOB1*(R*((1+R)**YRS)))/(((1+R)**YRS)-1))-((SAL1*R)/((((1+R)
     ***YRS)-1))
      TAX=(FOB1/100)*TAXR
      INS=(FOB1/1000)*INSR
      IF (ID.EQ.A) INS=0.0
      REP1=FOB*NUM*REP
      DEP1=(FOB1-SAL1)/YRS
      INT=AEC1-DEP1
      AEC=AEC1+REP1+TAX+INS
      WRITE(6,90) (NAME(I),I=1,5),FOB,NUM,YRS,SAL1,DEP1
     *,INT,REP1,TAX,INS,AEC
   90 FORMAT(1X,5A4,F11.2,I6,I4,6F10.2,12X,F15.2)
  120 IF (ID.EQ.C) DEP1=0.0
      TDEP(K)=TDEP(K)+DEP1
```

```
      TINT(K)=TINT(K)+INT
      IF (ID.EQ.C) REP1=0.0
      TREP(K)=TREP(K)+REP1
      PFC(K)=PFC(K)+AEC
      IF (ID.EQ.C) CHP=0.0
      TCHP(K)=TCHP(K)+CHP
      IF (ID.EQ.C) WTR=0.0
      TWTR(K)=TWTR(K)+WTR
      IF (ID.EQ.C) TAX= .0
      TTAX(K)=TTAX(K)+T X
      IF (ID.EQ.C) INS=0.0
      TINS(K)=TINS(K)+INS
      GO TO 50
   70 AEC1=FOB*NUM
      TND(K)=TND(K)+AEC1
      AEC=(FOB*NUM)*(1+(RS*.5))
      INT=AEC-AEC1
      WRITE(6,100) (NAME(I),I=1,5),FOB,NUM,INT,AEC1,AEC
  100 FORMAT(1X,5A4,F11.2,I6,24X,F10.2,30X,F12.2,F15.2)
      GO TO 120
   80 TDE1=TDE1+TDEP(K)
      TNDC=TNDC+TND(K)
      TIN1=TIN1+TINT(K)
      TRP1=TRP1+TREP(K)
      TFC=TFC+PFC(K)
      TCH1=TCH1+TCHP(K)
      TWT1=TWT1+TWTR(K)
      TTX1=TTX1+TTAX(K)
      TIS1=TIS1+TINS(K)
      WRITE(6,130) TDEP(K),TINT(K),TREP(K),
     *TTAX(K),TINS(K),TND(K),PFC(K)
  130 FORMAT(1X,'TOTAL COST',41X,5F10.2,F12.2,F15.2)
      WRITE(6,110) TDE1,TIN1,TRP1,TTX1,TIS1,TNDC,TFC
  110 FORMAT(/1X,'TOTAL FIXED COSTS',34X,5F10.2,F12.2,F15.2)
      RETURN
      END
```



NR

```
      SUBROUTINE NR(TR)
      COMMON N(13),PCS,R,RS,CPP,CAP(10),DP(10),DD(10),PFC(20),TCAP,K,
     *TINT(20),TDEP(20),TCHP(20),TREP(20),TWTR(20),DF(10),TREV(10),
     *TDE1,TIN1,TRP1,TCH1,TWT1,TTAX(20),TINS(20),CL(10),NPD(10),TND(20)
     *,PREP(20),TBAG(20),TANL(20),TFUEL(20),UF,
     *THEX(20),PLAB(20),RLAB(20),DLAB(20),TMIS(20),TITLE(20,5)
     *,TSURE(20),REVO,REVM,REVH,TRL,HRS(20,10),TRK,TIME(20)
      INTEGER E/'E'/,M/'M'/,H/'H'/,L/'L'/
      REAL NUM,PR
      TR=0.0
      WRITE (6,10)
   10 FORMAT(//////////20X,'TOTAL REVENUE AT 100% CAPACITY UTILIZATION')
      TRL=0.0
      TR=0.0
   20 READ (5,30) ID,NUM,PR
   30 FORMAT(A1,F9.0,F10.0)
      IF (ID.EQ.M) GO TO 40
      IF (ID.EQ.H) GO TO 60
      IF (ID.EQ.L) GO TO 70
      IF (ID.EQ.E) GO TO 90
      REVO=(TCAP*NUM)*PR
      TR=REVO+TR
      WRITE(6,50) REVO
   50 FORMAT(//,5X,'REVENUE FROM OIL SALES',20X,F15.2)
      GO TO 20
   40 REVM=((TCAP*NUM)/2000)*PR
      TR=REVM+TR
      WRITE(6,51) REVM
   51 FORMAT(5X,'REVENUE FROM MEAL SALES',19X,F15.2)
      GO TO 20
   60 REVH=((TCAP*NUM)/2000)*PR
      TR=REVH+TR
      WRITE(6,52) REVH
   52 FORMAT(5X,'REVENUE FROM HULL SALES',19X,F15.2)
      GO TO 20
   70 REVL=0.0
      REVL=(TCAP*NUM)*PR
      TRL=REVL+TRL
      GO TO 20
   90 TR=TRL+TR
      WRITE(6,53) TRL
   53 FORMAT(5X,'REVENUE FROM LINTER SALES',17X,F15.2)
      WRITE(6,54) TR
   54 FORMAT(/5X,'TOTAL REVENUE',24X,F20.2)
      RETURN
      END
```

STAGE

```
      SUBROUTINE STAGE
      COMMON N(13),PCS,R,RS,CPP,CAP(10),DP(10),DD(10),PFC(20),TCAP,K,
     *TINT(20),TDEP(20),TCHP(20),TREP(20),TWTR(20),DF(10),TREV(10),
     *TDE1,TIN1,TRP1,TCH1,TWT1,TTAX(20),TINS(20),CL(10),NPD(10),TND(20),
     *PREP(20),TBAG 20),TANL(20),TFUEL(20),UF,
     *THEX(20),PLAB(20) RLAB(20),DLAB(20),TMIS(20),TITLE(20,5)
     *,TSURE(20),REVO,REVM,REVH,TRL,HRS(20,10),TRK,TIME(20)
      INTEGER A/'A'/,B/'B'/,E/'E'/,F/'F'/,H/'H'/,L/'L'/,
     *M/'M'/,S/'S'/,U/' '/,T/'T'/,TITLE
      REAL NUM1,NUM2,NU 3,PR
      TBAG(K)=0.0
      TFUEL(K)=0.0
```

```
      THEX(K)=0.0
      TANL(K)=0.0
      TMIS(K)=0.0
      TSURE(K)=0.0
      TIME(K)=0.0
      TRK=0.0
      PLAB(K)=0.0
      RLAB(K)=0.0
      DLAB(K)=0.0
      PREP(K)=0.0
      IF (TCHP(K).GT.0) PREP(K)=TCHP(K)/TCH1
      READ(5,15) (TITLE(K,I),I=1,5),TIME(K)
   15 FORMAT(5A4,F10.0)
      IF (TIME(K).EQ.0.0) TIME(K)=24.
   10 PLBC=0.0
      RLBC=0.0
      DLBC=0.0
      NUM1=0.0
      NUM2=0.0
      NUM3=0.0
      PR=0.0
      READ(5,20) ID,PR,NUM1,NUM2,NUM3
   20 FORMAT(A1,F9.0,3F10.0)
      IF (ID.EQ.A) GO TO 30
      IF (ID.EQ.B) GO TO 40
      IF (ID.EQ.E) GO TO 100
      IF (ID.EQ.F) GO TO 50
      IF (ID.EQ.H) GO TO 60
      IF (ID.EQ.L) GO TO 70
      IF (ID.EQ.M) GO TO 80
      IF (ID.EQ.T) TRK=NUM1
      IF (ID.EQ.U) UF=NUM1
   30 TANL(K)=TANL(K)+PR
      GO TO 10
   40 TBAG(K)=((NUM1+NUM2+NUM3)/600)*PR
      GO TO 10
   50 TFUEL(K)=NUM1*PR
      GO TO 10
   60 THEX(K)=THEX(K)+(NUM1*PR)
      GO TO 10
   70 PLBC=NUM1*PR
      PLAB(K)=PLAB(K)+PLBC
      RLBC=NUM2*PR
      RLAB(K)=RLAB(K)+RLBC
      DLBC=NUM3*PR
      DLAB(K)=DLAB(K)+DLBC
      GO TO 10
   80 TMIS(K)=TMIS(K)+PR
      GO TO 10
  100 RETURN
      END
```

Appendix VII

Computer Model Output From
the Example Data Set

********COTTONSEED OIL MILL SIMULATION MODEL********
ECONOMICS, STATISTICS, AND COOPERATIVES SERVICE
USDA AND TEXAS TECH UNIVERSITY

Section A COTTONSEED OIL MILL DESCRIPTION

AREA = SOUTH
EXTRACTION TECHNOLOGY = SCREWPRESS
PROCESSING CAPACITY = 100. TPD
NUMBER OF DAYS PROCESSING AT FULL CAPACITY = 330. DAYS
NUMBER OF DAYS FOR REPAIRS BETWEEN SEASONS = 35. DAYS

Section B FIXED COST BY ITEM BY COST CENTER

| COST CENTER OFFICE | UNIT VALUE | NUM UNIT | YRS LIFE | SALVAGE VALUE | DEPR | INTEREST | FIXED REPAIR | TAXES | INSURE | NON-DEPR COST | ANNUAL COST |
|---|---|---|---|---|---|---|---|---|---|---|---|
| LAND | 1000.00 | 5 | 50 | 5000.00 | 0.0 | 500.00 | 0.0 | 70.00 | 0.0 | | 570.00 |
| BUILDING | 26.80 | 1500 | 40 | 4020.00 | 904.50 | 3197.24 | 402.00 | 562.80 | 241.20 | | 5307.73 |
| MILL MANAGER | 25000.00 | 1 | | | | 1874.99 | | | | 25000.00 | 26874.99 |
| MILL SUPT. | 22000.00 | 1 | | | | 1649.99 | | | | 22000.00 | 23649.99 |
| SHIFT SUPV. | 18000.00 | 3 | | | | 4049.99 | | | | 54000.00 | 58049.99 |
| FOREMEN | 16000.00 | 6 | | | | 7199.94 | | | | 96000.00 | 103199.94 |
| SECRETARIES | 7500.00 | 1 | | | | 562.50 | | | | 7500.00 | 8062.50 |
| TOTAL COSTS | | | | | 904.50 | 19034.64 | 402.00 | 632.80 | 241.20 | 204500.00 | 225715.06 |

| COST CENTER UNLOADING | UNIT VALUE | NUM UNIT | YRS LIFE | SALVAGE VALUE | DEPR | INTEREST | FIXED REPAIR | TAXES | INSURE | NON-DEPR COST | ANNUAL COST |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SCALES | 18852.00 | 1 | 30 | 1885.20 | 1476.74 | 3411.33 | 188.52 | 646.62 | 277.12 | | 6000.33 |
| TRUCKDUMP | 56877.00 | 1 | 25 | 5687.70 | 5346.43 | 9947.52 | 568.77 | 1950.88 | 836.09 | | 18649.69 |
| TOTAL COSTS | | | | | 6823.17 | 13358.84 | 757.29 | 2597.50 | 1113.22 | 0.0 | 24650.02 |

| COST CENTER STORAGE | UNIT VALUE | NUM UNIT | YRS LIFE | SALVAGE VALUE | DEPR | INTEREST | FIXED REPAIR | TAXES | INSURE | NON-DEPR COST | ANNUAL COST |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SEEDHOUSE | 465750.00 | 2 | 40 | 93149.94 | 20956.75 | 74085.38 | 18630.00 | 13041.00 | 5589.00 | | 132304.00 |
| CONVEYORS | 18880.00 | 1 | 20 | 0.0 | 2312.80 | 3120.42 | 0.0 | 647.58 | 277.54 | | 6358.34 |
| TOTAL COSTS | | | | | 23271.55 | 77205.75 | 18630.00 | 13688.58 | 5866.54 | 0.0 | 138662.31 |

| COST CENTER CLEANING | UNIT VALUE | NUM UNIT | YRS LIFE | SALVAGE VALUE | DEPR | INTEREST | FIXED REPAIR | TAXES | INSURE | NON-DEPR COST | ANNUAL COST |
|---|---|---|---|---|---|---|---|---|---|---|---|
| BUILDING | 13.50 | 900 | 40 | 2430.00 | 243.00 | 993.96 | 121.50 | 170.10 | 72.90 | | 1601.46 |
| 2-TRAY SHAKERS | 29375.00 | 2 | 30 | 0.0 | 4523.75 | 9872.54 | 0.0 | 1899.97 | 814.27 | | 17110.54 |
| CONVEYORS | 4720.00 | 1 | 20 | 0.0 | 578.20 | 780.11 | 0.0 | 161.90 | 69.38 | | 1589.59 |
| TOTAL COSTS | | | | | 5344.95 | 11646.61 | 121.50 | 2231.97 | 956.56 | 0.0 | 20301.58 |

| COST CENTER DELINTERING | UNIT VALUE | NUM UNIT | YRS LIFE | SALVAGE VALUE | DEPR | INTEREST | FIXED REPAIR | TAXES | INSURE | NON-DEPR COST | ANNUAL COST |
|---|---|---|---|---|---|---|---|---|---|---|---|
| BUILDING | 13.50 | 3000 | 40 | 8100.00 | 810.00 | 3313.20 | 405.00 | 567.00 | 243.00 | | 5338.19 |
| DELINTERS | 14582.00 | 14 | 30 | 0.0 | 15719.39 | 34305.70 | 0.0 | 6602.14 | 2829.49 | | 59455.72 |
| GUMMER | 15845.00 | 1 | 30 | 0.0 | 929.57 | 2028.68 | 0.0 | 390.42 | 167.32 | | 3516.00 |
| LINT FLUE SYS | 2500.00 | 1 | 20 | 0.0 | 306.25 | 413.19 | 50.00 | 85.75 | 36.75 | | 891.94 |
| LINT ROBBING SYS | 3500.00 | 1 | 20 | 0.0 | 428.75 | 578.47 | 70.00 | 120.05 | 51.45 | | 1248.72 |
| LINT PICKUP SYS | 3000.00 | 1 | 20 | 0.0 | 367.50 | 495.83 | 60.00 | 102.90 | 44.10 | | 1070.33 |
| LINT CLEANER | 24744.00 | 2 | 30 | 0.0 | 3810.57 | 8316.12 | 0.0 | 1600.44 | 685.90 | | 14413.04 |
| CONVEYORS | 11060.00 | 1 | 20 | 0.0 | 1354.85 | 1827.96 | 221.20 | 379.36 | 162.58 | | 3945.95 |
| TOTAL COSTS | | | | | 23726.87 | 51279.15 | 806.20 | 9848.04 | 4220.59 | 0.0 | 89880.75 |

| COST CENTER BALING | UNIT VALUE | NUM UNIT | YRS LIFE | SALVAGE VALUE | DEPR | INTEREST | FIXED REPAIR | TAXES | INSURE | NON-DEPR COST | ANNUAL COST |
|---|---|---|---|---|---|---|---|---|---|---|---|
| BUILDING | 12.80 | 200 | 40 | 512.00 | 51.20 | 209.43 | 25.60 | 35.84 | 15.36 | | 337.43 |
| BALE PRESS | 121713.00 | 1 | 40 | 0.0 | 7028.92 | 21722.02 | 0.0 | 3936.20 | 1686.94 | | 34374.07 |
| TOTAL COSTS | | | | | 7080.12 | 21931.45 | 25.60 | 3972.04 | 1702.30 | 0.0 | 34711.50 |

| COST CENTER HULL-SEP | UNIT VALUE | NUM UNIT | YRS LIFE | SALVAGE VALUE | DEPR | INTEREST | FIXED REPAIR | TAXES | INSURE | NON-DEPR COST | ANNUAL COST |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SAFETY SHAKER | 8378.00 | 1 | 20 | 0.0 | 967.66 | 1305.56 | 0.0 | 270.94 | 116.12 | | 2660.28 |
| HULLER | 14993.00 | 2 | 25 | 0.0 | 2770.70 | 4860.38 | 0.0 | 969.75 | 415.61 | | 9016.44 |
| PURIFYING-HULLER | 7383.00 | 2 | 25 | 0.0 | 1364.38 | 2393.40 | 0.0 | 477.53 | 204.66 | | 4439.96 |
| DOUBLE DRUM BEATER | 13230.00 | 1 | 25 | 0.0 | 1222.45 | 2144.43 | 0.0 | 427.86 | 183.37 | | 3978.11 |
| H AND S MACHINE | 7378.00 | 1 | 25 | 0.0 | 681.73 | 1195.89 | 0.0 | 238.60 | 102.26 | | 2218.48 |
| MEATS PURIFIER | 11793.00 | 1 | 25 | 0.0 | 1089.67 | 1911.51 | 0.0 | 381.39 | 163.45 | | 3546.02 |
| TAILINGS BEATER | 7545.00 | 1 | 25 | 0.0 | 697.16 | 1222.96 | 0.0 | 244.01 | 104.57 | | 2268.69 |
| MOTES BEATER | 5395.00 | 1 | 25 | 0.0 | 498.50 | 874.47 | 0.0 | 174.47 | 74.77 | | 1622.21 |
| CONVEYORS | 1260.00 | 1 | 15 | 0.0 | 194.04 | 188.63 | 0.0 | 40.75 | 17.46 | | 440.88 |
| HULLS BLOWING SYS | 10100.00 | 1 | 15 | 0.0 | 1555.40 | 1512.03 | 0.0 | 326.63 | 139.99 | | 3534.04 |
| TOTAL COSTS | | | | | 11041.68 | 17609.23 | 0.0 | 3551.93 | 1522.26 | 0.0 | 33725.11 |

| COST CENTER MEATS PREPARATION | UNIT VALUE | NUM UNIT | YRS LIFE | SALVAGE VALUE | DEPR | INTEREST | FIXED REPAIR | TAXES | INSURE | NON-DEPR COST | ANNUAL COST |
|---|---|---|---|---|---|---|---|---|---|---|---|
| MEATS COND. BLDG. | 13.50 | 600 | 40 | 1620.00 | 162.00 | 662.64 | 81.00 | 113.40 | 48.60 | | 1067.64 |
| BOILER | 22700.00 | 1 | 30 | 0.0 | 1747.90 | 3814.58 | 0.0 | 734.12 | 314.62 | | 6611.22 |
| CRUSHING ROLLS | 95040.00 | 1 | 30 | 0.0 | 7318.07 | 15970.83 | 0.0 | 3073.59 | 1317.25 | | 27679.75 |
| 6-HIGH COOKER | 128400.00 | 1 | 30 | 0.0 | 9886.79 | 21576.76 | 0.0 | 4152.45 | 1779.62 | | 37395.62 |
| CONVEYORS | 8873.00 | 1 | 15 | 0.0 | 1366.44 | 1328.34 | 0.0 | 286.95 | 122.98 | | 3104.71 |
| TOTAL COSTS | | | | | 20481.21 | 43353.14 | 81.00 | 8360.50 | 3583.08 | 0.0 | 75858.88 |

| COST CENTER EXTRACTION | UNIT VALUE | NUM UNIT | YRS LIFE | SALVAGE VALUE | DEPR | INTEREST | FIXED REPAIR | TAXES | INSURE | NON-DEPR COST | ANNUAL COST |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SCREWPRESS | 139030.00 | 2 | 40 | 0.0 | 17031.17 | 52632.70 | 0.0 | 9537.45 | 4087.48 | | 83288.75 |
| BUCKET ELEV. | 5300.00 | 1 | 20 | 0.0 | 649.25 | 875.97 | 53.00 | 181.79 | 77.91 | | 1837.92 |
| SETTLING TANK | 18000.00 | 1 | 20 | 0.0 | 2079.00 | 2804.98 | 180.00 | 582.12 | 249.48 | | 5895.57 |
| FILTER PRESS | 25450.00 | 1 | 30 | 0.0 | 1959.65 | 4276.70 | 0.0 | 823.05 | 352.74 | | 7412.13 |
| PUMP-CONVEYORS | 11850.00 | 1 | 15 | 0.0 | 1935.50 | 1881.53 | 118.50 | 406.45 | 174.19 | | 4515.17 |
| TOTAL COSTS | | | | | 23654.56 | 62471.87 | 351.50 | 11530.86 | 4941.79 | 0.0 | 102950.44 |

| COST CENTER OIL STORAGE | UNIT VALUE | NUM UNIT | YRS LIFE | SALVAGE VALUE | DEPR | INTEREST | FIXED REPAIR | TAXES | INSURE | NON-DEPR COST | ANNUAL COST |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TANKS | 12000.00 | 3 | 25 | 3600.00 | 3182.40 | 5942.57 | 360.00 | 1164.24 | 498.96 | | 11148.16 |
| PUMPS | 3300.00 | 1 | 10 | 0.0 | 762.30 | 478.31 | 0.0 | 106.72 | 45.74 | | 1393.07 |
| TOTAL COSTS | | | | | 3944.70 | 6420.88 | 360.00 | 1270.96 | 544.70 | 0.0 | 12541.23 |

| COST CENTER MEAL STORAGE | UNIT VALUE | NUM UNIT | YRS LIFE | SALVAGE VALUE | DEPR | INTEREST | FIXED REPAIR | TAXES | INSURE | NON-DEPR COST | ANNUAL COST |
|---|---|---|---|---|---|---|---|---|---|---|---|
| BUILDING | 13.20 | 3150 | 40 | 4158.00 | 935.55 | 3307.00 | 415.80 | 582.12 | 249.48 | | 5489.94 |
| TOTAL COSTS | | | | | 935.55 | 3307.00 | 415.80 | 582.12 | 249.48 | 0.0 | 5489.94 |

| COST CENTER HULL STORAGE | UNIT VALUE | NUM UNIT | YRS LIFE | SALVAGE VALUE | DEPR | INTEREST | FIXED REPAIR | TAXES | INSURE | NON-DEPR COST | ANNUAL COST |
|---|---|---|---|---|---|---|---|---|---|---|---|
| BUILDING | 13.20 | 7800 | 40 | 10295.99 | 2316.60 | 8188.76 | 1029.60 | 1441.44 | 617.76 | | 13594.15 |
| TOTAL COSTS | | | | | 2316.60 | 8188.76 | 1029.60 | 1441.44 | 617.76 | 0.0 | 13594.15 |

| COST CENTER LINTER STORAGE | UNIT VALUE | NUM UNIT | YRS LIFE | SALVAGE VALUE | DEPR | INTEREST | FIXED REPAIR | TAXES | INSURE | NON-DEPR COST | ANNUAL COST |
|---|---|---|---|---|---|---|---|---|---|---|---|
| BUILDING | 13.20 | 3000 | 40 | 3960.00 | 891.00 | 3149.53 | 396.00 | 554.40 | 237.60 | | 5228.52 |
| TOTAL COST | | | | | 891.00 | 3149.53 | 396.00 | 554.40 | 237.60 | 0.0 | 5228.52 |
| TOTAL FIXED COSTS | | | | | 130416.13 | 338956.50 | 23376.45 | 60263.13 | 25797.04 | 204500.00 | 783309.31 |

Section C TOTAL REVENUE AT 100% CAPACITY UTILIZATION

| | |
|---|---|
| REVENUE FROM OIL SALES | 2953086.00 |
| REVENUE FROM MEAL SALES | 2208588.00 |
| REVENUE FROM HULL SALES | 286970.88 |
| REVENUE FROM LINTER SALES | 467939.69 |
| TOTAL REVENUE | 5921583.00 |

Section D TOTAL VARIABLE COSTS BY ITEM BY COST CENTER

| UTILIZATION LEVEL | 100.% | 90.% | 80.% | 70.% | 60.% | 50.% | 40.% | 30.% | 20.% | 10.% |
|---|---|---|---|---|---|---|---|---|---|---|
| SEED PROCESSED | 33000. | 29700. | 26400. | 23100. | 19800. | 16500. | 13200. | 9900. | 6600. | 3300. |
| PROCESSING DAYS | 330. | 297. | 264. | 231. | 198. | 165. | 132. | 99. | 66. | 33. |
| COTTONSEED BUY | | | | | | | | | | |
| COTTONSEED COST | 3923039. | 3530735. | 3138431. | 2746127. | 2353824. | 1961520. | 1569216. | 1176912. | 784609. | 392305. |
| INT. OPER. CAP. | 266014. | 215471. | 170249. | 130347. | 95765. | 66504. | 42562. | 23941. | 10641. | 2660. |
| TOTAL COTTONSEED COST | 4189053. | 3746206. | 3308679. | 2876473. | 2449589. | 2028023. | 1611778. | 1200853. | 795249. | 394965. |
| COST CENTER OFFICE | | | | | | | | | | |
| ELECTRICITY | 42. | 42. | 42. | 42. | 42. | 42. | 42. | 42. | 42. | 42. |
| LAB ANALYSIS | 8250. | 7425. | 6600. | 5775. | 4950. | 4125. | 3300. | 2475. | 1650. | 825. |
| MISCELLANEOUS | 51150. | 46035. | 40920. | 35805. | 30690. | 25575. | 20460. | 15345. | 10230. | 5115. |
| TOTAL LESS INTEREST | 59442. | 53502. | 47562. | 41622. | 35682. | 29742. | 23802. | 17862. | 11922. | 5982. |
| INT. OPER. CAP. | 620. | 502. | 397. | 304. | 223. | 155. | 99. | 56. | 25. | 6. |
| TOTAL P.S. COST | 60062. | 54004. | 47959. | 41926. | 35905. | 29897. | 23901. | 17918. | 11947. | 5988. |
| COST CENTER UNLOADING | | | | | | | | | | |
| LABOR | 12852. | 11567. | 10282. | 8996. | 7711. | 6426. | 5141. | 3856. | 2570. | 1285. |
| ELECTRICITY | 1233. | 1110. | 987. | 864. | 741. | 618. | 495. | 372. | 249. | 126. |
| REPAIRS | 4791. | 4312. | 3833. | 3354. | 2875. | 2396. | 1916. | 1437. | 958. | 479. |
| TOTAL LESS INTEREST | 18876. | 16989. | 15102. | 13214. | 11327. | 9440. | 7552. | 5665. | 3778. | 1890. |
| INT. OPER. CAP. | 197. | 160. | 126. | 96. | 71. | 49. | 32. | 18. | 8. | 2. |
| TOTAL P.S. COST | 19073. | 17148. | 15228. | 13311. | 11398. | 9489. | 7584. | 5633. | 3785. | 1892. |
| COST CENTER SEED STORAGE | | | | | | | | | | |
| LABOR | 35343. | 31809. | 28274. | 24740. | 21206. | 17671. | 14137. | 10603. | 7069. | 3534. |
| ELECTRICITY | 5545. | 4991. | 4438. | 3884. | 3330. | 2777. | 2223. | 1669. | 1116. | 562. |
| REPAIRS | 14374. | 12936. | 11499. | 10061. | 8624. | 7187. | 5749. | 4312. | 2875. | 1437. |
| INSURANCE | 1961. | 1765. | 1569. | 1373. | 1176. | 980. | 784. | 588. | 392. | 196. |
| TOTAL LESS INTEREST | 57222. | 51501. | 45780. | 40058. | 34337. | 28615. | 22894. | 17173. | 11451. | 5730. |
| INT. OPER. CAP. | 597. | 484. | 382. | 293. | 215. | 149. | 96. | 54. | 24. | 6. |
| TOTAL P.S. COST | 57819. | 51985. | 46162. | 40351. | 34552. | 28765. | 22990. | 17226. | 11475. | 5736. |
| COST CENTER CLEANING | | | | | | | | | | |
| LABOR | 21206. | 19085. | 16965. | 14844. | 12723. | 10603. | 8482. | 6362. | 4241. | 2121. |
| ELECTRICITY | 14768. | 13291. | 11815. | 10338. | 8862. | 7385. | 5909. | 4432. | 2956. | 1479. |
| REPAIRS | 4791. | 4312. | 3833. | 3354. | 2875. | 2396. | 1916. | 1437. | 958. | 479. |
| TOTAL LESS INTEREST | 40765. | 36688. | 32612. | 28536. | 24460. | 20384. | 16308. | 12231. | 8155. | 4079. |
| INT. OPER. CAP. | 425. | 344. | 272. | 208. | 153. | 106. | 68. | 38. | 17. | 4. |
| TOTAL P.S. COST | 41190. | 37033. | 32884. | 28744. | 24613. | 20490. | 16376. | 12270. | 8172. | 4083. |
| COST CENTER DELINTERING | | | | | | | | | | |
| LABOR | 97729. | 93429. | 89128. | 84828. | 80528. | 76228. | 71928. | 67628. | 63328. | 59028. |
| ELECTRICITY | 154765. | 139291. | 123818. | 108344. | 92871. | 77397. | 61923. | 46450. | 30976. | 15503. |
| REPAIRS | 50211. | 45190. | 40169. | 35148. | 30127. | 25106. | 20085. | 15063. | 10042. | 5021. |
| MISCELLANEOUS | 9900. | 8910. | 7920. | 6930. | 5940. | 4950. | 3960. | 2970. | 1980. | 990. |
| TOTAL LESS INTEREST | 312605. | 286820. | 261035. | 235250. | 209466. | 183681. | 157896. | 132112. | 106327. | 80542. |
| INT. OPER. CAP. | 3261. | 2693. | 2179. | 1718. | 1311. | 958. | 659. | 413. | 222. | 84. |
| TOTAL P.S. COST | 315866. | 289513. | 263214. | 236968. | 210777. | 184639. | 158555. | 132525. | 106549. | 80626. |
| COST CENTER BALING | | | | | | | | | | |
| LABOR | 15637. | 15637. | 15637. | 15637. | 15637. | 15637. | 15637. | 15637. | 15637. | 15637. |
| ELECTRICITY | 22151. | 19937. | 17722. | 15507. | 13293. | 11078. | 8863. | 6648. | 4434. | 2219. |
| REPAIRS | 7187. | 6468. | 5749. | 5031. | 4312. | 3593. | 2875. | 2156. | 1437. | 719. |
| BAGGING-TIES | 24929. | 22436. | 19943. | 17450. | 14957. | 12464. | 9972. | 7479. | 4986. | 2493. |
| TOTAL LESS INTEREST | 69904. | 64477. | 59051. | 53625. | 48198. | 42772. | 37346. | 31920. | 26493. | 21067. |
| INT. OPER. CAP. | 729. | 605. | 493. | 392. | 302. | 223. | 156. | 100. | 55. | 22. |
| TOTAL P.S. COST | 70633. | 65083. | 59544. | 54016. | 48500. | 42995. | 37502. | 32019. | 26549. | 21089. |
| COST CENTER HULLING-SEPARATION | | | | | | | | | | |
| LABOR | 12959. | 11663. | 10367. | 9071. | 7775. | 6480. | 5184. | 3888. | 2592. | 1296. |
| ELECTRICITY | 2954. | 2658. | 2363. | 2068. | 1772. | 1477. | 1182. | 886. | 591. | 296. |
| REPAIRS | 958. | 862. | 767. | 671. | 575. | 479. | 383. | 287. | 192. | 96. |
| TOTAL LESS INTEREST | 16871. | 15184. | 13497. | 11810. | 10123. | 8436. | 6749. | 5062. | 3375. | 1688. |
| INT. OPER. CAP. | 176. | 143. | 113. | 86. | 63. | 44. | 28. | 16. | 7. | 2. |
| TOTAL P.S. COST | 17047. | 15326. | 13609. | 11896. | 10186. | 8480. | 6777. | 5077. | 3382. | 1689. |
| COST CENTER MEATS CONDITONING | | | | | | | | | | |
| LABOR | 12959. | 11663. | 10367. | 9071. | 7775. | 6480. | 5184. | 3888. | 2592. | 1296. |
| FUEL | 115500. | 103950. | 92400. | 80850. | 69300. | 57750. | 46200. | 34650. | 23100. | 11550. |
| TOTAL LESS INTEREST | 128459. | 115613. | 102767. | 89921. | 77075. | 64230. | 51384. | 38538. | 25692. | 12846. |
| INT. OPER. CAP. | 1340. | 1085. | 858. | 657. | 482. | 335. | 214. | 121. | 54. | 13. |
| TOTAL P.S. COST | 129799. | 116699. | 103625. | 90578. | 77558. | 64565. | 51598. | 38658. | 25745. | 12859. |
| COST CENTER EXTRACTION | | | | | | | | | | |
| LABOR | 86572. | 79739. | 72906. | 66074. | 59241. | 52408. | 45575. | 38742. | 31909. | 25076. |
| ELECTRICITY | 95399. | 85861. | 76323. | 66785. | 57247. | 47708. | 38170. | 28632. | 19094. | 9556. |
| REPAIRS | 30951. | 27856. | 24761. | 21666. | 18571. | 15475. | 12380. | 9285. | 6190. | 3095. |
| WATER | 89135. | 80258. | 71381. | 62504. | 53627. | 44750. | 35873. | 26996. | 18119. | 9242. |
| TOTAL LESS INTEREST | 302057. | 273714. | 245371. | 217028. | 188685. | 160341. | 131998. | 103655. | 75312. | 46969. |
| INT. OPER. CAP. | 3151. | 2570. | 2048. | 1585. | 1181. | 836. | 551. | 324. | 157. | 49. |
| TOTAL P.S. COST | 305208. | 276284. | 247419. | 218613. | 189366. | 161178. | 132549. | 103980. | 75469. | 47018. |
| COST CENTER OIL STORAGE | | | | | | | | | | |
| LABOR | 11781. | 10603. | 9425. | 8247. | 7069. | 5890. | 4712. | 3534. | 2356. | 1178. |
| ELECTRICITY | 247. | 223. | 198. | 173. | 149. | 124. | 100. | 75. | 50. | 26. |
| REPAIRS | 1916. | 1725. | 1533. | 1342. | 1150. | 958. | 767. | 575. | 383. | 192. |
| INSURANCE | 1473. | 1326. | 1179. | 1031. | 884. | 737. | 589. | 442. | 295. | 147. |
| TOTAL LESS INTEREST | 15418. | 13876. | 12334. | 10793. | 9251. | 7709. | 6168. | 4626. | 3084. | 1543. |
| INT. OPER. CAP. | 161. | 130. | 103. | 79. | 53. | 40. | 26. | 14. | 6. | 2. |
| TOTAL P.S. COST | 15579. | 14006. | 12437. | 10872. | 9309. | 7750. | 6194. | 4641. | 3091. | 1544. |
| COST CENTER MEAL STORAGE | | | | | | | | | | |
| LABOR | 5890. | 5301. | 4712. | 4123. | 3534. | 2945. | 2356. | 1767. | 1178. | 589. |
| ELECTRICITY | 739. | 666. | 592. | 518. | 444. | 370. | 296. | 223. | 149. | 75. |
| REPAIRS | 1916. | 1725. | 1533. | 1342. | 1150. | 958. | 767. | 575. | 383. | 192. |
| INSURANCE | 1100. | 990. | 880. | 770. | 660. | 550. | 440. | 330. | 220. | 110. |
| TOTAL LESS INTEREST | 9646. | 8682. | 7717. | 6753. | 5788. | 4824. | 3859. | 2895. | 1930. | 966. |
| INT. OPER. CAP. | 101. | 82. | 64. | 49. | 36. | 25. | 16. | 9. | 4. | 1. |
| TOTAL P.S. COST | 9747. | 8763. | 7782. | 6802. | 5824. | 4849. | 3875. | 2904. | 1934. | 967. |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| COST CENTER HULL STORAGE | | | | | | | | | | |
| LABOR | 5890. | 5301. | 4712. | 4123. | 3534. | 2945. | 2356. | 1767. | 1178. | 589. |
| ELECTRICITY | 1109. | 998. | 888. | 777. | 666. | 555. | 445. | 334. | 223. | 112. |
| REPAIRS | 2875. | 2587. | 2300. | 2012. | 1725. | 1437. | 1150. | 862. | 575. | 287. |
| INSURANCE | 143. | 129. | 114. | 100. | 86. | 71. | 57. | 43. | 29. | 14. |
| TOTAL LESS INTEREST | 10017. | 9016. | 8014. | 7012. | 6011. | 5009. | 4008. | 3006. | 2005. | 1003. |
| INT. OPER. CAP. | 104. | 85. | 67. | 51. | 38. | 26. | 17. | 9. | 4. | 1. |
| TOTAL P.S. COST | 10122. | 9100. | 8081. | 7064. | 6049. | 5036. | 4025. | 3016. | 2009. | 1004. |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| COST CENTER LINTER STORAGE | | | | | | | | | | |
| LABOR | 9425. | 8482. | 7540. | 6597. | 5655. | 4712. | 3770. | 2827. | 1885. | 942. |
| ELECTRICITY | 3. | 3. | 3. | 2. | 2. | 2. | 2. | 1. | 1. | 1. |
| REPAIRS | 479. | 431. | 383. | 335. | 287. | 240. | 192. | 144. | 96. | 48. |
| INSURANCE | 233. | 210. | 186. | 163. | 140. | 117. | 93. | 70. | 47. | 23. |
| TOTAL LESS INTEREST | 10140. | 9126. | 8112. | 7098. | 6084. | 5070. | 4056. | 3042. | 2028. | 1014. |
| INT. OPER. CAP. | 106. | 86. | 68. | 52. | 38. | 26. | 17. | 10. | 4. | 1. |
| TOTAL P.S. COST | 10246. | 9212. | 8180. | 7150. | 6122. | 5097. | 4073. | 3052. | 2033. | 1015. |

Section E

AVERAGE VARIABLE COST BY ITEM BY COST CENTER

| UTILIZATION LEVEL | 100.% | 90.% | 80.% | 70.% | 60.% | 50.% | 40.% | 30.% | 20.% | 10.% |
|---|---|---|---|---|---|---|---|---|---|---|
| COTTONSEED BUY | | | | | | | | | | |
| COTTONSEED COST | 118.88 | 118.88 | 118.88 | 118.88 | 118.88 | 118.88 | 118.88 | 118.88 | 118.88 | 118.88 |
| INT. OPER. CAP. | 8.06 | 7.25 | 6.45 | 5.64 | 4.84 | 4.03 | 3.22 | 2.42 | 1.61 | 0.81 |
| AVER. C.S. COST | 126.94 | 126.13 | 125.33 | 124.52 | 123.72 | 122.91 | 122.10 | 121.30 | 120.49 | 119.69 |
| COST CENTER OFFICE | | | | | | | | | | |
| ELECTRICITY | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 |
| LAB ANALYSIS | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 |
| MISCELLANEOUS | 1.55 | 1.55 | 1.55 | 1.55 | 1.55 | 1.55 | 1.55 | 1.55 | 1.55 | 1.55 |
| INT. OPER. CAP. | 0.02 | 0.02 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 |
| AVER. P.S. COST | 1.82 | 1.82 | 1.82 | 1.81 | 1.81 | 1.81 | 1.81 | 1.81 | 1.81 | 1.81 |
| COST CENTER UNLOADING | | | | | | | | | | |
| LABOR | 0.39 | 0.39 | 0.39 | 0.39 | 0.39 | 0.39 | 0.39 | 0.39 | 0.39 | 0.39 |
| ELECTRICITY | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 |
| REPAIRS | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 |
| INT. OPER. CAP. | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| AVER. P.S. COST | 0.58 | 0.58 | 0.58 | 0.58 | 0.58 | 0.58 | 0.57 | 0.57 | 0.57 | 0.57 |
| COST CENTER SEED STORAGE | | | | | | | | | | |
| LABOR | 1.07 | 1.07 | 1.07 | 1.07 | 1.07 | 1.07 | 1.07 | 1.07 | 1.07 | 1.07 |
| ELECTRICITY | 0.17 | 0.17 | 0.17 | 0.17 | 0.17 | 0.17 | 0.17 | 0.17 | 0.17 | 0.17 |
| REPAIRS | 0.44 | 0.44 | 0.44 | 0.44 | 0.44 | 0.44 | 0.44 | 0.44 | 0.44 | 0.44 |
| INSURANCE | 0.06 | 0.06 | 0.06 | 0.06 | 0.06 | 0.06 | 0.06 | 0.06 | 0.06 | 0.06 |
| INT. OPER. CAP. | 0.02 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 |
| AVER. P.S. COST | 1.75 | 1.75 | 1.75 | 1.75 | 1.75 | 1.74 | 1.74 | 1.74 | 1.74 | 1.74 |
| COST CENTER CLEANING | | | | | | | | | | |
| LABOR | 0.64 | 0.64 | 0.64 | 0.64 | 0.64 | 0.64 | 0.64 | 0.64 | 0.64 | 0.64 |
| ELECTRICITY | 0.45 | 0.45 | 0.45 | 0.45 | 0.45 | 0.45 | 0.45 | 0.45 | 0.45 | 0.45 |
| REPAIRS | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 |
| INT. OPER. CAP. | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 |
| AVER. P.S. COST | 1.25 | 1.25 | 1.25 | 1.24 | 1.24 | 1.24 | 1.24 | 1.24 | 1.24 | 1.24 |
| COST CENTER DELINTERING | | | | | | | | | | |
| LABOR | 2.96 | 3.15 | 3.38 | 3.67 | 4.07 | 4.62 | 5.45 | 6.83 | 9.60 | 17.89 |
| ELECTRICITY | 4.69 | 4.69 | 4.69 | 4.69 | 4.69 | 4.69 | 4.69 | 4.69 | 4.69 | 4.70 |
| REPAIRS | 1.52 | 1.52 | 1.52 | 1.52 | 1.52 | 1.52 | 1.52 | 1.52 | 1.52 | 1.52 |
| MISCELLANEOUS | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 |
| INT. OPER. CAP. | 0.10 | 0.09 | 0.08 | 0.07 | 0.07 | 0.06 | 0.05 | 0.04 | 0.03 | 0.03 |
| AVER. P.S. COST | 9.57 | 9.75 | 9.97 | 10.26 | 10.65 | 11.19 | 12.01 | 13.39 | 16.14 | 24.43 |
| COST CENTER BALING | | | | | | | | | | |
| LABOR | 0.47 | 0.53 | 0.59 | 0.68 | 0.79 | 0.95 | 1.18 | 1.58 | 2.37 | 4.74 |
| ELECTRICITY | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 |
| REPAIRS | 0.22 | 0.22 | 0.22 | 0.22 | 0.22 | 0.22 | 0.22 | 0.22 | 0.22 | 0.22 |
| BAGGING-TIES | 0.76 | 0.76 | 0.76 | 0.76 | 0.76 | 0.76 | 0.76 | 0.76 | 0.76 | 0.76 |
| INT. OPER. CAP. | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| AVER. P.S. COST | 2.14 | 2.19 | 2.26 | 2.34 | 2.45 | 2.61 | 2.84 | 3.23 | 4.02 | 6.39 |
| COST CENTER HULLING-SEPARATION | | | | | | | | | | |
| LABOR | 0.39 | 0.39 | 0.39 | 0.39 | 0.39 | 0.39 | 0.39 | 0.39 | 0.39 | 0.39 |
| ELECTRICITY | 0.09 | 0.09 | 0.09 | 0.09 | 0.09 | 0.09 | 0.09 | 0.09 | 0.09 | 0.09 |
| REPAIRS | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 |
| INT. OPER. CAP. | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| AVER. P.S. COST | 0.52 | 0.52 | 0.52 | 0.51 | 0.51 | 0.51 | 0.51 | 0.51 | 0.51 | 0.51 |
| COST CENTER MEATS CONDITONING | | | | | | | | | | |
| LABOR | 0.39 | 0.39 | 0.39 | 0.39 | 0.39 | 0.39 | 0.39 | 0.39 | 0.39 | 0.39 |
| FUEL | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 |
| INT. OPER. CAP. | 0.04 | 0.04 | 0.03 | 0.03 | 0.02 | 0.02 | 0.02 | 0.01 | 0.01 | 0.00 |
| AVER. P.S. COST | 3.93 | 3.93 | 3.93 | 3.92 | 3.92 | 3.91 | 3.91 | 3.90 | 3.90 | 3.90 |
| COST CENTER EXTRACTION | | | | | | | | | | |
| LABOR | 2.62 | 2.68 | 2.76 | 2.86 | 2.99 | 3.18 | 3.45 | 3.91 | 4.83 | 7.60 |
| ELECTRICITY | 2.89 | 2.89 | 2.89 | 2.89 | 2.89 | 2.89 | 2.89 | 2.89 | 2.89 | 2.90 |
| REPAIRS | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 |
| WATER | 2.70 | 2.70 | 2.70 | 2.71 | 2.71 | 2.71 | 2.72 | 2.73 | 2.75 | 2.80 |
| INT. OPER. CAP. | 0.10 | 0.09 | 0.08 | 0.07 | 0.06 | 0.05 | 0.04 | 0.03 | 0.02 | 0.01 |
| AVER. P.S. COST | 9.25 | 9.30 | 9.37 | 9.46 | 9.59 | 9.77 | 10.04 | 10.50 | 11.43 | 14.25 |
| COST CENTER OIL STORAGE | | | | | | | | | | |
| LABOR | 0.36 | 0.36 | 0.36 | 0.36 | 0.36 | 0.36 | 0.36 | 0.36 | 0.36 | 0.36 |
| ELECTRICITY | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| REPAIRS | 0.06 | 0.06 | 0.06 | 0.06 | 0.06 | 0.06 | 0.06 | 0.06 | 0.06 | 0.06 |
| INSURANCE | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 |
| INT. OPER. CAP. | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| AVER. P.S. COST | 0.47 | 0.47 | 0.47 | 0.47 | 0.47 | 0.47 | 0.47 | 0.47 | 0.47 | 0.47 |
| COST CENTER MEAL STORAGE | | | | | | | | | | |
| LABOR | 0.18 | 0.18 | 0.18 | 0.18 | 0.18 | 0.18 | 0.18 | 0.18 | 0.18 | 0.18 |
| ELECTRICITY | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 |
| REPAIRS | 0.06 | 0.06 | 0.06 | 0.06 | 0.06 | 0.06 | 0.06 | 0.06 | 0.06 | 0.06 |
| INSURANCE | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 |
| INT. OPER. CAP. | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| AVER. P.S. COST | 0.30 | 0.30 | 0.29 | 0.29 | 0.29 | 0.29 | 0.29 | 0.29 | 0.29 | 0.29 |

| COST CENTER HULL STORAGE | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| LABOR | 0.18 | 0.18 | 0.18 | 0.18 | 0.18 | 0.18 | 0.18 | 0.18 | 0.18 | 0.18 |
| ELECTRICITY | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 |
| REPAIRS | 0.09 | 0.09 | 0.09 | 0.09 | 0.09 | 0.09 | 0.09 | 0.09 | 0.09 | 0.09 |
| INSURANCE | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| INT. OPER. CAP. | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| AVER. P.S. COST | 0.31 | 0.31 | 0.31 | 0.31 | 0.31 | 0.31 | 0.30 | 0.30 | 0.30 | 0.30 |

| COST CENTER LINTER STORAGE | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| LABOR | 0.29 | 0.29 | 0.29 | 0.29 | 0.29 | 0.29 | 0.29 | 0.29 | 0.29 | 0.29 |
| ELECTRICITY | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| REPAIRS | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| INSURANCE | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| INT. OPER. CAP. | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| AVER. P.S. COST | 0.31 | 0.31 | 0.31 | 0.31 | 0.31 | 0.31 | 0.31 | 0.31 | 0.31 | 0.31 |

Section F

AVERAGE VARIABLE COST BY RESOURCE ITEM PROCESSED

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| LABOR | 9.95 | 10.25 | 10.62 | 11.10 | 11.74 | 12.63 | 13.97 | 16.21 | 20.69 | 34.11 |
| ELECTRICITY | 9.06 | 9.06 | 9.06 | 9.06 | 9.06 | 9.06 | 9.06 | 9.07 | 9.07 | 9.09 |
| REPAIRS | 3.65 | 3.65 | 3.65 | 3.65 | 3.65 | 3.65 | 3.65 | 3.65 | 3.65 | 3.65 |
| LAB ANALYSIS | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 |
| BAGGING-TIES | 0.76 | 0.76 | 0.76 | 0.76 | 0.76 | 0.76 | 0.76 | 0.76 | 0.76 | 0.76 |
| FUEL | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 |
| MISCELLANEOUS | 1.85 | 1.85 | 1.85 | 1.85 | 1.85 | 1.85 | 1.85 | 1.85 | 1.85 | 1.85 |
| SOLVENT | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| INSURANCE | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 |
| WATER | 2.70 | 2.70 | 2.70 | 2.71 | 2.71 | 2.71 | 2.72 | 2.73 | 2.75 | 2.80 |

Section G

COST CENTER AVERAGE FIXED COSTS

| UTILIZATION LEVEL | 100.% | 90.% | 80.% | 70.% | 60.% | 50.% | 40.% | 30.% | 20.% | 10.% |
|---|---|---|---|---|---|---|---|---|---|---|
| OFFICE | 6.84 | 7.60 | 8.55 | 9.77 | 11.40 | 13.68 | 17.10 | 22.80 | 34.20 | 68.40 |
| UNLOADING | 0.75 | 0.83 | 0.93 | 1.07 | 1.24 | 1.49 | 1.87 | 2.49 | 3.73 | 7.47 |
| SEED STORAGE | 4.20 | 4.67 | 5.25 | 6.00 | 7.00 | 8.40 | 10.50 | 14.01 | 21.01 | 42.02 |
| CLEANING | 0.62 | 0.68 | 0.77 | 0.88 | 1.03 | 1.23 | 1.54 | 2.05 | 3.08 | 6.15 |
| DELINTERING | 2.72 | 3.03 | 3.40 | 3.89 | 4.54 | 5.45 | 6.81 | 9.08 | 13.62 | 27.24 |
| BALING | 1.05 | 1.17 | 1.31 | 1.50 | 1.75 | 2.10 | 2.63 | 3.51 | 5.26 | 10.52 |
| HULLING-SEPARATION | 1.02 | 1.14 | 1.28 | 1.46 | 1.70 | 2.04 | 2.55 | 3.41 | 5.11 | 10.22 |
| MEATS CONDITONING | 2.30 | 2.55 | 2.87 | 3.28 | 3.83 | 4.60 | 5.75 | 7.66 | 11.49 | 22.99 |
| EXTRACTION | 3.12 | 3.47 | 3.90 | 4.46 | 5.20 | 6.24 | 7.80 | 10.40 | 15.60 | 31.20 |
| OIL STORAGE | 0.38 | 0.42 | 0.48 | 0.54 | 0.63 | 0.76 | 0.95 | 1.27 | 1.90 | 3.80 |
| MEAL STORAGE | 0.17 | 0.18 | 0.21 | 0.24 | 0.28 | 0.33 | 0.42 | 0.55 | 0.83 | 1.66 |
| HULL STORAGE | 0.41 | 0.46 | 0.51 | 0.59 | 0.69 | 0.82 | 1.03 | 1.37 | 2.06 | 4.12 |
| LINTER STORAGE | 0.16 | 0.18 | 0.20 | 0.23 | 0.26 | 0.32 | 0.40 | 0.53 | 0.79 | 1.58 |

Section H

COST CENTER AVERAGE VARIABLE COSTS

| UTILIZATION LEVEL | 100.% | 90.% | 80.% | 70.% | 60.% | 50.% | 40.% | 30.% | 20.% | 10.% |
|---|---|---|---|---|---|---|---|---|---|---|
| OFFICE | 1.82 | 1.82 | 1.82 | 1.81 | 1.81 | 1.81 | 1.81 | 1.81 | 1.81 | 1.81 |
| UNLOADING | 0.58 | 0.58 | 0.58 | 0.58 | 0.58 | 0.58 | 0.57 | 0.57 | 0.57 | 0.57 |
| SEED STORAGE | 1.75 | 1.75 | 1.75 | 1.75 | 1.75 | 1.74 | 1.74 | 1.74 | 1.74 | 1.74 |
| CLEANING | 1.25 | 1.25 | 1.25 | 1.24 | 1.24 | 1.24 | 1.24 | 1.24 | 1.24 | 1.24 |
| DELINTERING | 9.57 | 9.75 | 9.97 | 10.26 | 10.65 | 11.19 | 12.01 | 13.39 | 16.14 | 24.43 |
| BALING | 2.14 | 2.19 | 2.26 | 2.34 | 2.45 | 2.61 | 2.84 | 3.23 | 4.02 | 6.39 |
| HULLING-SEPARATION | 0.52 | 0.52 | 0.52 | 0.51 | 0.51 | 0.51 | 0.51 | 0.51 | 0.51 | 0.51 |
| MEATS CONDITCNING | 3.93 | 3.93 | 3.93 | 3.92 | 3.92 | 3.91 | 3.91 | 3.90 | 3.90 | 3.90 |
| EXTRACTION | 9.25 | 9.30 | 9.37 | 9.46 | 9.59 | 9.77 | 10.04 | 10.50 | 11.43 | 14.25 |
| OIL STORAGE | 0.47 | 0.47 | 0.47 | 0.47 | 0.47 | 0.47 | 0.47 | 0.47 | 0.47 | 0.47 |
| MEAL STORAGE | 0.30 | 0.30 | 0.29 | 0.29 | 0.29 | 0.29 | 0.29 | 0.29 | 0.29 | 0.29 |
| HULL STORAGE | 0.31 | 0.31 | 0.31 | 0.31 | 0.31 | 0.31 | 0.30 | 0.30 | 0.30 | 0.30 |
| LINTER STORAGE | 0.31 | 0.31 | 0.31 | 0.31 | 0.31 | 0.31 | 0.31 | 0.31 | 0.31 | 0.31 |

Section I

COST CENTER AVERAGE TOTAL COSTS

| UTILIZATION LEVEL | 100.% | 90.% | 80.% | 70.% | 60.% | 50.% | 40.% | 30.% | 20.% | 10.% |
|---|---|---|---|---|---|---|---|---|---|---|
| OFFICE | 8.66 | 9.42 | 10.37 | 11.59 | 13.21 | 15.49 | 18.91 | 24.61 | 36.01 | 70.21 |
| UNLOADING | 1.32 | 1.41 | 1.51 | 1.64 | 1.82 | 2.07 | 2.44 | 3.06 | 4.31 | 8.04 |
| SEED STORAGE | 5.95 | 6.42 | 7.00 | 7.75 | 8.75 | 10.15 | 12.25 | 15.75 | 22.75 | 43.76 |
| CLEANING | 1.86 | 1.93 | 2.01 | 2.12 | 2.27 | 2.47 | 2.78 | 3.29 | 4.31 | 7.39 |
| DELINTERING | 12.30 | 12.77 | 13.37 | 14.15 | 15.18 | 16.64 | 18.82 | 22.47 | 29.76 | 51.67 |
| BALING | 3.19 | 3.36 | 3.57 | 3.84 | 4.20 | 4.71 | 5.47 | 6.74 | 9.28 | 16.91 |
| HULLING-SEPARATION | 1.54 | 1.65 | 1.79 | 1.97 | 2.22 | 2.56 | 3.07 | 3.92 | 5.62 | 10.73 |
| MEATS CONDITONING | 6.23 | 6.48 | 6.80 | 7.21 | 7.75 | 8.51 | 9.66 | 11.57 | 15.39 | 26.88 |
| EXTRACTION | 12.37 | 12.77 | 13.27 | 13.92 | 14.79 | 16.01 | 17.84 | 20.90 | 27.03 | 45.44 |
| OIL STORAGE | 0.85 | 0.89 | 0.95 | 1.01 | 1.10 | 1.23 | 1.42 | 1.74 | 2.37 | 4.27 |
| MEAL STORAGE | 0.46 | 0.48 | 0.50 | 0.53 | 0.57 | 0.63 | 0.71 | 0.85 | 1.12 | 1.96 |
| HULL STORAGE | 0.72 | 0.76 | 0.82 | 0.89 | 0.99 | 1.13 | 1.33 | 1.68 | 2.36 | 4.42 |
| LINTER STORAGE | 0.47 | 0.49 | 0.51 | 0.54 | 0.57 | 0.63 | 0.70 | 0.84 | 1.10 | 1.89 |

Section J

TOTAL COSTS AND RETURNS MATRIX

| UTILIZATION LEVEL | 100.% | 90.% | 80.% | 70.% | 60.% | 50.% | 40.% | 30.% | 20.% | 10.% |
|---|---|---|---|---|---|---|---|---|---|---|
| TOTAL FIXED COST | 783309. | | | | | | | | | |
| TOTAL VAR. COST | 5251437. | 4710355. | 4174793. | 3644755. | 3120241. | 2601244. | 2087770. | 1579814. | 1077386. | 580476. |
| TOTAL COST | 6034746. | 5493664. | 4958102. | 4428064. | 3903550. | 3384353. | 2871079. | 2363123. | 1860695. | 1363785. |
| TOTAL REVENUE | 5921583. | 5329424. | 4737266. | 4145108. | 3552950. | 2960792. | 2368634. | 1776476. | 1184318. | 592160. |
| TOTAL NET REVENUE | -113163. | -164240. | -220836. | -282956. | -350600. | -423761. | -502445. | -586647. | -676377. | -771625. |

Section K

AVERAGE COST AND RETURNS MATRIX

| UTILIZATION LEVEL | 100.% | 90.% | 80.% | 70.% | 60.% | 50.% | 40.% | 30.% | 20.% | 10.% |
|---|---|---|---|---|---|---|---|---|---|---|
| AVER. FIXED COST | 23.74 | 26.37 | 29.67 | 33.91 | 39.56 | 47.47 | 59.34 | 79.12 | 118.68 | 237.37 |
| AVER. VAR. COST | 159.13 | 158.60 | 158.14 | 157.78 | 157.59 | 157.65 | 158.16 | 159.58 | 163.24 | 175.90 |
| AVER. TOTAL COST | 182.87 | 184.97 | 187.81 | 191.69 | 197.15 | 205.12 | 217.51 | 238.70 | 281.92 | 413.27 |
| AVER. REVENUE | 179.44 | 179.44 | 179.44 | 179.44 | 179.44 | 179.44 | 179.44 | 179.44 | 179.44 | 179.44 |
| AVER. NET REVENUE | -3.43 | -5.53 | -8.36 | -12.25 | -17.71 | -25.68 | -38.06 | -59.26 | -102.48 | -233.83 |